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PROVIDING AGRI-ENVIRONMENTAL PUBLIC GOODS THROUGH COLLECTIVE ACTION

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NOTE BY THE SECRETARIAT

This study is mandated under the Programme of Work 2011-12. It provides information to OECD countries that is intended to contribute to the design of policies that facilitate collective activities by farmers and non-farmers in their provision of agri-environmental public goods.

Following the discussion at the Joint Working Party on Agriculture and the Environment (JWPAE) meetings in Oectober 2011, April 2012 and November 2012, the attached report is the FINAL version of ***Providing Agri-environmental Public Goods through Collective Action***. Following agreement to declassify this report under the written procedure at the November 2012 JWPAE, no written comments were received from Delegates on the revised draft. A few linguistic changes have been made in the FINAL report. A version in track change mode can be found on the Delegates Corner (https://community.oecd.org/community/agriculture/coag).

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EXECUTIVE SUMMARY

1. Agriculture is a provider of food, feed, fibre, fuel and fun (e.g. agri-tourism) and, to a certain extent, public goods like landscape and biodiversity. However, agriculture can also have negative impacts on natural assets such as biodiversity and water quality. With the growing awareness of environmental issues, including loss of biodiversity and climate change, the provision of public goods and the reduction of negative externalities stemming from agriculture have become important policy issues.

2. Previous studies on public goods and agri-environmental policies have focused on individual farmers rather than on collective action. However, some public goods need to be provided by farmers co-operatively. For example, maintaining landscape usually requires the participation of several farmers working within the same area. This means that in addition to implementing policies that target individual farmers as a means to overcome market failure associated with public goods and externalities, different approaches may be needed to promote collective action.

3. The purpose of this study is to analyse the promotion of collective action for agri-environmental public goods and addressing externalities by reviewing the experience of various OECD member countries. Twenty-five cases from 13 countries (Australia, Belgium, Canada, Finland, France, Germany, Italy, Japan, the Netherlands, New Zealand, Spain, Sweden and the United Kingdom) are examined. The study shows that collective action should be given serious consideration as a means of addressing many agricultural and natural resource issues, and in some cases collective action should be actively promoted.

What is collective action and in what cases is collective action necessary?

4. Collective action is action taken by a group to achieve common interests. More specifically, in this study, it can be defined as "a set of actions taken by a group of farmers, often in conjunction with other people and organisations, acting together in order to tackle local agri-environmental issues". It may be useful for providing a range of agri-environmental public goods or reducing negative externalities associated with agriculture, including landscape, biodiversity, and water quality. It can be also used to manage common pool resources (e.g. natural habitat and catchments) and provide club goods (e.g. water supply for club members). In some cases, where a minimum amount of the public good is needed in order to have value, collective action can help surpass this threshold point and provide public goods on a larger scale as well as help farmers to adopt environmentally friendly farming practices. Collective action is also useful in dealing with externalities beyond the individual farm level. Many case studies presented in this report cover areas extending beyond the geographical boundaries of the individual farm property to the township or county boundaries.

What types of collective actions are undertaken in OECD countries?

5. Various stakeholders – such as farmers, citizens, NGOs and local authorities – participate in collective action. Some actions are bottom-up and farmer-led whereas others are top-down and government-led. Non-farmers such as private firms and NGOs can also play a role as intermediaries or co-ordinators. However, farmers usually form the core of the group, and provide the labour and equipment for group activities. They adopt innovative farming practices and provide agri-environmental public goods or reduce negative externalities. Non-farmers provide knowledge and expertise that collective action needs. They can connect people and help to form groups. They can provide support for collective action, assisting with planning and administration, communications and organisation of activities. Governments can contribute to collective action as participants and non-participants. They can support collective actions through various policy measures including technical assistance, funding programmes and regulation and promote a number of collective actions in different areas. In some cases, government participates in

collective action and provides more specific advice for specific cases to develop it. Most forms of collective action receive support from national or local governments and in many cases, several policy measures (technical assistance, agri-environmental payments, etc.) have been implemented simultaneously.

What are the benefits of collective action?

6. Collective action has several merits, compared with uncoordinated individual actions. First, it allows individual farmers to manage resources and farm practices at a geographically and ecologically appropriate scale, across legal and administrative boundaries. It can provide various agri-environmental public goods effectively. Second, it provides for economies of scale and scope, which can reduce the cost of providing agri-environmental public goods compared with individual uncoordinated provision. It can also reduce the cost of changing farm practices if it encourages locally adjusted approaches. Third, it promotes knowledge sharing among members and increases their technical capacities, thereby making it possible to undertake projects collectively with a larger pool of resources than could be supported or afforded by individuals acting separately. Lastly, it can tackle local issues that are not necessarily best dealt with by central authorities or individuals because of its flexible forms and diverse members with different knowledge and skills. It can identify critical sites that are central to different environmental objectives and signal opportunities for groups of farmers, landowners, conservation groups and local authorities to collaborate in a joint group.

What are the challenges for collective action?

7. There are, however, barriers that prevent collective action. Free-riding can be a major problem. Some group members tend not to contribute to group activities because they can benefit from other members' activities without contributing. However, it is also necessary to note that farmers are more willing to participate in collective action than is assumed by theories based on pure self-interest. Farmers are often strongly in favour of collaborating with their neighbours. How to facilitate communication and collaboration among them is a key challenge to be overcome. Transaction costs stemming from collective action (e.g. costs of identifying relevant participants, or of negotiating agreements) can also prevent collective action from being undertaken, especially if these costs occur at an early stage. In order to make collective action work, members' benefits from collective action need to cover the costs they incur from the action. It is important to study how to reduce costs associated with collective action. Certain sceptical attitudes towards collective action (e.g. individualism, inertia, awareness, acceptability of the evidence) can be barriers to collective action. In order to promote collective action, it is important to raise awareness of the importance of such action and provide solid scientific evidence that demonstrates the potential value of collective action to farmers. Lastly, uncertainty of the policy environment can also negatively affect farmers' willingness to take part in collective action. It creates apprehension amongst farmers as to the future direction of government support and choice of policy instruments.

What are the key factors for successful collective action?

8. This study identifies several key factors for successful collective action, which help participants to overcome barriers and increase benefits. They can be divided into four groups according to 1) the characteristics of the resources concerned, 2) the nature of the groups that depend on these resources, 3) the particulars of the institutional relationships through which the resources are managed, and 4) the nature of the links between the group, on the one hand, and external forces or the authorities, on the other. Figure 0.1 summarises the benefits, barriers and key factors of collective action.

1) Resource system characteristics

- Precise knowledge of community resources is necessary for collective action.
- Collective action should be based on geographical boundaries of targeted environmental resources, such as natural habitat and watersheds, and not on jurisdictional boundaries.
- Visible positive outcomes and clear benefits from the activity and resources are necessary to motivate participants and keep activities alive.

2) Group characteristics

- Understanding the behaviour of farmers is important as group activities are based on trust and co-operation. Social capital (e.g. trust, networks and supportive institutional arrangements) can help individuals work co-operatively. Good reputation, trust and reciprocity can lead to a higher level of co-operation.
- Although a relatively small group can establish trust and render collective action easier, large functional groups can work effectively and save costs as they have larger economies of scale and scope.
- Diverse endowments among members can leverage their resources, but homogeneity of identities and interests among groups is important for facilitating group activities.
- Leadership by farmers or other interested bodies (e.g. NGOs) is essential for better performances.
- Effective communication, especially face-to-face communication, is important for collective action.
- Participants need to share the aims of the collective action and understand the issues.

3) Institutional arrangement

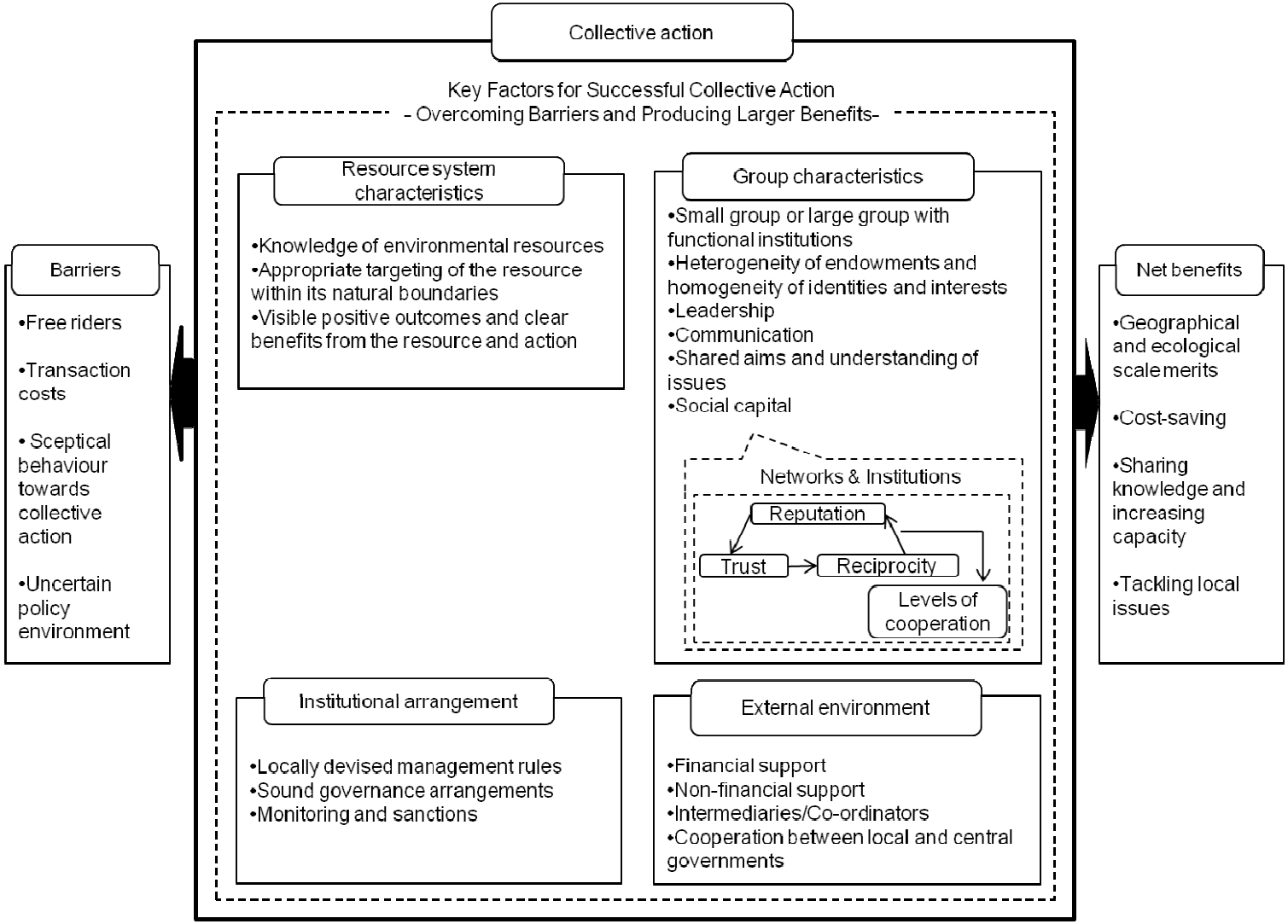
- Allowing groups to develop local management rules is essential for successful collective action because the "one-size-fits-all" approach may fail to engage farmers in collective action.
- Sound governance arrangements underpinning collective action are important, especially when the group size is large. Sometimes, a formal legal status for the group may help to establish strong institutions and strengthen the financial basis.
- Monitoring and sanctions are usually necessary to prevent free-riding and rule-breaking.

4) External environment

- Financial support from both governments and non-government entities is important for collective action. It is particularly significant at the initial stage of an activity because this stage usually incurs higher transaction costs compared to individual action.

  Non-financial support such as advice from local authorities can help identify potential parties and promote collective action. Research and development, technology and innovation can empower farmers.

Figure 0.1. Summary of benefits, barriers and key factors for collective action



- Support from intermediaries and co-ordinators (e.g. NGOs, government programme staff, research centres) can help collective action by contributing information about issues and policy measures, liaising between participants and providing inputs including staff and funding.

- Effective co-operation between local and central governments is important to promote collective action, as local governments usually have a better knowledge of local issues. Central governments can promote collective action through national programmes.

What policies are necessary to promote collective action?

9. Farmers should try to overcome barriers to collective action by themselves, but in some cases they will need external inputs —scientific knowledge, technical information or financial assistance— to overcome difficulties. If farmers are unable to mount a collective action by themselves, government support can help them to do so if the total benefits stemming from collective action outweigh its cost.

10. Government policies to promote collective action for providing public goods could in some cases be a more appropriate policy approach compared to other options which target individuals acting separately. For example, collective action may be better suited to dealing with a specific local environmental challenge than other options. In addition, transaction costs may be lower for collective action, particularly compared to setting up trading systems for environmental damage or benefits. Collective action is useful if it is necessary to leverage resources among various people and tackle local issues and complex and multi-dimensional problems. If the aim is to deal with local agri-environmental issues that are beyond the control of individual farmers, governments should take policy measures that work through collective action into serious consideration. The following eight policy implications emerge from the analysis in this study.

1. ***Policies for promoting collective action should be given serious consideration at the policy design stage.*** Collective action may be key to improving the agricultural environment given its effectiveness in dealing with agri-environmental public goods and externalities. Government policies should do more to promote collective action if farmers cannot undertake collective action voluntarily and if the benefits outweigh any additional costs stemming from collective action.

2. ***Holistic approaches are necessary to promote collective action***. Farmer behaviour is affected not only by external factors (financial and effort costs), but also by internal factors (habits and cognitive processes) and social factors (societal norms and cultural attitudes). To promote collective action, holistic approaches that recognise these factors are necessary.

3. ***Initial support, especially financial support, is important***. Collective action involves new transaction costs, especially at the beginning. Thus, initial support, particularly financial support from government and other external bodies, can be useful in promoting collective action.

4. ***Technical assistance can empower farmers***. Scientific knowledge is important for managing natural resources. Governments and other external bodies can provide such knowledge and encourage the development of partnerships between farm communities and scientists.

5. ***Policies should forge links with social networks and institutional arrangements***. Social networks help farmers develop collective action, as well as to exchange information and leverage resources, as farmers are in favour of co-operating with their neighbours. Institutional arrangements (e.g. social norms and cultures) affect collective action. Thus, they should be recognized as potential resources and incorporated into policy design.

6. ***Collaboration with intermediaries and co-ordinators is important***. Intermediaries and co-ordinators can play a critical role in providing local knowledge, ensuring that the right people are connected, and enhancing the level of co-operation. They should be seen as a potentially important resource.

7. ***Co-operation between local and central governments is essential***. Local governments often play an important role because most collective action deals with local issues. Flexibility is a necessary condition to adjust programmes to local conditions. Central governments are able to provide support on a larger scale than is possible for local governments.

8. ***More work on evaluating the cost-effectiveness of collective action is necessary***. Once an environmental goal is set, that goal should be achieved at the lowest cost. Since collective action targets areas beyond the individual farm level, achieving landscape-level outcomes at minimum cost should be examined. Despite this, there is little comparative or quantitative research on the outcomes of collective action and other agri-environmental policies.

PART I. SYNTHESIS REPORT

1. INTRODUCTION AND BACKGROUND TO AGRI-ENVIRONMENTAL PUBLIC GOODS

11. Agriculture provides valued outputs —food, feed, fibre, fuel and fun (e.g. agri-tourism) — and, to a certain extent, environmental public goods like landscape and biodiversity. However, agriculture can also have a negative impact on natural assets such as biodiversity, water quality and soil quality. Both the provision of public goods and the reduction of negative externalities have become increasingly important with the growing awareness of environmental issues, including loss of biodiversity and effects of climate change. For these reasons, OECD Agriculture Ministers recognised in 2010 that:

> "…incentives and disincentives can be effectively and transparently designed to reflect the total costs and benefits to society, with a view to ... ensuring the provision of public goods and services such as rural amenities, biodiversity, maintenance of landscape and land eco-system functions and contributing to the development of rural areas"
>
> and requested the OECD to:
>
> "…identify policy options and market approaches that allow the incentives faced by farmers, the agro-food sector and consumers to better reflect underlying social and environmental costs and benefits, including with respect to public and private goods and services of agriculture".

12. Many researchers and organisations, including the OECD, have studied agricultural public goods and externalities, and related policy measures. Previous studies have focused on provision by individual farmers acting independently, with little discussion of the importance of collective action among farmers in delivering public goods (Ayer, 1997; Hodge and McNally, 2000). However, some public goods may be provided more effectively by farmers acting co-operatively or in a synchronised manner (OECD, 2012a). Biodiversity and landscape are often more effectively approached on a scale greater than that of a single farm. Moreover, in order to tackle non-point source pollution, synchronised actions on a scale beyond that of the individual farm are necessary. This means that, in order to overcome market failure associated with public goods and externalities, policies that work through groups or consortia of individual farmers acting together may also be needed.

1.1. Objectives of the study

13. The purpose of this study is to analyse collective action for providing agri-environmental public goods and externalities by reviewing the experience of several OECD member countries, in order to clarify the following points.

- In what cases or for what type of agri-environmental public goods and externalities is collective action necessary?
- What types of collective action are undertaken in OECD countries?
- What are the benefits of collective action?
- What are the challenges for collective action?

- Which factors are conducive to successful collective action, and why?
- How can governments stimulate collective action and what policies are available for promoting collective action?

1.2. Methodology

14. This study draws on the collective action literature and on studies of agri-environmental public goods and externalities. It also makes extensive use of 25 case studies from 13 OECD countries in order to identify examples of good practice and to derive insights for policy practitioners.

15. The case studies were selected according to three criteria: 1) variety with respect to country and world region, 2) variety with respect to the type of case study, but with a special focus on clarifying the role and potential of government, both central and local, and 3) adequate coverage across the classic typology of public goods (pure public goods, common pool resources, and club goods) and negative externalities. Based on these criteria, 25 cases from 13 countries (Australia, Belgium, Canada, Finland, France, Germany, Italy, Japan, the Netherlands, New Zealand, Spain, Sweden and the United Kingdom) have been examined (Table 1.1). The broad range of these case studies offers a good overview of the kinds of public goods produced or negative externalities reduced by collective action, the different sorts of collective action currently undertaken in OECD countries and the particular policies that have proved successful in stimulating collective action.

1.3. Structure

16. Part I is a synthesis report of this study. Section 1 briefly provides background information on agri-environmental public goods. Section 2 discusses the relationship between collective action and public goods associated with agriculture; summarises the benefits of collective action; discusses barriers to collective action; and sets out the key factors for successful collective action. Section 3 examines farmer behaviour and collective action. Section 4 discusses the various policy measures for promoting collective action and considers the policy implications of collective action. Annex I.A provides summaries of the case studies. Annex I.B briefly summarises game theory in the context of collective action.

17. Part II contains the country case studies. These studies examine cases of collective actions in Australia, Belgium, Canada, Finland, France, Germany, Italy, Japan, the Netherlands, New Zealand, Spain, Sweden and the United Kingdom.

Table 1.1. Collective action case studies in OECD countries

Countries	Serial number	Case	Farming system	Public goods/Reducing negative externalities	Brief descriptions
Australia	AUS1	Landcare Programme (Mulgrave Landcare and Catchment Group Inc)	Sugar cane, bananas, other tropical fruit and cattle	Riparian and wetland restoration and improved water quality Management of competition for ground water	A farmer-based environment group has for some years been actively addressing the natural resource management issues in the catchments near the Great Barrier Reef World Heritage Area.
	AUS2	Landcare Programme (Holbrook Landcare Network)	Grazing (sheep and cattle), dryland cropping, forestry	Enhancing biodiversity Managing erosion and dryland salinity on and off-farm	The Holbrook Landcare Network is acting to address the main natural resource management issues (habitat loss, dryland salinity and soil erosion)
Belgium	BEL1	Strategic installation of buffer strips in the Dommel Valley	Specialised pig and poultry farms, and dairy cattle	Water quality protection	The Watering the Dommel Valley (a local organisation responsible for water management) is acting to improve water quality in the valley's rivers and streams. They aim to convince farmers to manage interconnected buffer strips next to water courses running through their land.
	BEL2	Water quality management by a water provider (Pidpa) and farmers in the Antwerp region	Combination of breeding (pigs and poultry) and dairy cattle	Water quality protection	The water company Pidpa is co-operating with farmers who manage Pidpa-owned land in groundwater catchment areas and in protection zones around the catchment. The scheme also stimulates the management of nature areas on local farmer-owned land.
Canada	CAN1	Group Environmental Farm Planning in Saskatchewan	Various grains and livestock in a prairie region	Wetland protection (water quality protection), air and soil quality, and biodiversity	Some Saskatchewan producers are acting together to adopt Beneficial Management Practices (BMPs) by accessing risk assessment programmes that approach environmental protection collectively.
	CAN2	Beaver Hills Initiative (near Edmonton)	Forage, grazing and cropland	Natural resource management, biodiversity	The Beaver Hills Initiative was launched to deal with strong development pressure that threatens landscape and other environmental values. It involves various participants, who pool knowledge and develop science-based strategies for preserving the area.
Finland	FIN1	Pyhäjärvi Restoration Project	Intensive cereal and vegetable cultivation	Water quality protection	Local voluntarily actions aiming to improve or maintain water quality in Lake Pyhäjärvi undertaken by local firms, communities and other beneficiaries of the lake's water quality.
France	FRA1	Contract between Vittel (mineral water bottler) and farmers, Vosges region	Livestock production (milk, meat), Cereals	Water quality protection	A group of farmers located in Vittel's catchment area have accepted a contract to change their practices in order to reduce non-point source pollution from intensive farming

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Table 1.1. Collective action cases in OECD countries *(continued)*

Countries	Serial number	Case	Farming system	Public goods/Reducing negative externalities	Brief descriptions
Germany	DEU1	Landcare associations (example: Altmühl Valley, Bavaria)	Extensive grazing (sheep) in semi-natural dry grassland	Landscape, biodiversity, water quality protection	Landcare associations are regional non-profit associations, where farmers, local administrations, politicians and nature conservation experts work together with the aim to implement nature conservation and landcare measures.
	DEU2	Co-operation in drinking water protection, Lower Saxony	Arable crops (cereals, rape, sugar beet, potatoes, and maize for silage)	Water quality protection	Co-operation between farmers, water suppliers and technical advisers in Lower Saxony is helping to solve problems of maintaining or restoring a high drinking water quality.
	DEU3	Wetland restoration in the Eider valley	Extensive grazing (dairy, cattle and horses).	Biodiversity, retention of nutrients, landscape, climate protection	The project aims to restore wetlands in the Eider Valley by extensifying agricultural land use and deconstructing drainage systems, based on co-operative institutional organisations
Italy	ITA1	Custody of the territory in Tuscany	Hill farming (livestock, arable crops and pastures together with management of local forests)	Hydro-geological management, other environmental services	Initiative promoted by a territorial agency via an agreement with local farmers for co-production of environmental services such as the cleaning of rivers, riverbeds, rivers banks and canals in Tuscany
	ITA2	Community garden in Campania	Vegetables (produced by citizens)	Providing farming opportunities for members, public green space, biodiversity, etc.	Since 2001 a local NGO has been co-ordinating a project called Eco-archaeological Park, converting a degraded site into a collaborative green space where urban gardens, environmental benefits and social relationships can flourish
	ITA3	Mountain pasture management in the Aosta Valley	Extensive grazing	Alpine pasture management, landscape, biodiversity	In *Alta Val d'Ayas,* farmers provide highly valued public goods by inscribing the rules and organisational patterns for successful alpine grazing into the collective management of mountain meadows and pastures
Japan	JPN1	Policy for Preserving Biodiversity Associated with Agriculture, Shiga Prefecture	Rice production in paddy fields	Biodiversity	This policy for preserving biodiversity makes payments to farmers who agree to increase the water level of drainage canals so that fish can swim up to paddy fields.
	JPN2	Policy to Recycle Drained Water from Agriculture, Shiga Prefecture	Rice production in paddy fields	Water quality protection	This policy aims to recycle drainage water from agriculture, by means of contracts with irrigation districts, each representing large numbers of farmers, to reuse drained water.

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Table 1.1. Collective action cases in OECD countries *(continued)*

Countries	Serial number	Case	Farming system	Public goods/Reducing negative externalities	Brief descriptions
Japan	JPN3	Measures to conserve and improve land, water, and the environment	Rice production in paddy fields	Proper management of drainage facilities	The most extensive agri-environmental policy in Japan for preserving agricultural resources and the environment, which works through hamlet-based local action groups that manage drainage facilities
Netherlands	NLD1	Water, Land & Dijken Association, Laag Holland	Grazing (livestock farming)	Biodiversity (grassland bird), landscape	The Water, Land & Dijken association, composed of farmers and civilians, is developing tailor-made conservation practices for biodiversity (grassland birds) and landscape
New Zealand	NZL1	Sustainable Farming Fund (SFF) (Aorere Catchment Project)	Dairy farming	Innovation, water management, integrated pest management, etc (Water quality protection in the Aorere case)	SFF funds grass-root activities by farmers, growers and foresters. Aorere Catchment Project is led by members of the local community, including dairy farmers. SFF provides fund and helps address the complexities around sustainable water management
	NZL2	East Coast Forestry Programme, Gisborne district	Pastoral farming, forestry	Prevention of soil erosion, carbon sequestration, improved water quality and biodiversity	This programme aims to prevent and control erosion in the district by providing funding to landholders and promoting collective action
	NZL3	North Otago Irrigation Company	Livestock production, cropping , etc	Reliable water supply for members, promotion of biodiversity and cultural values	Farmers formed the North Otago Irrigation Company, which establishes, manages and operates an irrigation scheme for the North Otago area and provides water for its members
Spain	ESP1	Community water management, (example: Guadalquivir River basin)	Perennial and annual irrigated crops with irrigation system	Irrigation management	Communities of irrigators (CR) are established by owners of irrigated land who are collectively granted a water concession. They manage resources locally following their own water allocation rules
	ESP2	Animal Health Associations (ADGs) (example: Pedroche county)	Livestock	Prevention of animal diseases by sharing best practices among members	ADGs (currently 1500 in Spain) are created by local livestock breeders who implement a common animal health programme. The ADSG of Pedroches is a representative example
Sweden	SWE1	Söne Mad Grazing Association, Western Sweden	Extensive grazing (cows and calves)	Wetland management, biodiversity	The Söne Mad pasture area, historically collectively grazed by farmers, is managed by a NGO established by landowners and farmers. It applies environmental subsidies to restore and maintain fences
United Kingdom	GBR1	"Upstream Thinking" project in the Southwest of England	Livestock and dairy farms	Water quality protection, biodiversity, resilience to flood, carbon sequestration	This project aims to improve raw water quality through a collaborative approach that informs and assists landowners in the protection of river catchments as part of an integrated approach to good land management

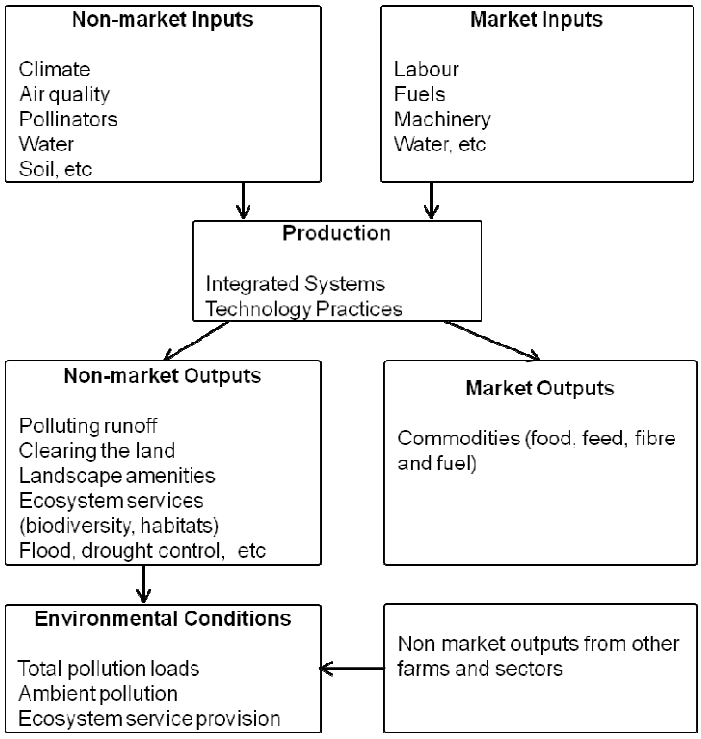
1.4. Agri-environmental public goods

18. This background section provides a brief background on public goods and externalities associated with agriculture. First, the links between agricultural production and public goods and externalities are reviewed. Second, detailed definitions and examples of these public goods and externalities are given. Lastly, agri-environmental policy measures are examined.

Agricultural production and public goods[1]

19. Agriculture is a complex economic activity involving both market and non-market relationships. OECD (2010) illustrates the relationship between agricultural production and agri-environmental public goods and externalities in a stylised way (Figure 1.1). Farms produce output using two types of input: market inputs (e.g. labour, fuel and machinery) and non-market inputs (e.g. climate, air quality and soil quality). By using these inputs, farms produce two kinds of output: final products (commodities) that can be sold on markets, and non-marketable outputs (public goods and externalities). Some of the latter involve positive environmental effects, while others have negative environmental effects. For example, farmland can be managed to produce wildlife habitat and agricultural landscape. However, fuel used to cultivate land produces airborne emissions that may have an adverse effect on the environment. Environmental effects of agricultural activities tend to be public goods or externalities for which property rights are lacking and markets are absent. The fundamental purpose of agri-environmental policy instruments is to achieve environmental policy objectives that would otherwise not be reached given the absence, or the poor functioning, of markets for public goods and externalities.

Figure 1.1. Agricultural production and agri-environmental public goods/externalities



1. Artificial markets can be created for some non-market inputs/outputs (e.g. tradeable permit markets for polluting runoff).
Source: Adapted from OECD (2010).

1. This section is based on *Guidelines for Cost-effective Agri-environmental Policy Measures* (OECD, 2010).

1.5. Agri-environmental public goods and externalities

20. Many non-market outputs from agricultural activities are public goods or externalities (positive or negative). Understanding the relevant concepts is a first step to overcoming market failure associated with them.

Public goods

21. Pure public goods are goods that satisfy the two criteria of being non-excludable and non-rival (Samuelson, 1954, 1955).

- *Non-excludability*: The nature of the good is such that it is impossible to exclude anyone from consuming it.
- *Non-rivalry*: The same good can be consumed by anyone without diminishing the consumption opportunities available to others.

22. A classic example of a pure public good is national defence. It is impossible to exclude anyone from the benefits of national defence and everyone can enjoy them without adversely affecting the benefit derived by others. In reality, few products fully meet both these criteria, whereas a number of goods are *only to a certain extent* excludable and/or rival (Cooper et al., 2009). Goods that are neither private goods (i.e. fully rival and excludable goods) nor pure public goods (i.e. fully non-rival and non-excludable goods) are called impure public goods. They can be further sub-divided into two main groups, common pool resources (CPRs) and club goods, according to the degree of their excludability and rivalry (see Box 1.1 for a detailed explanation of each type of good).

Box 1.1. Pure public goods, common pool resources and club goods

Pure public goods

Pure public goods are non-rival and non-excludable goods. Their provision poses a free rider problem: providers of pure public goods cannot exclude anyone who tries to enjoy the benefits without paying for them, thus making it difficult for individuals to provide pure public goods on a commercial basis. Therefore, governments generally play an important role in their provision (e.g. national security).

Common pool resources

Common pool resources (CPRs) are goods which are rival (subtractable) but for which it is difficult to exclude someone from consuming them. This leads to a risk of overexploitation. This situation is known as "the tragedy of the commons" (see, for example, Hardin, 1968). A shared pasture, for example, would be depleted because each herder has an interest in putting a maximum number of cows on the land. To prevent this over-exploitation, two solutions are available: privatisation and government intervention. However, Ostrom (1990) claims community activities could also successfully regulate CPRs by setting up community rules that rely on neither privatisation nor governmental control.

Where CPRs are not owned by anyone, they are called "open access resources" since it is hard to prevent free access to resources due to the lack of exclusionary systems.

Club goods/ Toll goods

Club goods are excludable to non-club members, but club members can consume them without incurring rivalry up the point where over-crowding or a deterioration of the good is triggered. The theory of club goods originates from a study by Buchanan (1965) that examines club goods as a means of filling the gap between private goods and pure public goods. *A*n example of a club good is the protection of wildlife on a certain tract of land, or of fish stocks in a watercourse, paid for by syndicates of hunters or fishermen who have exclusive hunting or fishing rights in the areas concerned, and prevent others from enjoying the wildlife, either for hunting or simply for the pleasure of observing it, The term "toll good" is also used for excludable and non-rival goods because the term "club good" can be misleading for some excludable and non-rival goods, such as toll roads. Although users pay fees to use toll roads (i.e. they can be made excludable), these users are not club members of toll roads. A national park can also be an example of a toll good if people are required to pay an entrance fee.

Public goods associated with agriculture

23. Agriculture produces non-marketable outputs that are pure or impure public goods. They may have positive or negative impacts on natural resources.[2] Table 1.2 gives examples of public goods associated with agriculture.

Table 1.2. Classification of public goods associated with agriculture[1]

		Rivalry (subtractability)	
		Low	**High**
Excludability	**Difficult**	*Pure public goods* • Landscape • Biodiversity, wildlife (non-use value[4]) • Flood control • Soil conservation • Landslide prevention	*Common pool resources*[2] • Biodiversity, wildlife (use-value[3]) • Community irrigation systems (if difficult to exclude) • Catchments
	Easy	*Club goods* • Biodiversity, wildlife (if exclusive to club members) • Irrigation systems (if exclusive to club members) • Community gardens (if exclusive to club members)	*Private goods* • Agricultural commodities

1. The list given in each cell is not exhaustive, it covers the main examples only.

2. CPRs offer non-rival benefits until saturation or congestion point is reached. After that point, their services are highly rival.

3. Use-value: value representing i) the value associated with actual use and ii) the value of having the ability to make choices in an uncertain future.

4. Non-use value: value representing i) the value that humans attach to the simple fact of a resource's existence and ii) the value that humans attach to the possibility of maintaining a resource for future generations.

Source: Adapted from OECD (2001a) and Hess and Ostrom (2007).

Externalities

24. Externalities occur when decisions about production or consumption by one person affect someone else without this being taken into account by the decision maker. If one person's action has a positive impact on another, the externality is defined as positive. A classic example of a positive externality is an agricultural example, where a beekeeper benefits neighbouring farmers by supplying pollination services as an unintended effect of his production of honey, from which the farmers' crops benefits. Another example of a positive externality is the grazing of animals in pasture. Many people enjoy seeing these animals and consider that they enhance the agricultural landscape. However, when and how long to graze them is decided by the farmer as part of his production plan. As shown in Table 1.2, this agricultural landscape is an example of a pure public good because many people can enjoy the benefits (non-excludable) without decreasing the benefits of others (non-rival). As in this example, public goods and externalities often overlap (OECD, 1999).

25. When the externality decreases the well-being or utility of the affected person, it is defined as a negative externality. A typical example of a negative externality is pollution. Agriculture produces negative externalities such as water pollution and soil erosion as a result of the use of fertilisers and pesticides, or unsustainable farming methods.

2. If non-rival and non-excludable goods cause harm and people do not want them, sometime, the term, *public bads*, is used (Kolstad, 2011).

1.6. Agri-environmental policy measures for public goods

26. When the provision of public goods or the level of negative externalities is left to market forces, the appropriate ("welfare-maximising") levels of supply are not achieved. Farmers have market incentives related to the returns from selling market outputs and the costs of market inputs, but lack market incentives for managing non-market outputs such as public goods and externalities. Public goods and positive externalities are likely to be undersupplied, since those who provide them are not adequately rewarded for the benefits they supply to others. This can result in the degradation of the public goods or positive externalities concerned. On the other hand, negative externalities are likely to be overproduced. This too can lead to the degradation of the environment. In both cases, the effects may be irreversible. Thus, although under-supply of positive external effects and over-supply of negative ones represent a welfare loss for society, as long as market incentives are lacking, individuals will not act to improve the situation. In order to overcome these difficulties and create markets for public goods and externalities, policy interventions may be necessary (Cooper et al., 2009; OECD, 2010).

27. The OECD has undertaken many studies related to public goods associated with agriculture, including agricultural policy reform studies and rural amenity studies in the 1990s, and multifunctionality studies in the 2000s. In 2010, the OECD published *Guidelines for Cost-effective Agri-environmental Policy Measures* (OECD, 2010), which compared the cost-effectiveness of agri-environmental policies such as environmental standards and regulations, taxes, tradable permit schemes, and payments. This study concluded that there is no single instrument able to achieve all agri-environmental policy goals, and policy mixes need to include policy instruments that complement but do not conflict with one another (OECD, 2010). Box 1.2 briefly summarises several agri-environmental policy measures based on OECD studies.

Box 1.2. Agri-environmental policy measures

Environmental standards regulate producer choices (input standards) or measures of non-market outputs (performance standards). *Input standards* place mandates on the production process, technology, the products that are used, or the manner in which they are used. *Performance standards* regulate polluting emissions from non-agricultural point sources. While input standards do not provide producers with the flexibility or incentives to look for cost-effective solutions to environmental problems, performance standards allow producers to meet mandated requirements in ways of their own choice. Therefore, performance standards in general allow farmers to achieve the standards at a lower cost (OECD, 2010).

Environmental taxes can be used to reduce negative externalities from agriculture as well as to increase positive externalities (e.g. by reducing tax when producing them). Taxes can be used to internalise, or reduce, the costs of externalities. The concept of the polluter-pays-principle (PPP) is also important. The PPP is the principle by which the polluter bears the cost of measures to reduce pollution, according either to the extent of the total damage done to society or when acceptable levels of pollution have been exceeded (OECD, 2001b). When applying the PPP, negative externalities should be taxed so as to generate a socially optimal level of production (OECD, 2011).

Tradable permits can achieve environmental targets at a lower social cost than traditional environmental standards. Trading can offer a mechanism for allocating environmental effort among those concerned in a cost-effective way even if environmental regulators do not know the abatement costs of individual agents (OECD, 2010).

Agri-environmental payments can be used to reduce negative externalities from agricultural activities and to promote the supply of public goods or positive externalities. If a fixed-rate payment does not consider the heterogeneity in farmers' compliance costs or the site-productivity of environmental public goods, this payment might not be cost-effective. However, targeting the individuals who produce these goods could reduce this problem (OECD, 2010). Although it is difficult to design a payment system for tackling the problem because of asymmetric information, *auctions* could be useful as they induce farmers to reveal their estimated compliance costs or their net pay-offs via their auction bids. Auctions could thus reduce farmers' information rents and improve the cost-effectiveness of agri-environmental payment schemes (OECD, 2010). More generally, an incentive-compatible mechanism should be embedded in policy design so as to make individuals reveal information truthfully.

28. Previous studies on public goods and agri-environmental policies have focused on individual farmers rather than on collective action.[3] However, some public goods such as landscape and biodiversity need to be provided by farmers co-operatively. A recent OECD study (2012b) argued that policy measures for collective action should be given serious consideration. Market based approaches or regulation in addressing many agricultural and natural resource problems can also promote collective action, not just individual actions, if they target collective activities by farmers and others. This study aims to fill this gap by identifying how collective action can contribute to the provision of public goods or positive externalities and the mitigation of negative externalities, and how this can be promoted.

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2. COLLECTIVE ACTION AND AGRI-ENVIRONMENTAL PUBLIC GOODS

29. Collective action is "action taken by a group (either directly or on its behalf through an organisation) in pursuit of members' perceived shared interests" (Scott and Marshall, 2009). Meinzen-Dick and Di Gregorio (2004) also define it as an "action taken by a group to achieve common interests." These definitions are broad, but they include two important keywords of the collective action: "group action" and "common/shared interests."

30. Participation in collective action to provide agri-environmental public goods is not restricted to farmers, but may also extend to other people and organisations who share the interests that motivate the action. Many agri-environmental public goods include a collective, spatial element. Critical mass, synergies among farmers and the extent and manner in which individuals are co-ordinated affect the provision of the goods (OECD, 2012a).

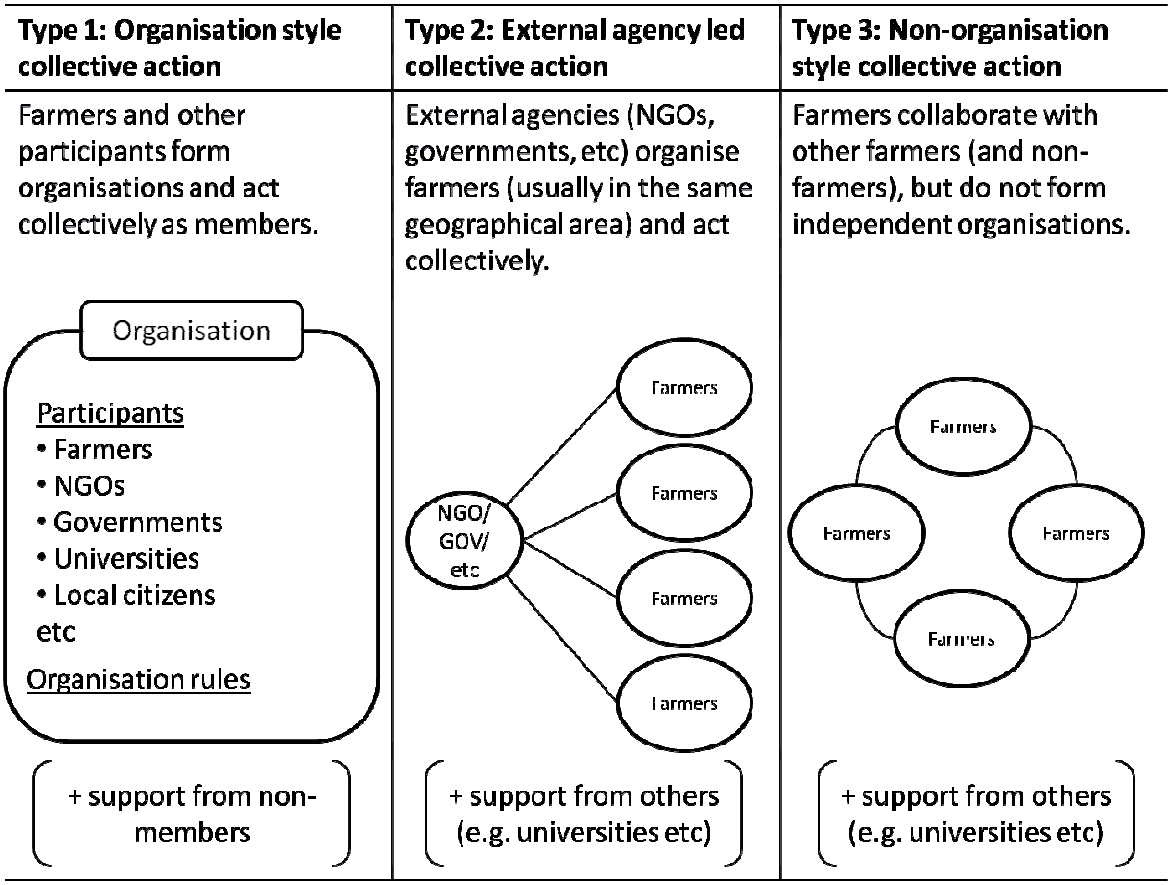
31. Common or shared interests are usually about local agri-environmental issues such as biodiversity, landscape, water quality, or management of CPRs. Even in the case of collective action promoted by national governments, each collective action deals with locally specific issues under the big umbrella of a government programme. For example, the Japanese project for conserving and improving land, water, and the environment (JPN3) pays local action groups to preserve irrigation and drainage facilities, and more than 20 000 local action groups carried out such activities in 2011 (MAFF, 2012). The activities for preserving and drainage facilities undertaken by each local action group differ slightly since each local situation varies and locally adapted approaches are necessary. Each group chooses appropriate participants from farmers, farmers' organisations, local governments, NGOs and others, and decides what activities they should undertake.

32. Thus, in this report, collective action is defined as "a set of actions taken by a group of farmers, often in conjunction with other people and organisations, acting together in order to tackle local agri-environmental issues". Three simple types of collective actions are identified in the study (Figure 2.1). Type 1 is a collective action in which farmers and other participants form organisations and act collectively as members. In this case, to manage organisations, rules and governance are very important. Sometimes, they establish sub-groups or sub-committees composed of those most concerned to discuss specific issues. Type 2 is a collective action in which external agencies (NGOs, governments, etc.) organise farmers (usually in the same geographical area) to act collectively for a common purpose. In this case, external agencies take strong initiatives and co-operate with farmers. Co-operation *between* farmers is not necessarily a feature of all these collective action cases, but a common goal is shared by the external agencies and farmers (e.g. improving water quality, reducing soil erosion). Type 3 is a collective action in which farmers collaborate with other farmers (and non-farmers), but do not form an independent organisation. This group does not require strict rules and strong governance, unlike Type 1, since co-operation is usually based on strong social capital and daily communication. For all three types, external support is often provided by farmers' organisations, NGOs, researchers, etc.

33. In some cases, these types are combined. For example, the case study of wetland restoration in the Eider valley (DEU3) is a combination of Type 2 and Type 3. Here, external agencies (Water and Land Association) take strong initiatives to restore wetland and undertake negotiations with landowners and farmers. Through contracts with the Association, landowners co-operate with farmers and allow their land

to become part of large collective grazing areas, with wetlands to be restored. Then, by using collective land, farmers undertake large-scale extensive pasture management. The University of Kiel and other organisations provide technical assistance.

Figure 2.1. A simple typology of collective action



34. This section discusses the relationship between collective action and agri-environmental public goods. First, the type of agri-environmental public goods that collective action can provide is discussed. Second, the decision to participate in collective action is reviewed, and third, the emergence of collective action is analysed. Fourth, benefits of collective action are summarised. Fifth, barriers to collective action are discussed. Lastly, the key factors for successful collective action are set out.

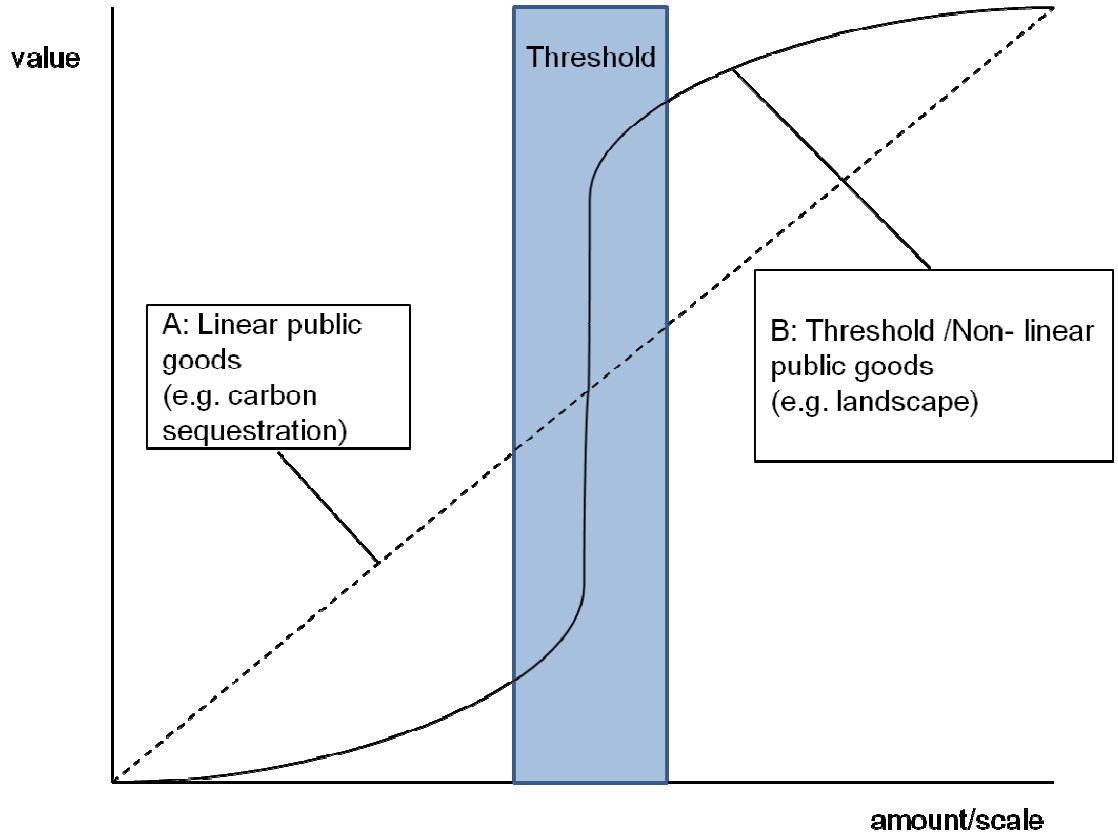
2.1. Agri-environmental public goods provided by collective action

35. Farmers develop collective action to provide a range of agri-environmental public goods. It is especially useful when the production of public goods needs a certain minimum amount of supply in order to provide significant value. These types of public goods are called "threshold public goods" or "non-linear public goods" (Marks and Croson, 1998). On the other hand, "linear public goods" have a linear relationship between their supply and their total value (Cremer and Vugt, 2002).

36. Figure 2.2 provides a stylised representation of linear public goods and threshold/non-linear public goods. *Line A* denotes a linear public good. As the amount produced increases, its value increases proportionally. This type of public good does not need a minimum amount of supply to be provided. Carbon sequestration is an example of a linear public good; for example, the cultivated under a no-tillage

farming system on each farm increases the amount of carbon sequestered in soils, and the total contribution is the simple aggregate of these areas. *Line B* corresponds to a threshold/non-linear public good. For the provision of this public good, a minimum amount of supply is required, and the public good is produced on a significant scale only beyond this threshold (Rondeau et al., 1999). Agricultural landscape is such an example. Although a small amount of landscape provision can be valuable in a micro-location, the value of the landscape provision significantly increases if the supply exceeds a certain amount and has a certain geographic scale. Collective action can play an important role in ensuring that public good provision exceeds this threshold point.

Figure 2.2. Stylised model of linear/non-linear public goods



37. The main agri-environmental public goods provided by collective action in the case studies are landscape, biodiversity and water quality. Collective action is also used to manage common pool resources (e.g. natural habitat and catchments) and to provide club goods. Most of them have characteristics of threshold/non-linear public goods. Box 2.1 presents examples of these five cases.

Box 2.1. Examples of agri-environmental public goods provided by collective action

Landscape

- *Landcare associations (DEU1)*: Landcare Associations (LCAs) in Germany are regional non-profit associations in which farmers, local administrations, politicians and nature conservation experts work together to implement nature conservation and landcare measures. The main public goods provided through collective action via the LCAs are the conservation of diverse landscapes, biotopes and biodiversity in cultivated landscapes. Since an area-wide network of natural and semi-natural habitats is necessary for the provision of these non-linear public goods, LCAs have been set up generally at the district level. LCAs assist in coordinating different interests, acquiring financial means, and developing measures.

Biodiversity

- *Water, Land & Dijken Association (NLD1)*: The Water, Land & Dijken Association (WLD) is a regional farmers' co-operative for nature conservation in the Netherlands. Its main objective is to conserve grassland and provide biodiversity (grassland birds and wintering geese). For this purpose, the WLD drafts a regional map with management "mosaics" (grassland use patterns) for grasslands birds, establishes individual contracts with farmers for the disbursement of agri-environmental payments from the Dutch paying agency to promote conservation work (e.g. farmers can receive payments according to the number of nests protected), and co-ordinates protection work in the field undertaken by farmers and volunteers. A targeted regional approach with fine-tuned management mosaics (grassland use patterns) is expected to provide better results for preserving grassland birds (Oerlemans et al., 2007).

Water quality

- *Policy to recycle drained water from agriculture in Shiga Prefecture (JPN2)*: Shiga Prefectural government, one of 47 prefectural governments in Japan, implements policy to recycle drainage water from agriculture. The prefectural government pays irrigation districts that re-use the water drained from paddy fields in order to reduce emissions from agricultural non-point sources. This policy was initiated by the Shiga prefectural government in 2004 to reduce the flow of chemicals from agricultural non-point sources into Lake Biwa, the largest lake in Japan. In this case, farmers in the irrigation districts jointly recycle drained water for irrigation use and to improve water quality. In order to reach an acceptable standard of water quality, a threshold participation point has to be exceeded, which necessitates a collective action at district level.

Common pool resources

- *Beaver Hills Initiative (CAN2)*: The Beaver Hills area, near Edmonton in Canada, is a region rich with natural resources and accessible to public and private citizens (hence its benefits are non-excludable). In this area, local residents enjoy recreational activities, the construction industry is building new housing for the region's expanding population and agricultural producers grow a range of livestock, forage and horticultural crops. Land-uses compatible with the finite natural resources are desired by all, but development pressures and economic demand and competition for land are high (rival). In particular, private land (of which 90% is farmed agricultural land) in the area is in danger of losing the ability to provide a rich supply of ecosystem services. Thus, to conserve this large-scale common pool resource, the Beaver Hills Initiative (BHI) has developed conservation plans for the area, collects relevant data, draws up maps and examines policies for the conservation of the resources. The BHI involves various partners including counties administrations, provincial governments, federal governments, academia, industrial partners and NGOs.

Club goods

- *North Otago Irrigation Company (NZL3)*: Farmers in North Otago, a sub-region on the east coast of the South Island in New Zealand, faced difficulties in accessing reliable water supplies. Strong demand for reliable water encouraged farmers to take their own initiative and they established the North Otago Irrigation Company Ltd (NOIC) with support from local governments. NOIC provides its shareholders (farmers) with water on a large scale. This service can be classified as a club good because it is exclusive to shareholders but is non-rival. New members can be admitted to the scheme only if they do not affect existing shareholders' water flows or pressures. Because of the large infrastructural investment and the size of the operating system, there is a threshold point and collective action by NOIC, farmers and local governments is necessary.

38. Collective action is also useful for co-ordinating farm practices and the spatial distribution of policy outcomes on the right scale. For instance, the co-existence of many species of natural fauna alongside agriculture in rural areas depends on the adoption of certain supportive farm practices (Cooper et al., 2009). The environmental result may also rely on the spatial pattern of the land, in addition to the total size of the area. A co-ordinated spatial pattern of farming management is important for preserving biodiversity (Bamière et al., 2012).

39. Policy measures often try to stimulate good practices and try to conserve and enhance biodiversity. The crucial issue here is to firmly establish these farm practices among farmers. In this respect, collective action can help farmers to adopt environmentally friendly farming practices on a larger scale and provide agri-environmental public goods more effectively since farmers are more willing to adopt recommendations if neighbouring farmers do so too. Indeed, it is widely known that actions taken by neighbours affect farmers' actions (e.g. White and Runge, 1994; Damianos and Giannakopoulos, 2002). Some OECD cases approach local leaders or "reference farmers" who have some influence on farmer behaviour and try to expand collective action and manage appropriate areas in a co-ordinated way (e.g. the Dommel Valley – BEL1).

40. The necessity or desirability of collective action is also related to the geographical boundaries defining the area within which externalities associated with agriculture have an impact. Collective action can be especially useful for dealing with externalities whose boundaries exceed those of the farm property and extend to much larger areas. The impact of externalities due to agriculture on other farmers and resource quality differs depending on the distance from the farm property. Figure 2.3 depicts the total discounted benefits/damage per hectare associated with farming activities in a highly stylised form. Three types of agri-environmental externalities are represented. *Curve A* shows an example of chemical pesticides. Their dispersion into the environment is assumed to decline gradually with distance. *Curve B* depicts an activity that causes wind-borne soil erosion. It may result in relatively little damage to soils on the farm where the activity is carried out, but considerable damage to neighbouring farms. Lastly, *Curve C* represents an example of greenhouse gas emissions such as methane. Their diffusion into the environment occurs within a global system and is widespread. Thus the marginal damage is shown as uniform over the globe.

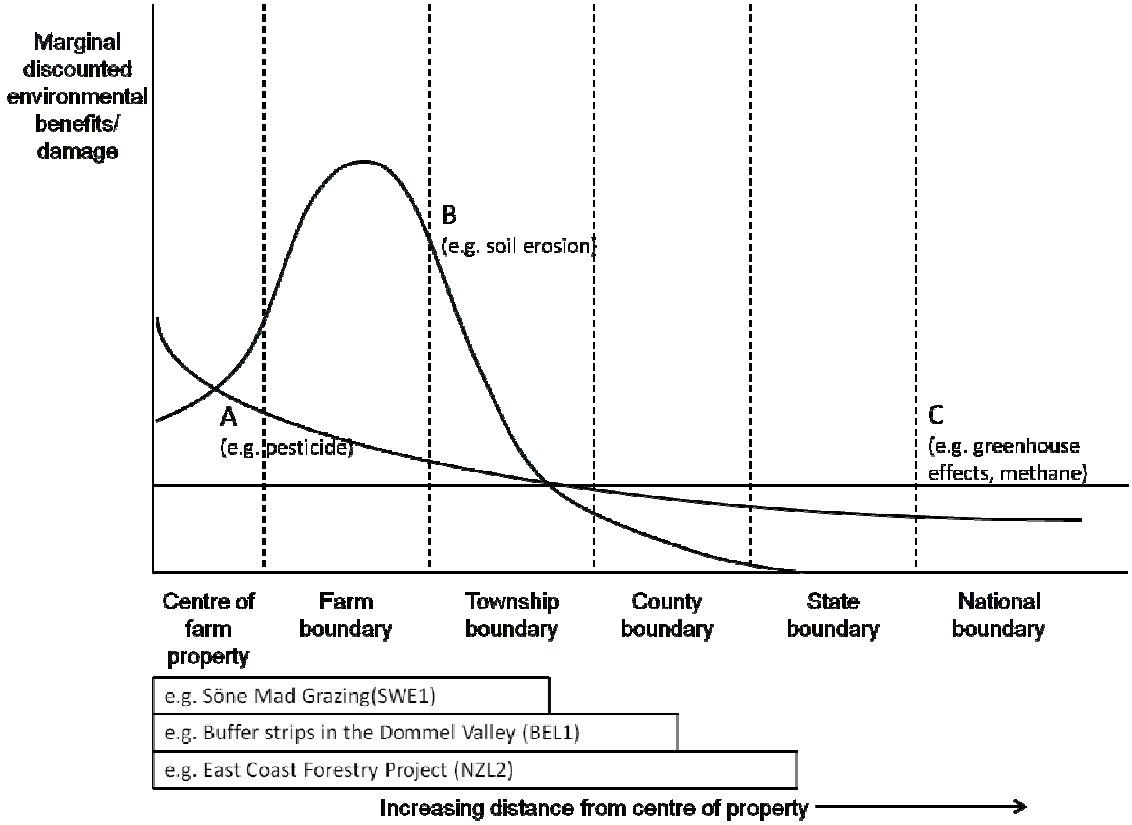
41. Collective action could be especially useful for the externalities represented in *Curve A* and *Curve B*. In the case of Curve *A,* the net cost to a farmer of reducing pesticide use could be quite high compared with the off-site impacts borne by surrounding land owners. However, the need to use those pesticides may also be affected by the practices of neighbouring farmers; for example, the farmer may need to use more pesticides as a result of inappropriate pesticide use by neighbouring farmers. In such a situation, farmers may have an incentive to work together to use their pesticides appropriately.[4]

42. In the case of Curve *B,* a large proportion of the environmental costs generated from a farmer's activities are externalised to his neighbours' farms. If he were the only farm creating such an externality, it might be worthwhile for affected land owners to pay him to take remedial measures. In a typical case, the farmer would himself be affected by similar externalities generated by neighbours, and those neighbours

4. When local collective action would be good for the local area but could affect a neighbouring area negatively, it may be necessary to involve a wider community and form a new collective action group consisting of both beneficiaries of the local collective action and those people who will suffer from it, in order to reach mutual agreement. For example, a new irrigation system implemented by a farmer group can bring them benefits by ensuring a sustainable water supply. However, if water resources in the area as a whole are limited, this new water allocation may risk reducing water availability to neighbours. In this case, it may be necessary to set up a wider group including farmers, neighbours and, if necessary, governments in order to discuss appropriate water allocation in the region.

by other neighbours in turn. In this case, they may devise a solution that attempts to get every farmer in the area to commit to a common plan of action.

Figure 2.3. Stylised representation of farming activities that create externalities



Source: Adapted from OECD (1998).

43. In the case of *Curve C,* both the farmer and his neighbours have little economic incentive to reduce their environmental impact to any large degree since the share of local benefits to be gained, even collectively, is likely to be tiny compared with those of the rest of the world. Moreover, such benefits are unlikely to be realised by the current generation. The idea of all interested parties working out solutions within a group is difficult due to the large numbers involved, thousands of millions of people. Such transboundary issues require co-ordination among larger, representative institutions, i.e. governments.

44. Many case studies cover the geographical boundaries from the farm property to township or county boundaries, as illustrated in Box 2.2. These case studies confirm that collective action can be especially useful for dealing with the externalities represented by *Curve A* and *Curve B*.

45. Table 2.1 summarises agri-environmental public goods provided by collective action or negative externalities reduced by it in the OECD case studies. It shows that multiple public goods are produced (or negative externalities are reduced) by collective action simultaneously. This implies that collective action has economies of scope, i.e. the co-ordinated provision of multiple goods can reduce the costs of provision compared with separate provision.

46. The study identifies that there are different types of agri-environmental public goods provided in OECD countries (e.g. biodiversity, landscape, water quality, common pool resources) and collective action has a possibility to manage these issues effectively. However, to figure out the best approach for dealing with agri-environmental issues, it is necessary to compare all related approaches (individual actions and

collective actions) and policy measures (e.g. regulations, agri-environmental payments, tradeable credits). Deeper analyses between the various tools and the different types of resource problems are necessary to provide additional insight as to how the outcomes of policy intervention might differ across the different types of resource problems. This point should be further examined in future studies.

Box 2.2. Examples of the geographical boundaries of collective actions in the OECD case studies

The geographical boundary of the Söne Mad Grazing Association (SWE1) is based on a wet meadow grazing area (estimated to be 160-200 hectares). To restore wetlands, provide landscape and preserve biodiversity, 30 landowners including three farmers established the association to manage their common wetlands beyond their individual land boundaries.

The geographical boundary of the buffer strips in the Dommel Valley (BEL1) also extends beyond the area of each farm. In order to improve the water quality of rivers and streams in the Dommel Valley, Watering the Dommel Valley (a "watering" is a Belgian association for managing water at a local level) and farmers in the seven municipalities have strategically installed and manage a total of 32 km of interconnected buffer strips bordering streams in the Valley.

Collective action can manage larger areas beyond county boundaries, especially if problems are severe and affect broad areas. The geographical boundary of the East Coast Forestry Project (NZL2) targets an area suffering from severe erosion (60 thousand hectares) in the Gisborne region in New Zealand. To tackle this problem, landowners, the local government, and the Ministry for Primary Industries of New Zealand work together.

Table 2.1. Agri-environmental public goods and negative externalities targeted by case studies

Case	Name	Public Goods			Reduction in Negative Externalities[1]
		Pure Public Goods	Common Pool Resources	Club Goods	
AUS1	Landcare Programme (Mulgrave Landcare and Catchment)	XX (Riparian and wetland restoration, biodiversity)	X (Management of ground water)	NR	NR
AUS2	Landcare Programme (Holbrook Landcare Network)	XX (Biodiversity)	NR	NR	XX (Management of soil erosion and dry land salinity)
BEL1	Strategic installation of buffer strips in the Dommel Valley	X (Biodiversity, landscape)	NR	NR	XX (Improvement in water quality)
BEL2	Water quality management by a water provider and farmers	X (Biodiversity, landscape)	NR	NR	XX (Improvement in water quality)
CAN1	Group Environmental Farm Planning in Saskatchewan	XX (Wetland restoration, biodiversity)	NR	NR	XX (Improvement in water quality)
CAN2	Beaver Hills Initiative	X (Landscape, biodiversity)	XX (Management of natural resources)	NR	NR

Table 2.1. Agri-environmental public goods and negative externalities targeted by case studies *(continued)*

Case	Name	Public Goods			Reduction in Negative Externalities[1]
		Pure Public Goods	Common Pool Resources	Club Goods	
DEU1	Landcare association	XX (Landscape, biodiversity)	NR	NR	NR
DEU2	Co-operation in drinking water protection	NR	NR	NR	XX (Improvement in water quality)
DEU3	Wetland restoration in the Eider valley	XX (Greenhouse gas mitigation, biodiversity, flood control)	NR	NR	X (Improvement in water quality)
ESP1	Community water management	NR	XX (Management of common irrigation)	NR	X (Improvement in water quality and quantity)
ESP2	Common good practice against animal diseases	X (Animal welfare, prevention of zoonosis)	NR	XX (Animal disease protection for members)	NR
FIN1	Pyhäjärvi Restoration Project	NR	XX (Management of Lake)	NR	XX (Improvement in water quality)
FRA1	Water quality protection by a mineral water bottler and farmers	X (Landscape, biodiversity)	NR	NR	XX (Improvement in water quality)
GBR1	"Upstream thinking" in the Southwest of England	X (Biodiversity, resilience to flood, carbon sequestration)	NR	NR	XX (Improvement in water quality)
ITA1	Custody of the territory in Tuscany	XX (Hydro-geological management, landscape, resilience to flooding)	NR	NR	NR
ITA2	Community garden in Campania	X (Landscape, biodiversity)	NR	XX (Farming opportunities for members)	NR
ITA3	Mountain pastures in the Aosta Valley	XX (Hydro-geological management, landscape, biodiversity)	NR	NR	NR
JPN1	Policy for Preserving Biodiversity Associated with Agriculture in Shiga Prefecture	XX (Biodiversity)	NR	NR	NR
JPN2	Policy to Recycle Drained Water from Agriculture in Shiga Prefecture	NR	NR	NR	XX (Improvement in water quality)

Table 2.1. Agri-environmental public goods and negative externalities targeted by case studies *(continued)*

JPN3	Measures to Conserve and Improve Land, Water, and the Environment	NR	XX (Maintaining drainage facilities)	NR	NR
NLD1	Water, Land & Dijken Association	XX (Biodiversity, landscape)	NR	NR	NR
NZL1	SFF (Aorere Catchment Project)	X (Biodiversity)	X (Management of Aorere Catchment)	NR	XX (Improvement in water quality)
NZL2	East Coast Forestry Project	X (Carbon sequestration, biodiversity)	NR	NR	XX (Management of soil erosion)
NZL3	North Otago Irrigation Company	X (Biodiversity)	NR	XX (Water supply for members)	NR
SWE1	Söne Mad Grazing	XX (Biodiversity, landscape)	XX (Management of wetland grazing)	NR	NR

NR: Not relevant, or marginal; X: Important; XX: Very important.

1. It should be noted that, as discussed in the previous section, public goods and externalities often overlap. It means that some cases belong to more than one category of the classification shown in Table 2.1. For example, water quality and availability have characteristics of non-excludability and non-rivalry, i.e. public goods (Cooper et al., 2009). Agriculture impacts negatively on both the availability and quality of water resource. It is one of the largest consumers of water and its activity depletes the stock and/or quality of this public good. Inappropriate use of fertilisers and pesticides or unsustainable farming methods may degrade water quality and availability (negative externalities). However, certain management practices can result in significant improvements to water quality and availability. For instance, the creation of reed beds along river valleys or converting arable land to grassland can improve water quality (Cooper et al., 2009). Just as the negative externalities agriculture inflicts on water resources are non-excludable and non-rival, so too are the improvements to water quality and availability beyond regulation levels achieved by collective action, and they can be regarded as public goods/positive externalities. For simplicity, in Table 2.1, water quality is categorised as negative externalities, since most water quality improvement associated with agriculture is related with the reduction of pesticide or manures stemming from agriculture.

2.2. Collective action and participants

47. Collective action is a group action. Thus, to provide a range of agri-environmental public goods, various participants such as farmers, farmers' organisations, NGOs, local citizens, private firms, universities, research centres and governments, participate in collective action. Table 2.2 summarises the participation in the 25 OECD case studies. Broadly speaking, there are three main types of participants in collective action: farmers; non-farmers and governments. Generally speaking, their main roles are as follows.

- Farmers: Farmers usually form the core of the group, and provide labour and equipment for group activities. They own or operate the farms whose management provides the scope for public good provision or externality reduction. As collective action participants, they may adopt innovative farming practices in order to provide agri-environmental public goods or reduce negative externalities.

- Non-farmers: Non-farmers provide knowledge and expertise needed for the collective action. They can be intermediaries or co-ordinators who connect people and help them form groups. Co-ordinators can provide support for collective action, assisting with planning and administration, communications and organisation of activities.

Table 2.2. Collective action and participants in case studies

Case	Name	Farmers	Non-farmers					Governments[1]	
		Individual farmers	Farmers' organisations	NGOs/ NPOs[2]	Local citizens	Private firm	Others (universities, etc)	Central governments[3]	Local governments
AUS1	Mulgrave Landcare Group	X			X	X	X	X	X
AUS2	Holbrook Landcare Network	X			X	X	X	X	X
BEL1	Buffer strips in Dommel Valley	X		X				X	X
BEL2	Water management by Pidpa	X		X		X[4]		X[5]	
CAN1	Group Environmental Farm Planning	X		X				X	X
CAN2	Beaver Hills Initiative	X	X	X	X	X	X	X	X
DEU1	Landcare association	X	X	X	X	X	X	X	X
DEU2	Co-operation in drinking water	X	X			X	X	X	X
DEU3	Wetland restoration in Eider	X		X			X	X	X
ESP1	Community water management	X		X				X	X
ESP2	Prevention of animal diseases	X		X				X	X
FIN1	Pyhäjärvi Restoration Project	X		X	X	X	X	X	X
FRA1	Water management by Vittel	X	X			X	X[6]	[7]	
GBR1	"Upstream thinking"	X		X		X	X	X[8]	
ITA1	Custody in Tuscany	X	X					X	X
ITA2	Community garden in Campania	[8]		X	X				
ITA3	Mountain pastures in Aosta	X			X			X	X
JPN1	Policy for Biodiversity in Shiga	X			X				X
JPN2	Recycling Water in Shiga	X	X						X
JPN3	Measures to Conserve Land, Water and the Environment	X	X	X	X	X	X	X	X
NLD1	Water, Land & Dijken	X	X	X	X			X	X
NZL1	Aorere Catchment Project	X		X			X	X	(X)[10]
NZL2	East Coast Forestry Programme	X[11]						X	X
NZL3	North Otago Irrigation Company	X				X[12]			X
SWE1	Söne Mad Grazing	X		X	X			X[13]	

Notes to Table 2.2

1. Governments sometimes participate in groups and provide direct support, but in other cases they facilitate group activities through policy programmes. Non-participants cases are also included in the table. Their support includes both financial and non-financial support. Some agri-environmental payments are available for both individuals and groups, and do not specifically target the promotion of collective action.
2. Non-Profit Organisations
3. EU policies (e.g. the Rural Development Programme) are classified as support from central government.

4. Provincial and Intermunicipal Water Company of the Province of Antwerp (Pidpa) is not a purely private company. Its shareholders are the province of Antwerp, 65 communities within the province and Antwerp Water Works (another water company operating in the province

5. Although there are no policies that directly stimulate or help water providers to co-operate with farmers, representatives from government actors at Flemish level participate in the local networks established by Pidpa and provide technical assistance.

6. A public research consortium from the French National Agronomic Institute (INRA) provides technical assistance.

7. There is indirect government involvement. For example, the Vittel area benefited from a land consolidation operation programme (OGAF), which facilitated the reorganisation of the lands within defined boundaries and helped farmers to change their practices to reduce non-point source pollution from intensive farming. But, the contracts between a mineral water bottler and farmers are private.

8. The national government provides technical assistance through the government funded Environment Agency, but there is no direct financial support from government.

9. In this case, a local NGO manages a community garden where local citizens cultivate vegetables, but no professional farmers participate in the project.

10. Some SFF projects receive support from local governments, but not all projects do.

11. Landowners (foresters, farmers, etc).

12. North Otago Irrigation Company Ltd (NOIC) is a registered company per the New Zealand Companies Act. Its shareholders are farmers.

13. This case involves general agri-environmental subsidies (the EU Rural Development Program). They can be paid to individuals and groups, and do not specifically target the promotion of collective action.

- Governments: Government can contribute to collective action in two different roles: as a participant and as a non-participating supporter. As a non-participant, government can support collective actions through various policy measures including background technical assistance, funding programmes and regulation. In this case, government sometimes, promotes a number of collective actions in different areas through a horizontal policy programme (e.g. Landcare programme – AUS1 and AUS2). On the other hand, as a participant, government staff participate in meetings and generally provide more case-specific advice and assistance for developing the collective action (e.g. Beaver Hills Initiative – CAN2). Even when government is a direct participant, it will often also provide financial support or appeal to members strongly to undertake collective action, if such policy measures are deemed suitable for the particular case.

48. Table 2.2 shows that among 25 OECD case studies, there are no cases that are composed only of farmers. All cases include other participants or receive government support (either as participants or non-participants). In addition, except FRA1 and ITA2, governments provide some support. They suggest that roles of non-farmer participants and governments are important for collective action.

49. Based on the types of participants in a collective action, they can be classified into three types: farmer-led action, non-farmer-led action and government-led action. However, many cases combine two or three of these elements. Participants collaborate, take initiatives together and undertake collective action. Therefore, it is difficult to classify all the case studies according to this typology. Table 2.3 provides selected examples from the OECD case studies.

Table 2.3. Selected examples of farmer-led, non-farmer-led and government-led collective action

Type	Brief explanation of an example
Farmer-led action	Aorere Catchment Project in New Zealand (NZL1) is a project led by dairy farmers. Local marine farmers faced a risk of closure due to deteriorating water and raised their issues publicly. In order to improve water quality, local dairy farmers started to take actions voluntarily, with the assistance of a local NGO. They applied for support from the Sustainable Farming Fund (SFF) managed by the Ministry for Primary Industries of New Zealand (MPI). Farmers commissioned a scientific investigation to understand the possible causes of water deterioration, and changed their farming practices for water quality improvement with the help of the SFF.
Non-farmer-led action	Water quality protection by a mineral water bottler and farmers (FRA1) is a case study in which a private water company, Vittel, took the initiative. In order to improve water quality, Vittel made an agreement with a group of farmers located in its catchment area, under which they changed their farming practices so as to reduce non-point source pollution from intensive farming.
Government-led action	The Fish Nursery Paddy Field Project in Shiga Prefecture in Japan (JPN1) is a project that allows fish to lay eggs in paddy fields. Farmers are paid to ensure that a special type of fish remains in paddy fields by increasing the water level of drainage canals and by allowing the fish to move freely from canals to paddy fields. Otherwise, modern paddy fields with their deep drainage canals prevent lake fish from coming up and spawning in paddy fields. In order to control the water level of drainage canals, which are shared by several farmers, collective action is necessary. This collective action is introduced by a local policy in Shiga Prefecture. To improve biodiversity and promote eco-friendly farming, the Prefecture took the initiative to introduce this collective action by farmers.

2.3. Emergence of collective action

50. These three types of collective action (farmer-led, non-farmer-led and government-led action) indicate that the emergence of collective action may also have three patterns: 1) farmers voluntarily form a group to act collectively, 2) non-farmers help farmers to act collectively, sometimes by playing a role of intermediary, and 3) governments take the initiative to set up a collective action. The first two patterns can be described as bottom-up approaches and the third as a top-down approach.

51. For the first two patterns, there are two important initial conditions for the emergence of collective action: benefits from collective action and severe agri-environmental problems. First, those who benefit from collective action are important as leaders in forming a group. Olson (1965) argues that sufficient returns from collective action could lead individuals to initiate co-operative action. His argument is supported by Lubell et al. (2002). They analyse the emergence of over 900 watershed partnerships in the United States and find that collective action is more likely to be initiated when potential benefits outweigh the transaction costs of developing and maintaining new institutions. For example, Vittel took the initiative to improve water quality by making agreements with farmers, since improving water quality is very important for Vittel and the benefits outweigh the costs of paying compensation to farmers (FRA1).

52. Severe agri-environmental problems can also be drivers to collective action. According to Lubell et al. (2002), watershed partnerships in the United States are most likely to emerge amongst people confronted with severe pollution problems due to agricultural and urban run-off. The severity of the problem increases the motivation for taking action as well as awareness of the benefits to be gained from collective action. Indeed, in the case of Water, Land & Dijken Association (NLD1), the fact that the number of grassland birds had declined in spite of conservation efforts pushed participants to take more proactive actions and to develop strong regional co-ordination beyond farm boundaries to protect the species and population of grassland birds. In the case of Holbrook Landcare Network (AUS2), it has been active in the Holbrook region in south-eastern Australia for more than 20 years. This group has been working primarily on vegetation management in a region where vegetation has been significantly modified with 85% of the original vegetation replaced by pastures and crops. To enhance biodiversity and manage dryland salinity and soil erosion, the group initiated collective action.

53. Some studies point out that a sufficiently large number of participants is needed to take the first step towards collective action (e.g. Granovetter, 1978). Although this threshold number may differ in each case, shared recognition of the importance of taking co-operative action is a trigger. This collective awareness can make it easier to surpass the minimum threshold number of participants for collective action.

54. On the other hand, government-led collective action is launched when markets do not sufficiently ensure the provision of public goods or reduce negative externalities. For example, in the case of Custody of the Territory in Tuscany (ITA1), it became clear that hydro-geological management was a major environmental priority due to recent extreme weather events. However, nobody was keen to manage over 115 000 ha of mountain areas and about 1 500 km of streams and torrents. Thus, to ensure the provision of public goods that would stem from hydro-geological management (e.g. landscape, resilience to flooding) a local agency took the initiative to undertake collective action in collaboration with local farmers. In the case of the Policy to Recycle Drained Water from Agriculture in Shiga Prefecture (JPN2), the Shiga prefecture took the initiative to launch collective action to reduce the flow of chemicals into Lake Biwa. The prefectural government pays irrigation districts to reuse the water drained from paddy fields. Without payments by the prefecture, farmers would not have an economic incentive to re-use the water voluntarily. In this case, farmers in the same irrigation districts jointly recycle drained water for irrigation.

55. Collective actions are usually led by multiple actors. There are cases of top-down and bottom-up collective action where farmers volunteer to work with government. Even top-down collective actions are presumably based to some degree on the willingness of farmers to collaborate, as seen in the case of Fish Nursery Paddy Field Project in Shiga Prefecture in Japan (JPN1).[5] In all these types of collaborative action,

5. The Fish Nursery Paddy Field Project in Shiga Prefecture in Japan (JPN1) is developed by a local government. If there were no government intervention, no farmers would have tried to adopt special farming measures to allow fish to lay eggs in paddy fields. However, this project is promoted by voluntary agri-environmental payment, not by regulation. Although local government promotes this project, whether farmers join the project or not is voluntary. In addition, this project cannot be done by an individual farmer.

the benefits from such action, the severity of the agri-environmental problems, and government policies affect its emergence.

2.4. Benefits of collective action

56. This section discusses the benefits of the collective action, drawing on the literature review and the case studies. The main benefits are geographical and ecological scale merits, cost-saving, increased capacity, and ability to tackle local issues.

Geographical and ecological scale merits

57. Collective action has geographical and ecological scale merits. It allows individual farmers to manage problems at a geographically and ecologically appropriate scale, across legal and administrative boundaries (Figure 2.3). Collective action makes it possible to deliver public goods characterised by a large geographical scale, such as landscape and biodiversity, that could not be provided or protected by a single farmer (Davies et al., 2004). Collective action can involve a number of farmers and non-farmers and thereby cover a large geographical scale through co-ordinated activities and leveraging resources among them. In addition, land management at a landscape level can deliver *greater* public goods benefits than at the individual farm scale (Mills et al., 2010). Several examples in the literature and the case studies show this geographical and ecological scale merit (Box 2.3).

Box 2.3. Examples of geographical and ecological scale merits

Restoring wetlands: Hodge and McNally (2000) analysed wetland restoration in Wales and argue that enhancing environmental benefits of wetland restoration requires management of the protected area as well as of the adjacent land. Wetlands are influenced by their surroundings and it is not likely that the appropriate area for restoration would fall exclusively within the land owned by one farmer, hence collective action is necessary for appropriate management of wetland restoration. This statement is confirmed by the OECD case studies. For example, Mulgrave Landcare and Catchment Group Inc. (AUS1) undertakes riparian and wetland restoration and improves the water quality of the Mulgrave River, which discharges into the Great Barrier Reef lagoon (a UNESCO World Heritage Area). Farmers, collaborating with volunteers, develop farm machinery to improve fertiliser efficiency and reduce soil erosion, monitor soil nutrient status and water quality, and hold school and public information sessions for wetland restoration. Wetland restoration in the Eider valley (DEU3) is another example of collective action that covers large areas beyond individual farmland units. Public authorities, non-profit organisations, land owners and farmers undertake extensification of agricultural land use, deconstruction of drainage systems, and reflooding of land together.

Managing negative externalities: Collective action is useful for managing negative externalities. For example, non-point pollution is difficult to monitor in a small-scale activity because it goes beyond legal and administrative boundaries, but it can be more easily monitored on a larger scale by collective action (Pollard et al., 1998; Davies et al., 2004). Many of the OECD collective action case studies manage negative externalities by collaborating with farmers, landowners, NGOs and governments. For example, the Pyhäjärvi Restoration Project (FIN1) tries to stop eutrophication development in Lake Pyhäjärvi in south west Finland. To cover broad activities that affect water quality, the project includes about 20 organisations, 100 farmers and 20 fishermen, and leverages their knowledge and resources. In the case of co-operation in drinking water protection (DEU2) to maintain and improve drinking water quality and reduce diffuse pollution of groundwater exacerbated by nitrate leaching, farmers and water suppliers set up co-operative activities in designated areas for drinking water protection. This co-operation establishes a protection framework for the area, develops and implements appropriate measures of water protection, and monitors and evaluates farming methods, nutrient management, and water quality.

Thus, to apply for this project, farmers need to co-operate with neighbouring farmers. Bottom-up collaboration is a pre-requisite of this top-down collective action.

Cost-saving

58. Collective action can allow agri-environmental public goods to be provided at lower cost because of economies of scale and scope[6]. When the action includes participants who have different skills and who can pool their assets to provide public goods, this sharing and mobilising of resources can reduce the cost of providing public goods (OECD, 1998; Davies et al., 2004; Polman et al., 2010). This may even be decisive for whether or not the public good is provided at all. For example, the Community of Irrigators of Bembézar Margen Derecha (ESP1) manages irrigation districts collectively because managing the distribution of irrigation water is a complex task with high fixed costs (monitoring and control) beyond which there are in fact increasing returns to scale. Hodge and McNally (2000) found that large-scale collective action could reduce marginal costs for wetland restoration in Wales due to economies of scale. Moreover, neighbouring farmers provide different types of public goods such as landscape and biodiversity. The co-ordinated provision of these goods through collective action may reduce the cost of their provision compared with a single provider of public goods (economies of scope) (Shobayashi et al., 2011). Table 2.1 shows that many case studies provide multiple public goods while reducing negative externalities.

59. In addition, collective action can reduce the cost of implementing farm practices. Farming practices adopted voluntarily by farmers can fit better into local management systems. Allowing groups to develop their own solutions and implementation rules is important for making collective action effective (Ostrom 1990; Mills et al., 2010). For example, in the Netherlands, collective actions are undertaken and owned by farmers. Their boards set specific goals in their area together with the government and decide on the measures to be taken by farmers. Board members are farmer neighbours, which encourages farmers to participate in collective action and harmonise farming practices (White and Runge, 1994; Damianos and Giannakopoulos, 2002). Because of these locally adapted approaches, farmers tend to adopt appropriate farm practices even if governments do not pay them to do so. As a result, measures can be more solidly established, bringing more value to regions and increase cost-effectiveness (NDL1). In this way, collective action can promote farmer-led management of ecosystem services and reduce costs associated with promoting certain farm practices.

Increasing capacity

60. Collective action makes it possible for members to collect and share knowledge and information at a lower cost (OECD, 1998). It can enhance farmers' expertise in ways that cannot be achieved by an individual farmer. For example, collective action can draw different stakeholders and landholders together and utilise their knowledge, skills and institutions (Hodge and Reader, 2007). This type of sharing can facilitate the harmonisation of multiple objectives for resources, attract funding by increasing the credibility and legitimacy of decision making, and build understanding and a capacity to cope with future changes (Davie et al., 2004). Moreover, collective action may create new knowledge through innovation that arises from the collaboration of various participants. Kiminami (2012) indicates that knowledge creation can be promoted if each participant has different types of knowledge and they are close in terms of geography, institutions, technologies, organisations, society and culture. In order to increase these capabilities, creating a co-operative environment among participants is important (Hodge and Reader, 2007).

6. Economies of scale are the cost advantages that occur due to increased size of production. Economies of scope are the cost advantages obtained by producing two or more products concurrently.

Box 2.4. Increasing capacity: The case of the Beaver Hills Initiative

The Beaver Hills Initiative (CAN2) shares information including scientific data among members and develops consistent planning and practices in order to conserve the Beaver Hills area in Canada. Local knowledge from local landowners is shared with others, including policy makers in the region as well as industrial partners and NGOs. This can foster a better understanding of community-based stewardship across multiple sectors and multi-disciplinary partners. In addition, the Beaver Hills Initiative effectively leverages resources (e.g. funding and technical expertise) among members and makes it collectively possible to undertake projects with a larger pool of resources that could not be supported or afforded at the individual municipality level.

Tackling local issues

61. Collective action can make it possible to tackle local issues that may be difficult for central authorities to deal with because of its flexible forms and diverse members with different knowledge and skills. Local people know local issues better than central authorities. By collaborating with others, they can share knowledge, leverage resources and identify critical sites that are central to different environmental objectives. Collective action can signal opportunities for groups of landholders, conservation groups and local authorities to collaborate in a joint project (Hodge and Reader, 2007). By contrast, regulations and market-based instruments, which may cover the whole country, do not necessarily take local conditions into account. This local focus of collective action is useful not only for promoting public goods, but also for reducing negative externalities such as non-point pollution. Collective action can utilise local knowledge to identify pollution risks by using local expertise (Pollard et al., 1998; Vojtech, 2010). Although central approaches may not be able to provide solutions for dispersed pollution problems, local approaches can find better measures to deal with them by adjusting activities to each local situation. Collective action can allow greater flexibility, responsiveness and local relevance (Davies et al., 2004).

Box 2.5. Tackling local issues: The case of Landcare in Australia

Landcare in Australia (AUS1 and AUS2) is a grass-roots movement grounded in local volunteer effort and stewardship of the land and other natural resources. Landcare groups form when like-minded community members decide collectively to address local environmental issues, such as the prevention of soil erosion and the conservation of native vegetation. Australian governments have encouraged the landcare movement and enlisted landcare groups, with their drive and enthusiasm, as partners in addressing national land degradation and environmental problems. Groups may apply for funding from a variety of different sources to support their work including local, state and federal government programmes and industry, philanthropic and commercial organisations.

2.5. Barriers to collective action

62. As well as the numerous advantages of collective action, this study identifies several barriers to collective action. The main challenges are free rider problems, transaction costs, sceptical attitudes towards collective action and policy uncertainty.

The free rider problem

63. Many studies on collective action point to the problem of free riders, where some group members tend not to contribute to group activities because they can benefit from other members' activities without contributing. In Olson's seminal work (Olson, 1965), the difficulty of co-operation due to the free rider problem is addressed. He stated that "rational, self-interested individuals will not act to achieve their common or group interests", i.e. individuals have incentives to free ride in collective action because one

who cannot be excluded from the benefits of a collective good has little incentive to make a voluntary contribution to the provision of that good. Hardin (1968) points to the difficulty of collective action by using the example of a pasture open to all. Each herder tries to add more animals to increase his private benefit, which results in over-exploitation of the common pasture. This situation is known as "the tragedy of the commons". Hardin's argument shows that individuals' pursuit of their own benefits may hinder the maximization of benefits of collective action.

64. This free rider problem is known to occur in repeated public goods experiments (Ledyard, 1995). Thus, it can be difficult to provide public goods by collective action. They are, by definition, non-excludable and non-rival, and it is therefore difficult to limit the resulting benefits to active group members. Many studies have pointed out the difficulty of voluntary provision of public goods (e.g. Dixit and Olson, 2000; Ellingsen and Paltseva, 2012).[7]

65. However, previous studies have also found that people tend to contribute to the production of public goods and are in favour of collaborating with their neighbours more than would be expected based on pure self-interest alone (OECD, 2012b). There are several possible explanations for this, one of which relates to "social norms" or "heuristics —rules of thumb that individuals have learned over time regarding responses that tend to give them good, but not necessarily optimal, outcomes in particular kinds of situations" (Ostrom, 2010). Farmers are indeed influenced by social norms or social pressure although traditional economics usually assumes farmers behave "rationally". For example, Vanslembrouck et al. (2002) found that only 20-33% of farmers raised economic factors as the primary reason for join countryside stewardship schemes. Defrancesco (2008) shows that in addition to economic factors such as profit and income, the relationship with neighbouring farmers and their opinions on environmentally-friendly practices significantly affect their adoption of agri-environmental measures.

66. Indeed, some case studies indicate that strong social capital helps farmers to act together and promotes their production of public goods. For example, in Spain, there is a long history of collective self-management of irrigation water resources. Strong social capital shared by farmers helped the Community of Irrigators (CRs) in Spain to successfully promote co-operation among them, prevent free-riding, and manage common irrigation infrastructures and water endowment collectively (ESP1).

67. Several studies also argue that successful collective action can prevent free rider problems and move production closer to a Pareto optimum. Olson (1965) suggests the possibility of being able to prevent free rider problems by limiting the benefits of group activities to active group members. Property rights help individuals to overcome free rider problems (Ostrom, 2004). Enforcing a monitoring system among members is also useful in this context (Davies et al., 2004). For instance, the North Otago Irrigation Company (NZL3) prevents free-riding by requiring farmers who use the NOIC irrigation system to comply with the environmental agreements for improving water quality and auditing their compliance of agreements. Indeed, NOIC has stopped supplying water to farmers who fail to adhere to requirements. Thus, monitoring and sanctions encourage farmers to contribute to collective action and reduce free riding.

Transaction costs

68. Collective action involves additional transaction costs when compared with individual activities, especially at the initial stage of its implementation (Ostrom, 1990; Davies et al., 2004), which may hinder collective action from taking place. Dixit and Olson (2000) point out that even small transaction costs can prevent voluntary provision of public goods.

7. Annex I.B analyses the problems posed for collective action by selfish individual behaviour in a game-theoretic context.

69. Davies et al. (2004) summarise the transaction costs related to collective action based on the study by Singleton and Taylor (1992) (Table 2.4). There are three types of related transaction costs: search costs, bargaining costs, and monitoring and enforcement costs. Several case studies and the literature indicate that transaction costs are major challenges for collective action. For example, Harris-Adams et al. (2012) found that complex and time-consuming application procedures for government programmes deter farmers from participating in Australian funding programmes. This suggests that the costs of gathering information and identifying funding sources (search costs) may be significant barriers to collective action even when governments provide programmes to promote it. Swinnerton (2010) notes that the Beaver Hills Initiative (CAN2) takes time to achieve outcomes due to the fact that its members must often adjust their activities to multiple and competing priorities (bargaining costs). Monitoring and enforcement costs are a significant barrier to continuing with collective action, and how to finance them is a major challenge for groups even after agreements among members are successfully established and collective actions have emerged.

Table 2.4. Transaction costs in collective action

Transaction Costs	Explanation	Examples
Search costs	Cost incurred in identifying possibilities for mutual gain	• Costs of identifying relevant participants • Costs of gathering information • Costs of identifying funding sources for collective action
Bargaining costs	Cost associated with negotiating an agreement	• Time spent at meetings • Effort expended in verbal and written communications • Costs of acquiring support from external agencies
Monitoring and enforcement costs	Cost involved in making sure all parties keep to the agreement	• Time and effort spent monitoring others • Employment of an external monitor • Costs of enforcing sanctions

Source: Adapted from Davies et al. (2004) and Singleton and Taylor (1992).

70. Other studies argue that collective action may reduce transaction costs, such as those related to contracting, monitoring and making payments, because of the economies of scale or scope (e.g. Hodge and McNally, 2000; Shobayashi et al., 2011). For example, collective action helps to reduce transaction costs as the number of parties that authorities need to negotiate with is reduced (OECD, 1998). In the North Otago Irrigation Company (NOIC) case (NZL3), local governments work closely with NOIC to improve on-farm environmental practices. NOIC acts as intermediary and helps governments to promote sustainable farming among individual farmers. This lowers the transaction costs due to monitoring and enforcement.

71. Nonetheless, additional transaction costs are inevitable. In order to make collective action work, benefits from collective action need to cover these costs incurred by the action.[8] Thus, for collective action to succeed it is important to identify how to reduce them.

8. Bundling is one way of overcoming the problem of non-provision of public goods due to transaction costs and free rider problems (Dixit and Olson, 2000). In a bundling case, participants do not have the option of participating separately for each issue, i.e. they have to participate in the whole package or not at all. In this case, even if individuals do not benefit adequately from participating in action on some issues, they may

72. Transaction costs can be reduced by sharing experience across agencies, regions or countries, exploiting already existing administrative networks, integrating government and private information, reducing the number of agencies, and using information technologies (OECD, 2007). Davies et al. (2004) pointed out that the existence of social networks, trust and norms of reciprocity among group members can reduce transaction costs. In the Aorere Catchment Project (NZL1), the strong social capital shared by the small Aorere group (33 farmers) seems to have helped them negotiate agreements and reduce bargaining and other transaction costs. Hodge and McNally (2000) also find that external agents, such as water management organisations, can reduce transaction costs by playing the role of information provider as well as being a forum for establishing co-ordination among members. In the case of Group Environmental Farm Planning in Saskatchewan (CAN1), search costs (e.g. gathering information and identifying funding sources) were reduced because of the assistance received from local NGOs/NPOs. They provide farmers with the information on the funding programme and other related information and help them to organise collective action. In the Söne Mad Grazing case (SWE1), in order to undertake collective grazing in wetlands held by a number of landowners, contracts were signed between each landowner and one party, i.e. the Söne Mad Grazing Association. This led to lower transaction costs compared to signing contracts between each owner of cattle and a number of landowners.

73. Institutional approaches can also be useful in reducing transaction costs (OECD, 2007). For instance, in order to reduce the drainage flow from agriculture into Lake Biwa in Japan, the policy to Recycle Water Drained from Agriculture (JPN2) encourages several irrigation districts to re-use the water drained from paddy fields by paying subsidies. The main question concerning this collective action was how each irrigation district could reduce the transaction costs associated with obtaining consent from its farmer members. They used their general annual conferences with all members or their representatives as venues to obtain consent. This approach, i.e. using a regular institutional decision-making process, can reduce transaction costs for obtaining consent from members.

Sceptical behaviour towards collective action

74. Attitudes towards collective action vary among individuals. For example, Aldrich and Stern (1983) argue that individualistic attitudes can be a barrier to collective action. A recent study of drivers of change in farming management in Australia found that group-based extension is not suitable for everyone since some farmers prefer to act as individuals (Ecker et al., 2012). At the policy design stage, governments need to decide carefully whom they should target — individual farmers or groups of farmers— depending on each agri-environmental situation. Group-based approaches are not always the most appropriate.

75. Other behavioural issues like inertia, awareness and willingness to accept the evidence regarding the impacts of the action on the natural environment also affect farmers' collective action. Inertia is the tendency to resist change per se. When there is "status quo bias", great effort may be necessary to move from the current situation. If farmers are used to farming individually, it may not be easy to persuade them to co-operate with others.[9] Indeed, it is sometimes claimed that farmers do not engage collectively until they are confronted with severe pollution problems (Lubell et al., 2002). In order to promote collective action, it is important to raise awareness of the need to act and provide solid scientific evidence that clearly shows the implications of collective action for farmers.

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opt for the whole package if its total benefits outweigh its total costs. Thus, by bundling public goods with private goods, it might be possible to induce individuals to participate in the provision of public goods.

9. Factors affecting farmer behaviour, including status quo bias, are discussed in more detail in Section 3.

Uncertain policy environment

76. An uncertain policy environment also negatively affects farmers' initiatives to take actions. Harris-Adams et al. (2012) found that changing funding sources and objectives of policies and programmes can be a significant barrier to managing native vegetation on agricultural and other private land. Policy uncertainty creates nervousness amongst farmers as to the future direction of support and of policy instrument choice (Davies et al. 2004). As providing agri-environmental public goods (e.g. native vegetation conservation) is a usually long-term process, lack of policy continuity can work against the provision of long-term benefits. It follows that a stable policy environment is necessary also when such objectives are addressed by collective action.

77. Greater stability in policy does not, however, mean unchanging or inflexible policies. To remain relevant to farmers' needs, current policy measures will probably need further innovation and evolution. For instance, although Australian farmers strongly support Landcare programmes in Australia, a recent study suggests that on-going effort by government is needed if they are to continue meeting farmers' expectations (de Hoyer, 2012). The challenge is how to continue improving policies for collective action for public good provision whilst avoiding unnecessary disruption.

2.6. Key factors for successful collective action

78. Collective action is a complex activity involving various participants. This implies that various factors can influence its success. Many authors have attempted to identify the most important of them. For example, Ostrom lists six conditions under which collective action is likely to be able to address common pool resource (CPR) problems (Ostrom, 1990).

- *Common recognition*: Most appropriators (resource users) share a common judgement that they will be harmed if they do not adopt an alternative rule on the use of the resource.
- *Similarity*: Most appropriators will be affected in similar ways by the proposed rule changes.
- *Low discount rates*: Most appropriators highly value the continuation activities from the CPRs; in other words, they have low discount rates.
- *Low transaction costs*: Appropriators face relatively low information, transformation and enforcement costs.
- *Social capital*: Most appropriators share generalized norms of reciprocity and trust that can be used as initial social capital.
- *Small group*: The group appropriating from the CPRs is relatively small and stable.

79. Some studies have tried to synthesise at a more general level the necessary factors for successful collective action. Agrawal (2001) summarised the key factors for successful collective action governing CPRs by reviewing the three most significant analyses of local community efforts to manage and govern CPRs (Wade, 1988; Ostrom, 1990; and Bland and Plateau, 1996). Davies et al. (2004) also summarised the key factors by examining 12 academic studies. However, these syntheses present several limitations. First, the number of variables is too great and too complex. For example, the total number of factors identified in the latter two studies is more than 35. The complex links between these numerous variables at different levels make the research on collective action extremely challenging (Ostrom, 2010). Second, as Agrawal (2001) explains, these variables have proved important in specific cases rather than arising from a general theory of collective action, and it is difficult to undertake systematic tests to evaluate these factors due to

the lack of available data. Therefore, the literature still lacks a general theory of what makes for successful collective action in sustainable resource management (Agrawal, 2001). Nevertheless, deepening the understanding of these factors and examining some common factors across the case studies can help to develop better methods for providing public goods and mitigating negative externalities.

80. Agrawal (2001) divides the variables identified in previous studies into four sets: 1) the characteristics of the resources to be managed; 2) the nature of the groups that depend on these resources; 3) the particulars of institutional regimes through which the resources are managed; and 4) the nature of the relationship between the collective group(s), on the one hand, and external forces and authorities on the other. Mills et al. (2010) use the typology developed by Agrawal (2001) to analyse the factors influencing collective action in Wales. This framework is useful for categorising variables and understanding why they are relevant. Table 2.5 synthesises the main variables identified in the literature review and those identified in the case studies.

Table 2.5. Key factors for successful collective action

1) Resource system characteristics	2) Group characteristics
Knowledge of environmental resources	Social capital
Appropriate targeting of the resource within its natural boundaries	Small group or large group with functional institutions
Visible positive outcomes and clear benefits from the resource and action	Heterogeneity of endowments and homogeneity of identities and interests
	Leadership
	Communication
	Shared aims and understanding of issue
3) Institutional arrangement	**4) External environment**
Locally devised management rules	Financial support
Sound governance arrangements	Non-financial support
Monitoring and sanctions	Intermediaries and co-ordinators
	Co-operation between local and central governments

Source: OECD Secretariat based on Agrawal (2001), Davies et al. (2004) and the OECD case studies.

Resource system characteristics

81. The characteristics of the resource system (e.g. biodiversity, water pollution) affect collective action. Among the factors related to this point are knowledge about the environmental resources, the geographical scale and boundaries of the resource system, and whether positive outcomes of the action can be proved and will produce clear benefits for participants.

Knowledge of environmental resources

82. Good knowledge of the environmental resources concerned, including both local knowledge and scientific expertise, are necessary for local groups to work collectively in order to use the resources in a sustainable way (Agrawal, 2001; Pretty, 2003). Even if private benefits are high enough, collective action may not happen due to the lack of information on, for example, technical requirements (Wade, 1988; Hodge and McNally, 2000).

83. Generally speaking, farmers have a relatively good working knowledge of how the biophysical system operates because such knowledge is essential for on-going successful resource management (Ostrom, 1999a). Through experience, they have learned what impacts on their resources, especially where these are internal to the communities. However, when biophysical systems are evolving (e.g. under pressure from new environmental stresses, including climate change), an adequate level of knowledge may be lacking.

84. Moreover, local communities of resource users may lack knowledge about impacts they themselves have on the wider resource system, especially when these systems are external to or extend well beyond the communities themselves. For instance, local groups may not have access to scientific knowledge concerning the type of resource system involved. They may not know how transported nutrients affect the environment hundreds of kilometres away. In these cases, they may need support from external authorities (Ostrom, 1999a; Pretty, 2003). Local government, universities or other regional organisations can take on the role of an external agent, and they can facilitate communication among farmers and provide the necessary information (Ostrom, 1999a; Hodge and McNally, 2000). It is often true that no one holds all the necessary information for an environmental resource and thus the farmer, the regulator, agricultural advisors, and other specialists need to join a multi-disciplinary team and share expertise to tackle problems they are facing (Pollard et al., 1998).

85. Many case studies also identify that different participants can contribute and share various elements of essential knowledge and expertise. External scientists can play an important role in identifying environmental problems (e.g. water quality protection by a mineral water bottler and farmers (FRA1), Pyhäjärvi Restoration Project (FIN1) and Aorere Catchment Project (NZL1)). In these three cases, scientific experts undertake scientific research and help farmers address environmental problems based on scientific evidence. Governments can also provide necessary knowledge. In the case of East Coast Forestry Programme (NZL2), the local and central governments provide expertise on soil erosion and help landowners identify suitable measures against soil erosion. Sometimes, collective action provides a forum to exchange information and knowledge and can leverage resources. The Beaver Hills Initiative (CAN2) provide forums to pool the information and scientific knowledge among various participants including municipal, provincial and federal governments, NGOs, industrial partners and universities that is necessary for achieving their common objectives.

Appropriate targeting of the resource within its natural boundaries

86. Collective action should be based on appropriate geographical boundaries of the targeted environmental resources such as natural habitats, watersheds and aquifers, and not on administrative jurisdictions. Assessing agri-environmental issues and solving them are common interests among farmers and other participants within the boundaries. If an environmental resource extends beyond a single municipality, it is necessary for all municipalities concerned to collaborate. To preserve the broad Beaver Hills area, which lies within five counties, the Beaver Hills Initiative tries to co-ordinate approaches to preserve the resource collaborating with the five counties, as well as provincial and central governments (CAN2). Some studies (e.g. Wade, 1988; Ostrom, 1990) emphasise the importance of defining the boundaries of targeted environmental resources. This approach helps communities to identify common issues, share recognition, and act collectively.

87. The case studies show that typically collective action deals with broad agri-environmental issues beyond individual farms, such as tackling severe resource problems (e.g. severe soil erosion (NZL2), non-point water pollution (e.g. GBR1)) and managing common pool resources (e.g. catchments (NZL1), or a lake (FIN1)), but not issues related to individual farming (e.g. risk-assessment of individual farms) (Figure 2.3). Dealing with common issues within their geographical boundaries helps farmers to recognise the utility of taking action together. However, participants may still face difficulties to share objectives,

since most actions usually take some time to become effective and a lot of resources are necessary to achieve the goals. In this case, as discussed above, knowledge of environmental resources can help farmers to share common objectives since it provides them with science-based evidence.

Visible positive outcomes and clear benefits from the resource and action

88. The private benefit of farmers participating in collective action is an important factor if farmers decide to act co-operatively (e.g. Ayer, 1997; Hodge and McNally, 2000; Lubell et al., 2002; McCarthy, 2004). Collective action is more likely to develop when potential benefits, proven elsewhere and credible in the local context, outweigh the transaction costs of developing and maintaining new institutions. However, achieving agri-environmental objectives (e.g. enhancing biodiversity and improving water quality) can take time and bringing tangible benefits to participants may be difficult. To continue collective action, it is important to produce actual visible positive outcomes and clear benefits from the agri-environmental public goods provided by collective action (Pollard et al., 1998; Lubell. et al., 2002). Otherwise, collective action could be abandoned.

89. Many of the case studies demonstrate the importance of visible outcomes and benefits from the action. The Aorere Catchment Project (NZL1) was able to improve water quality dramatically. Although mussel farming near the Aorere River mouth could harvest only during 28% of the harvest days in 2002, after the three-year project, this percentage increased to 79% in 2009. Such a positive outcome gave farmers confidence and strengthened their motivation to work on improving water quality. In the case of the communities of irrigators of Bembézar Margen Derecha in Spain (ESP1), farmers agreed to modernise the irrigation system collectively since new irrigation technology made it possible for farmers to produce more profitable crops (citrus with drip irrigation). Thus strong benefits from collective action attracted enough farmers to take actions.

90. Creating visible positive outcomes and bringing clear benefits are important for non-farmer participants as well. As benefits outweigh the costs of their participation, some private companies pay groups of farmers to, for example, improve water quality (e.g. BEL1, FRA1 and GBR1). Governments also address agri-environmental issues (e.g. biodiversity) for the benefit of the wider community, and not just for farmers. Achievement of visible goals is also important for governments to continue committing public revenue to these policies.

Group characteristics

91. The nature of the groups concerned affects collective action. Indeed, the literature review and the case studies identify the significant roles played by social capital, group size, heterogeneity of endowments and homogeneity of identities and interests, leadership, communication among group members, and shared aims and understanding of issue.

Social capital

92. Many studies point to the importance of *social capital* for collective action (e.g. Pennington and Riding, 2000; Rudd, 2000; HAN and Ostrom, 2002; Pretty, 2003; Davies et al., 2004). Although there is no formal definition of social capital, it is conceived as shared social attributes and aspects of social relationships that are conducive to achieving individual and/or collective goals. Social capital usually includes social networks, norms, trust, reciprocity, obligations and expectations, values and attitudes, culture, information and knowledge, formal groups, institutions and rules, and sanctions (Davies et al., 2004). Social capital can lower the transaction costs of working together, facilitate harmonisation of interests among groups, and enhance the predictability of reactions among members (Pretty, 2003; Davies et al., 2004).

93. Several of the case studies point to the importance of social capital. For instance, the rural district around Söne Mad is characterised by a considerable presence of social capital. Local people consider that "helping each other is the way to act." To generate something positive, they feel they must act instead of waiting for it to happen. This social capital significantly helps the Söne Mad Grazing Association to preserve wetlands by reducing search, bargaining, and monitoring and enforcement costs (SWE1).

94. The concept of social capital is strongly linked to farmers' behaviour. Ostrom (1998) argues that reputation, trust and reciprocity, affect an individual's action. Understanding how farmers make their decisions and how social capital could facilitate collective action is central to promoting collective action.

Small group or large group with functional institutions

95. The appropriate group size for collective action has been analysed in many studies. Much of the literature argues that small groups are more appropriate since they can prevent free riders more easily and help members to know one another (e.g. Olson, 1965; Wade, 1988; Ayer, 1997), but that large groups can work if their rules, decision-making procedures and operating methods are well established so as to increase group capabilities through group dynamics.

96. Olson (1965) argued that small groups can prevent free riders and work more efficiently. His argument is based on the costs and benefits of collective action: small groups incur relatively small costs when organising collective action[10] and per capita gains to participants may be high, whereas large groups incur higher transaction costs and the resulting per capita benefits tend to be smaller (Olson, 1965). Although large groups can reduce the initial costs per member, as the group becomes larger, costs associated with negotiation, monitoring and enforcement increase (McCarthy, 2004).

97. When the number of group members is small, individuals know each other's particularities and this can facilitate effective co-operation among members (Dowling and Chin-Fang, 2007). Bland and Plateau (1996) examined how rural communities manage CPRs in developing countries and noted that small group-size was important for co-operation. This is because individuals know each other better and can more closely observe one another's behaviour. As a result, people take into account the more indirect and long-term consequences of their choices instead of only paying attention to immediate costs and benefits. The small size of Aorere Catchment Project (NZL1) makes it easier to establish a common understanding through intensive communication, which facilitates collective resource management.

98. Dunbar (1992) suggested that, because there is a cognitive limit within which people can maintain stable social relationships, more rules and norms are needed to maintain group stability when the number of people exceeds a certain level. Although this level is not clearly identified, some studies on collective action have given specific numbers. According to Pretty (2003), from the early 1990s to the early 2000s, about 400 000 to 500 000 new local groups were established worldwide to manage agricultural and rural resources; most of them were small groups, usually having 20 to 30 active members. Mills et al. (2010) argue that a maximum number of members should be initially about ten in order to facilitate communication and development of the organisation.

99. However, large groups can still provide public goods if they have clear, fair and meaningful rules and their effective governance is well established. If larger groups work well, they can cover larger geographical areas and bring greater environmental benefits. Large groups can exploit economies of scale to reduce costs. Spanish community water management is an example of a large collective action. Irrigation projects typically exhibit high fixed costs for monitoring and control, and increasing returns-to-

10. For instance, smaller groups can reduce the transaction costs associated with the co-ordination, monitoring and enforcement of group activities (Ayer, 1997).

scale. Thus, large-scale collective management of irrigation is necessary (ESP1). Spanish animal health associations are also large-scale, since the implementation of animal health programmes exhibits increasing returns-to-scale. The larger the animal health associations become, the cheaper the provision of health services. Thus in Spain, only one association has been established in each territory and municipal associations have been integrated into larger county associations (ESP2).

100. Ayer (1997) shows three possible cases of provision of public goods associated with agriculture: 1) one person, whose benefits from the provision of a public good outweigh his costs, provides the public goods for all; 2) rules can be set requiring that those who benefit the most from the provision of a public good pay more of the costs; and 3) a government institution can divide a larger group into more homogeneous subgroups to facilitate co-operation. The last point is made by many studies (e.g. Ostrom, 1990; Marshall, 2008; Hearnshaw et al., 2012). Ostrom (1990) points out the importance of decomposing large groups into smaller nested groups. Bland and Plateau (1996) claim that even a large group can work when members share common norms or when it is confronted by a common challenge.

101. Table 2.6 summarizes the information on group size found in the case studies. These are classified into three classes according to number of participants: small (fewer than 50), middle (50-100) and large (more than 100). To examine the correlation, if any, between group size and institutional arrangements, each case study is also classified according to the three types of group structure identified in above (Figure 2.1).

102. Table 2.6 shows that farmers and other participants tend to form independent organisations if the group size becomes large. If organisations are established, more functional institutions (e.g. clear, fair and meaningful rules) can be established. Therefore, although there are many members, they can work together by following the rules. They can form sub-groups or sub-committees and contribute for specific issues. Thus, an effective organisational structure is essential to managing large groups.

Table 2.6. Group size in the case studies

Group structure type	Small (<50 members) (8 cases)		Group structure type	Middle (50-100 members) (5cases)		Group structure type	Large (>100 members) (12 cases)	
1	SWE1	Söne Mad Grazing	1	AUS 1	Landcare Programme (Mulgrave Landcare and Catchment)	1	AUS2	Landcare Programme (Holbrook Landcare Network)
2	FRA1	Water quality protection by a mineral water bottler and farmers	1	DEU 2	Co-operation in drinking water protection	1	CAN 2	Beaver Hills Initiative
2/3	BEL1	Strategic installation of buffer strips in the Dommel Valley	1	ITA2	Community garden in Campania	1	DEU 1	Landcare association
2/3	DEU3	Wetland restoration in the Eider valley	2	BEL2	Water quality management by a water provider and farmers	1	ESP1	Community water management

Table 2.6. Group size in the case studies *(continued)*

2/3	ITA1	Custody of the territory in Tuscany	3	JPN3	Measures to Conserve and Improve Land, Water, and the Environment	1	ESP2	Common good practice against animal diseases
2/3	JPN1	Policy for Preserving Biodiversity Associated with Agriculture in Shiga Prefecture				1	FIN1	Pyhäjärvi Restoration Project
3	ITA3	Mountain pastures in the Aosta Valley				1	JPN2	Policy for Recycling Drained Water from Agriculture in Shiga Prefecture
3	NZL1	SFF (Aorere Catchment Project)				1	NLD1	Water, Land & Dijken Association
						1	NZL3	North Otago Irrigation Company
						2	GBR 1	"Upstream thinking" in the Southwest of England
						2	NZL2	East Coast Forestry Project
						2/3	CAN 1	Group Environmental Farm Planning in Saskatchewan
Majority types are Type 2 or Type 3			Various types exist, but Type 1 predominates.			Most of them are Type 1, suggesting larger groups need strong governance.		

Note: Type 1 is an organisation style collective action in which farmers and other participants form organisations and act collectively as members. Type 2 is an external agency-led collective action in which external agencies (NGOs, governments, etc.) organise farmers (usually in the same geographical area) to act collectively for a common purpose. Type 3 is a non-organisation style collective action in which farmers collaborate with other farmers (and non-farmers), but do not form an independent organisation. In some cases, these types are combined.

Heterogeneity of endowments, homogeneity of identities and interests

103. The discussion of heterogeneity is closely related to that of group size because small groups tend to be homogeneous and large groups tend to be heterogeneous. In general, groups that are homogeneous in terms of identity and interests can more easily develop collective action. They share similar social, economic and cultural circumstances, and it is easier for them to communicate and reach agreement (Dowling and Chin-Fang, 2007). Lubell et al. (2002) analysed hundreds of watershed partnerships in the United States and found that partnerships with homogeneous human, social and financial capital developed most rapidly. Larger groups often exhibit greater differences in individual needs and interests, and in financial ability, which can prevent collective action from working effectively (Ayer, 1997).

104. However, heterogeneity does not necessarily have a negative impact on collective action. Some studies indicate that heterogeneous endowments can have a positive impact on collective action when these endowments are complementary and participants are mutually supportive (e.g. Olson, 1965).

105. Many of the case studies indicate that heterogeneity of endowments and homogeneity of identities and interests are important for collective action. In many cases, core members of collective actions tend to be homogeneous in terms of identity and interests, but external agents can bring different views and expertise and help groups enhance their capacities. For example, in the Mulgrave Landcare and Catchment (AUS1), farmers have been farming in the same area for a long time (homogeneous interests) and this fact seems to facilitate their group activities. But external support from researchers and Great

Barrier Reef agencies (heterogeneous endowments) provide diversity and also help the group activities. In the Group Environmental Farm Planning in Saskatchewan (CAN1), farmers are within the same geographical boundary (i.e. watershed), practice similar farming and share common interests (i.e. water quality), but external support from NGOs/NPOs can leverage resources and help them establish a group farming plan for improving water quality.

106. Lastly, in the case of heterogeneity of identity and interests, collective action can provide a forum for members to discuss issues from different points of view. Although this type of collective action is relatively difficult to develop and takes time to achieve outcomes, it allows participants to become aware of different viewpoints and develop mutual understanding that would otherwise not be possible. Among the OECD case studies, the Beaver Hills Initiative (CAN2) and the Pyhäjärvi Restoration Project (FIN1) provide examples of this kind of forum. In both cases, diverse partners, including farmers, NGOs, scientists, industrial partners and governments, participate in collective action, share experience and information from different viewpoints, and seek to establish common ground for achieving their shared objectives

Leadership

107. In a group activity, leadership is one of the most important factors for achieving collective objectives. Bland and Plateau (1996) argue that young leaders familiar with changing external environments, but who are also connected to local traditions, are necessary for successful collective action. Pollard et al. (1998) insist on the importance of impetus, commitment, influence, and resources of project officers or local leaders for collective action.

108. Local farmers can take strong initiatives for collective action. The Aorere Catchment Project (NZL1) is a successful case of farmer-led collective action: farmers themselves started to tackle issues and find solutions suitable to their local situation. The success of landcare programmes in Australia (AUS1 and 2) also relies on individuals in the community who work tirelessly to articulate a vision, encourage participation, and build the political coalition necessary to support landcare.

109. However, programme facilitators sometimes assume strong leadership as well. In the Group Environmental Farm Planning in Saskatchewan (CAN1), active and enthusiastic involvement by programme facilitators with deep experience, expertise and a good reputation plays a key role. A good reputation is important if producers are to trust facilitators and follow their advice. When this occurs, it can increase the number of programme participants and the level of co-operation, which brings larger benefits.

110. Organisations may also take the leading role. For instance, the North Otago Irrigation Company (NZL3) plays a strong role in maintaining water quality and the environment in the North Otago region. It sets environmental requirements and asks farmers to comply with them. It does monitoring and can impose sanctions to prevent free riding. Strong initiatives of this kind may be needed to make group action feasible.

Communication

111. Communication is also an essential factor because it is difficult to establish trust without it (Ostrom, 1999b). It can serve to enlighten, educate and articulate community preferences (Rudd, 2000), and helps individuals exhaust all mutually beneficial options (Ayer, 1997).

112. Face-to-face communication rather than less personal internet or telephone exchanges is especially important for establishing trust (Hodge and McNally, 2000). Public institutions can also provide necessary information and facilitate communication (Ayer, 1997). Where it is difficult to establish good relationships because of a long history of mistrust amongst participants, an external authority can help

communication by acting as a catalyst. For example, in the case of the strategic installation of buffer strips in the Dommel Valley (BEL1), where there has historically been mistrust between agricultural and environmental interests, the Dommel Valley Watering strives to be neutral and connect both sides.

113. Communication is not just for collective action participants, but also for outsiders. In the Landcare association in Germany (DEU1), outreach events and environmental education are an integral part their work and play an important role in making landowners and a wide range of people aware of landscape and nature protection. Some collective actions (e.g. Mulgrave Landcare and Catchment (AUS1), Water, Land & Dijken Association (NLD1), Policy for Preserving Biodiversity Associated with Agriculture in Shiga Prefecture (JPN1)) have school programmes for local children, which provide opportunities to learn about the environment and agriculture. In addition, various kinds of social activities can facilitate communication and, above all, can entertain and motivate farmers and other participants to undertake collective action (e.g. Beaver Hills Initiatives (CAN2), Custody of the territory in Tuscany (ITA1), Aorere Catchment Project (NZL1)).

Shared aims and understanding of issue

114. Collective action involves a large number of individuals and organisations, and usually extends to areas beyond the individual farm level. To make this group activity feasible, everyone needs to know why they should act collectively (Pollard et al., 1998; Nostrum, 1999a; Mills et al., 2010). Many group characteristics discussed above (social capital, small size, homogeneity of identities and interests, leadership and communication) help members share aims and understanding of issues. The importance of having a clear vision is identified in the case studies (e.g. Landcare movement (AUS1 and 2), Söne Mad Grazing (SWE1)). Smaller groups generally achieve a shared vision more easily.

115. For large collective action groups, sharing a long-term vision can be difficult because of divergent views held by participants, but this is very important to manage heterogeneous members. For example, knowledge based on scientific evidence can help large groups to share goals. In the case of the Beaver Hills Initiative (CAN2), members can more easily adhere to a long-term land-use plan that has clear and consistent goals, because it is underpinned by science-based data and evidence (Swinnerton, 2010). The Initiative incorporates a sub-group that maintains an effective spatial data management system to provide accurate and robust data to aid the development of appropriate policies. Experts in geometrics and other relevant subjects share their cross-sectional mapping and modeling experience through a working group. This mapping, based on scientific data, helps diverse members to harmonies goals. Their long-term vision is clearly stated in their business plan decided at board meetings.

116. In some cases, institutional approaches help members to develop common aims. For instance, in the case of the policy for recycling drained water from agriculture in the Shiga Prefecture (JPN2), it is necessary to obtain consent from member farmers (who number between 400 to 10 000 depending on the irrigation district) to use recycled water for irrigation. To achieve this, all the irrigation districts that joined the project have used their regular decision-making processes. Specifically, all districts are required by law to have general conferences with all members or their representatives at least once a year. These general conferences aim to make major decisions, such as those involving the water charges and the operation and maintenance plans for the next fiscal year. The irrigation districts under this project use these occasions in order to obtain consent from their members. This institutional approach also helps to the reduce transaction costs of obtaining consent from each farmer.

Institutional arrangements

117. Some institutional arrangements are essential for successful collective action. The literature review and the case studies find that locally devised management rules, sound governance arrangements, and monitoring and sanctions are key factors for successful collective action.

Locally devised management rules

118. Allowing groups to develop their own solutions and implementation rules is important for successful collective action because the "one-size-fits-all" approach may fail to engage farmers in collective action (Ostrom 1990; Mills et al., 2010). For example, Ayer (1997) argues that farmer-led organisations could better incorporate incentives into rules that encourage necessary maintenance for managing resources. By contrast, top-down rules may fail because they are unable to take local situations into consideration. Wade (1988) argues that central governments need to be tolerant towards locally-based authorities and give them sufficient power to adjust rules to local conditions. Bland and Plateau (1996) state that any rule set at a high level should be properly explained to community groups and that there should be scope for adaptation. Tailor-made locally devised management rules are important.

119. In the Group Environmental Farm Planning in Saskatchewan (CAN1), tailor-made action plans are developed by each group to address agri-environmental issues identified within a geographic area, such as a watershed, with support from various actors like programme facilitators and non-profit organisations. The number of beneficial management practices eligible for shared-cost funding in Saskatchewan is more than 70 and producers can select the best practices for them. This flexibility contributes to the programme's success. In the Dommel Valley case (BEL1), tailor-made solutions for installing buffer strips are provided to farmers through personal (informal) contacts. Farmers have different attitudes towards buffer strips and how to manage them: some prefer them to look "natural", whereas others like to keep their buffer strips short and neat. It is difficult to know in advance how much effort it will take to convince a farmer or how he would like to manage his buffer strips. Therefore, it is important to visit the farmer personally and talk about the situation and his preferences, and then to work out a tailor-made solution. The local organisation (the Watering) knows the local situation and the local people, and the people know the project managers of the Watering. This provides opportunities for informal contacts.

120. In addition to adapting rules to local conditions, local people should be able to modify them so that there is a better fit to the specific characteristics of local settings, and thereby making them easier to enforce by the local population (Ostrom, 1990). In the Vittel case (FRA1), farmers participated in designing the "rules of the game" for water management. Vittel and the multidisciplinary research team progressively elaborated technical and economically feasible solutions compatible with farmers' strategies in co-operation with the farmers (Depress et al., 2008). This process allowed farmers to discuss clauses of their contracts with Vittel and thus increase their acceptance of agreements (Gaffs, 1999; INRA, 1997, 2006). This approach, moreover, can generate "procedural utility": farmers obtain utility not only from actual outcomes, but also from the conditions that led to these outcomes (Benz et al., 2004).

121. Rules for managing resources and organise collective action need to be simple and easily followed by participants. Wade (1988), and Bland and Plateau (1996) argue that simple rules are easier to remember and enforce. This is particularly needed for collective action that involves multiple players. Complicated rules are usually difficult to understand, which increases the number of (intentional and unintentional) rule breakers, which could lead to mistrust among members. In the case of the Custody of the Territory in Tuscany (ITA1), simple rules for cleaning rivers, riverbeds, rivers banks and canals are made between a local government and farmers. Farmers are paid by the local government if they perform maintenance work like removing trees, woods and debris from riverbeds and dikes to avoid overflowing, together with the management of riparian vegetation. The management of this collective action is based on

a daily relationship between the co-ordinator of the project, the technicians and the farmers. This strong collaboration has favoured the development of trust and willingness to co-operate, which has allowed the use of a very simple agreement without excessive regulation or bureaucratic red tape.

122. Rules also need to be fair and consensual although collective action may bring unequal benefits to each member. In the case of co-operation in drinking water protection in the German Federal State of Lower Saxony (DEU2), farmers and water suppliers form co-operatives to maintain and improve drinking water quality and reduce diffuse pollution of groundwater. Farmers have equal rights in the co-operatives and establish fair and consensual rules to protect the respective designated area, appropriate measures of water protection, and to monitor and evaluate farming, nutrient management, and water quality.

Sound governance arrangements

123. Sound governance arrangements of collective action are important, especially when the group is large (Figure 2.1 and Table 2.6). The need to establish independent organisations for collective action is greater when the group becomes too large to manage diverse members. Some of these organisations have legal status, which may help them to establish efficient formal rules and good governance, and to receive funds[11]. For instance, Mulgrave Landcare and Catchment and Holbrook Landcare are established as incorporated not-for-profit associations under government legislation (AUS1 and 2). Both have active, innovative boards composed of a mix of farmers and other specialists with many years of board and land management experience. They hold monthly meetings and members pay a nominal subscription. This governance framework is necessary to manage an annual budget. In both the Spanish case studies (Communities of Irrigators (*comunidad de regantes*, ESP1) and Animal Health Associations (*Agrupaciones de Defensa Sanitaria Ganadera*, ESP2), the organisations concerned have legal status and strong governance mechanisms.

124. However, whether formal legal status is necessary or not to receive funds depends on the policies of the country concerned[12]. For instance, the Beaver Hills Initiative (BHI) (CAN2) does not have any legal status, but its effective organisational structure, composed of the BHI board and eight working groups, allows it to manage diverse participants that include different levels of governments, NGOs and private industries and receive funds from governments and non-governments.

Monitoring and sanctions

125. In order to prevent free riding and rule-breaking, it is important to monitor collective action. Baland and Platteau (1996) argue that groups should be granted secure rights over local-level resources and clear responsibilities that include monitoring so as to make collective action more successful. Although monitoring can be done by a central authority, according to Baland and Platteau (1996) self-monitoring organised by the users themselves is likely to be significantly less costly than a centralised system. Ostrom (1990) found that in the successful management of CPRs by collective action, monitoring is undertaken not by external agencies but by the participants themselves. Pennington and Rydin (2000) also argue that local issues are easier to monitor than global issues because the organisers have much smaller groups, such that any free-riding behaviour can be more easily monitored. In order to prevent farmers from free-riding regarding irrigation water access, the North Otago Irrigation Company (NZL3) audits one-third of farmers every year and undertakes weekly unscheduled compliance checks on the requirements regarding water

11. Some government programmes require groups to be either a legal entity or sponsored by a legal entity enabling them to take contractual responsibility for managing grants.

12. Some collective actions (e.g. Farmers in mountain pastures in the Aosta Valley (ITA3), Aorere Catchment Group (NZL1)) do not have independent organisations, thus they have no legal status.

usage. This strong monitoring system helps large-scale collective action to work. If monitoring activities necessitate the use of costly technologies and equipment, it is probably better for government to provide financial and technical support for decentralised monitoring (Baland and Platteau, 1996). However, if it is necessary to monitor broad areas that go beyond the limits of the group (e.g. non-point pollution), both monitoring by groups themselves and by government may be necessary.

126. Once collective action emerges, some degree of coercion is likely to be needed to sustain it. Coercion is usually required to provide public goods or internalise externalities, especially for large groups, because voluntary participation by individuals may not be sufficient for collective action to achieve the optimal level of provision (Dixit and Olson, 2000). Wade (1988) explains why measures should be taken in cases of rule-breaking. More specifically, Ostrom (1990) raises the importance of graduated sanctions depending on the seriousness and context of the offence. People can learn how to co-operate even if they make mistakes. Although someone who commits a significant violation of the rules should be excluded, severe sanctions for a first offence may damage trust and co-operation rather than promoting them. To make sanctions effective, easy detection of rule-breakers is also important (Wade, 1988). Some of the case studies incorporate sanctions into the collective action mechanism. For example, to enhance compliance with the environmental agreements between farmers and the North Otago Irrigation Company, the Company stops supplying water to farmers if they do not satisfy requirements (NZL3). In the case of Landcare Associations in Germany, funding for landcare measures is often provided through from within Pillar II of the European Union's Common Agricultural Policy, which requires monitoring as well as sanctions in the case of non-compliance. This clear legal requirement and technical assistance from Landcare Associations in addition to advice on implementation, planning and monitoring can lower the risk of non-compliance by farmers (DEU1).

External environment

127. External forces and authorities also affect group activities. Some collective action may arise spontaneously, or it may need government intervention (Ayer, 1997). If collective action does not naturally develop, external support may be necessary if benefits outweigh costs stemming from collective action. Indeed, the literature review and the case studies reveal the importance of external support, both financial and non-financial support. Intermediaries or co-ordinators also play important roles to connect people, contribute knowledge and focus activities. It is also important to have good co-operation between local and central governments.

Financial support from governments and non-government entities

128. The importance of financial support from external authorities is mentioned in several studies. Ecker et al. (2011) identified lack of funds as the most significant barrier to changing soil and land practices in Australian agriculture. Hodge and McNally (2000) also found it to be important in the context of collective action for restoring wetlands in Wales. Financial assistance seems particularly important at the beginning of a collective project because of the higher initial transaction costs (Mills et al., 2010). Pollard et al. (1998) analysed ten partnerships for tackling non-point pollution in Scotland, finding that partnerships need pump-priming resources, either in the form of staff time or financial support.

129. External financial support comes from both governments and non-government entities. Among the 25 OECD case studies, 21 cases involved some financial support from governments. Financial support from governments is discussed in Section 4.

130. Non-governmental bodies also provide financial support. For example, water companies (BEL2; FRA1; and GBR1) pay farmers to change farming practices to improve water quality. In these cases, beneficiaries of ecosystem services (water quality) pay the providers of these services. These are examples

of Payments for Ecosystem Services (PES).[13] NGOs also provide financial support in some cases. In the Aorere Catchment Project (NZL1), non-governmental stakeholders such as NZ Landcare Trust and Dairy NZ provide finance to support farmers' activities in addition to governmental financial support. The Sustainable Farming Fund in New Zealand (SFF) requires a minimum of 20% non-governmental contribution (MPI, 2012). Most SFF projects leverage a significant amount of cash and in-kind support from the applicant group.

Non-financial support from governments and non-government entities

131. Non-financial support is important for collective action. For example, advice from local authorities can help identify potential participants that are appropriate to local circumstances (Hodge and McNally, 2000; Mills et al., 2010). Research and development, technology and innovation can empower farmers and promote collective action. Sanctions are a non-financial means by which governments can reinforce collective action as well (Ayer, 1997). It is important to note that sanctions imposed by the groups themselves may work better those imposed by governments.

132. Non-financial support comes from both governments and non-government entities. Farmers do not always have enough scientific knowledge about resource management. If they lack specific expertise, external experts like government officials, academics and researchers can provide them with technical assistance. For example, in the East Coast Forestry Programme (NZL2), governments take proactive approaches and provide free technical assistance to help landowners tackle soil erosion problems. The New Zealand Ministry for Primary Industries and the local government of Gisborne District Council approach landowners together and develop plans to treat erosion. Non-financial support from governments is discussed in Section4.

133. Non-governmental bodies also provide non-financial support. For example, in the case of co-operation in drinking water protection (DEU2), to help farmers and water suppliers work on water quality improvement, specialised technical advisers from consultancies or the Chamber of Agriculture approach individual farmers or groups of farmers to improve their knowledge and understanding of the environmental problems of farming, and to promote water protection measures. They organise the conceptual process, perform monitoring and evaluation, and moderate meetings and discussions.

Intermediaries and co-ordinators

134. Collective action can develop from farmer-led bottom-up initiatives, or by government-led top-down initiatives, or sometimes by a combination of bottom-up and top-down approaches, i.e. under the government-led top-down approaches (e.g. government programmes for promoting collective action), farmers voluntarily develop collective action. In all cases, intermediaries and co-ordinators (e.g. NGOs, government programme staff, research centres) often play important roles. They can contribute information about issues and policy measures, put participants in contact with each other, and provide in-kind contributions like staff and funding. Ecker et al. (2011) found that landcare and production groups are the most influential source of support when Australian farmers change soil and land management practices. Mills et al. (2010) claim that support from local facilitators to assist in the group development process is important for successful collective action.

13. Payments for Ecosystem Services (PES) are "agreements whereby a user or beneficiary of an ecosystem service provides payments to individuals or communities whose management decisions influence the provision of ecosystem services" (OECD, 2010). They are agreements between at least "one" seller and "one" buyer of ecosystem services. Therefore, collective action is not a prerequisite of PES.

135. Many of the case studies have identified the importance of intermediaries and co-ordinators. Mulgrave Landcare and Catchment (AUS1) is strongly facilitated by an experienced, committed and well-qualified co-ordinator who has a strong educational background as well as considerable practical skills. The collective action on drinking water protection (DEU2) also relies on the presence of a person who acts as a specialised technical adviser, a permanent local contact person, and co-ordinator of the various activities. As a co-ordinator plays an important role in the German landcare programme, the national umbrella organisation, the German Association for Landcare tries to create an attractive employment opportunity for management (100% employment, qualified person). This co-ordinator is a central person for networking, not only towards land managers and other concerned stakeholders, but also towards administrations.

136. In addition to individuals, organisations can take on the role of intermediaries and co-ordinators. For example, the community garden in Campania (ITA2) is organised by a local NGO, which motivates gardeners, promotes the project, actively advocates the community garden, facilitates communication among members, serves as mediator in conflicts or negotiations, shares expertise, resources and experience, and improves the gardeners' environmental education. The NGO also spreads the experience beyond local boundaries by using a national NGO network. Wetland restoration in the Eider valley in Germany (DEU3) is overseen by the Water and Land Association (Wasser und Boden Verband), which acts as an organiser and intermediary of the co-operation. It undertakes negotiations with landowners and farmers, purchases land parcels, offers long-term land management and extensification contracts with farmers to allow them to establish large parcels of land for collective grazing. Without this organiser and intermediary, the collective action would not operate properly.

Co-operation between local and central governments

137. Co-operation between local and central governments is important. Collective action usually deals with local issues, and local governments have better local knowledge. On the other hand, central government can provide more resources. Where geographical area targeted by the collective action extends beyond the township/county boundaries, central government needs to provide support. Therefore, both support from local governments regarding detailed local issues and support from central governments that requires larger resources are necessary.

138. In many of the OECD cases, both local and central governments provide support. For example, in the East Coast Forestry Project (NZL2), collective action to reduce soil erosion in the Gisborne region by landowners is underpinned by the Ministry for Primary Industries in New Zealand (MPI) because the resources required, including financing, are beyond the capacity of the local government. However, the local government also supports the action by establishing rules targeting erosion and erosion-prone areas. The local government is responsible for the regional plan, which involves establishing tree cover using cost-effective treatment options. The MPI project helps landowners satisfy this requirement by providing grants. This case study shows how a good working relationship between the central and local governments has been important to the success of this collective action.

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3. COLLECTIVE ACTION AND BEHAVIOURAL ECONOMICS

139. When designing approaches to promote collective action, it is important to understand farmers' individual behaviour and also the dynamics of their group behaviour. Ostrom (1998) argues that reputation, trust and reciprocity affect the actions of an individual within a group. The social capital shared by the group – trust, reciprocity, norms and institutional arrangements – is important for understanding collective action to produce public goods and positive external effects (Rudd, 2000). This section reviews the collective behaviour of farmers in this context through the prism of behavioural economics and with reference to the OECD case studies.

3.1. Farmer behaviour and behavioural economics[14]

140. Behavioural economics combines the insights of psychology and economics, applying relevant theories and evidence from these disciplines in order to understand and predict human decision-making (OECD, 2012). Factors such as social norms, behavioural habits and patterns of cognition affect a farmer's participation in collective action, together with more traditional factors like financial incentives and deterrents. Although traditional market-based instruments, including taxes and subsidies, work well, they are sometimes unable to fully overcome other factors affecting behaviour.

141. Blandford (2010) underlines the narrowness of the behavioural assumptions underlying traditional economics, i.e. that people act rationally (as "*homo economicus*") when designing agricultural policies. *Homo economicus* has three main characteristics: constant discount rate for future consumption, being able to choose among uncertain payoffs to maximise the expected utility of the payoffs,[15] and the idea that utility is derived from the *absolute* level of returns. However, Gintis (2000) found that individuals systematically violate these assumptions. Individuals i) often have a higher discount rate to exchanges between the present and the near future, but a low discount rate for trade between the near and far future (hyperbolic discounting), ii) do not maximise the expected utility of the payoff, rather rely on a limited number of heuristic principles and predict values in a simpler way than traditional economics assume, and iii) compare values to *status quo*.

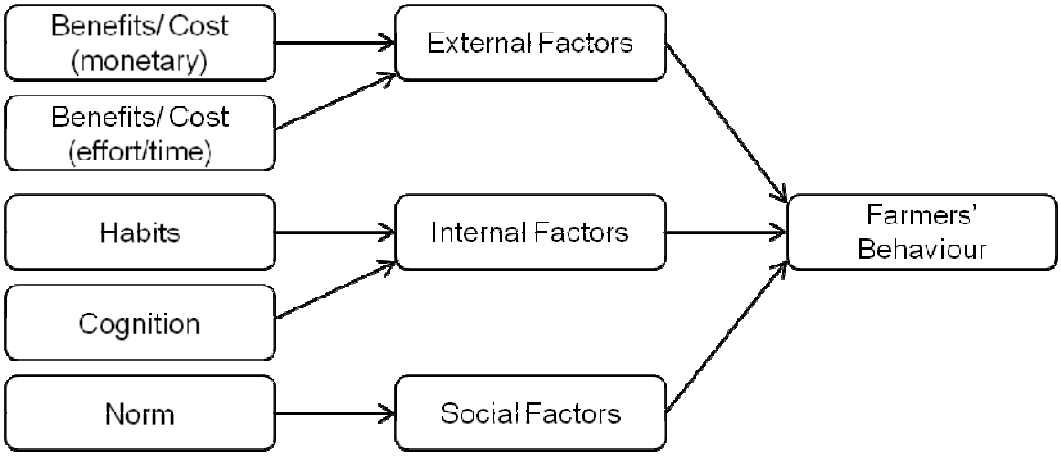
142. Ostrom (2010) argues that the assumption of "bounded rationality" provides a better basis for explaining collective action. She considers that rational choice theory, which assumes decision-makers maximise material payoffs, explains how individuals aim for optimal outcomes in markets, but fails to explain non-market behaviour like voting or contributing voluntarily to the provision of public goods. Behavioural economics allows us to modify —but not abandon— the key methodological principles of modern economics (OECD, 2012). Economic models can be enriched by supplementing traditional economic analysis with the results of research in psychology.

143. Recent OECD work on farmer behaviour (OECD, 2012) has analysed the factors affecting it. Using a framework developed by Prendergrast et al. (2008), it categorises various drivers for behavioural changes into three areas: external factors (financial and effort benefits/costs); internal factors (habits and cognitive processes); and social factors (societal norms and cultural attitudes) (Figure 3.1).

14. This section is based on *Farmer Behaviour, Agricultural Management and Climate Change* (OECD, 2012).

15. This expected utility principle can be derived from the assumption that people have consistent preferences over an appropriate set of uncertain payoffs (Gintis, 2000).

Figure 3.1. Factors affecting farmer behaviour



Source: Adapted from OECD (2012), which is based on Defra (2008) and Prendergrast et al. (2008).

External factors

144. Figure 3.1 shows external factors, such as financial incentives (reducing/increasing monetary benefits/cost), and regulations (reducing/increasing effort/time benefits/cost), influence farmers' behaviour. It reveals that these external factors, which traditional economics usually recognise, can only partially explain farmers' behaviour. Poe et al. (2001) found that only 78% of farmers would agree to adopt a comprehensive nutrient management plan if they were to be fully compensated for the costs of participation. It seems that financial incentives are only one factor determining participation in agri-environmental programmes.

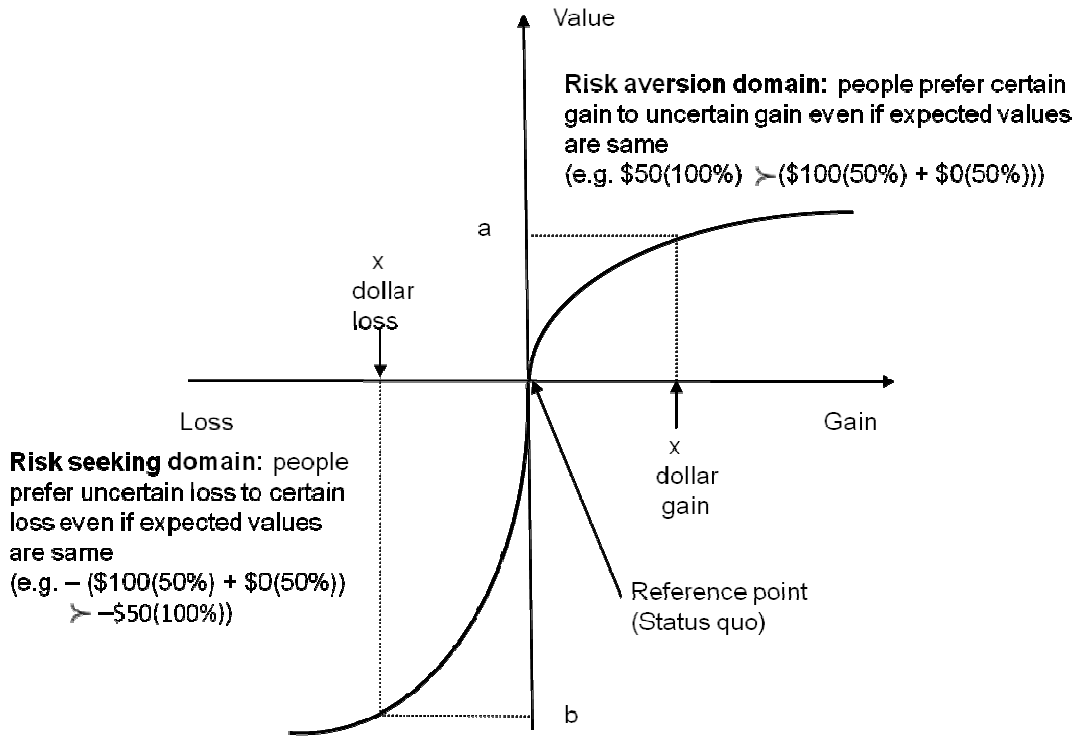
145. All the case studies involve some kind of monetary transaction for the provision of public goods or the reduction of negative externalities. In all but four cases (ITA2, BEL2, FRA1 and GBR1), governments provide agri-environmental payment to farmers who produce public goods or reduce negative externalities. In the case of BEL2 (Pidpa), FRA1 (Vittel) and GBR1 (South West Water), water companies pay farmers to improve water quality. As for the community garden in Campania (ITA2) operated a club good, a local NGO provides local citizens with opportunities for gardening and they pay fees for using services.

Internal factors

146. Internal factors such as habits and cognition also affect farmers' behaviour. A recent survey in Australia finds that environmental motivations are very important in protecting native vegetations and internal motivations first drive people's actions and then people seek external support (Ecker et al. 2012). Traditional market-based intervention relies on leverage from external economic factors to change behaviour, thereby assuming that human beings act rationally taking *only* these factors into account. Given the other determinants of their behaviour, as shown in Figure 3.1, this means that, their actions can often seem anomalous from the viewpoint of economic rationality. In fact, recent studies show that many farmers systematically deviate from economically rational behaviour. For example, people do not only evaluate utilities from their absolute income, but also from their income relative to others. Changes may be judged relative to a reference point (often the status quo). People prefer the status quo and much effort may be necessary to shift them from the current situation ("status quo bias"). Figure 3.2 illustrates another insight from "prospect theory" developed by Kahneman and Tversky (1979) and Tversky and Kahneman (1992). It shows that the slope of the expected value curve switches from concave to convex at the

reference point (status quo), which means that individuals are risk averse for gain and risk seeking for losses, and that the expected value (b) of a loss of X dollars (in absolute terms) is significantly higher than that (a) of a gain of the same amount.

Figure 3.2. Prospect theory



Source: Adapted from OECD (2012), which is modified from Kahneman and Tversky (1979).

147. Prospect theory helps explain farmer behaviour towards the environment. Farmers are at the reference point and moving from this point takes effort due to status quo bias. This is to be expected, as farmers have been farming for many years and are usually proud of their farming skills. Requests to change their farming methods must be accompanied by strong evidence and incentives. If they perceive the outcome of changing farming practices as uncertain (e.g. it could make them better or worse off in material terms, with gains and losses distributed symmetrically around the status quo position of doing nothing), they are more fearful of a possible loss than they are attracted by a potential gain (of equal amount and equal probability as the loss).

148. Cognition, awareness of emerging problems, is also very important. Environmental problems stemming from farm practices, such as soil erosion or water quality deterioration, also negatively affect farming in the long term. Farmers may be aware of the potential for these problems if they continue using current farming methods, and yet not all farmers act proactively to mitigate them, tending to wait until the damage becomes visible. However, once the damage is observed, it may have already produced significant negative effects for farmers. As the case studies show, collective actions develop when problems become severe and undeniable. For example, recent prolonged droughts causing severe damage for farmers were an important trigger for collective action in the North Otago Irrigation Company (NZL3). Although farmers had been struggling to access reliable water supplies for many years, concerns about the ability to fund large irrigation schemes had prevented them from going further. Following the 1999 drought, strong demand for reliable water finally encouraged farmers and other participants to take action co-operatively.

149. People are also biased by the availability of information ("availability heuristics"). People tend to place higher importance on the risks that are readily called to mind. The Pyhäjärvi Restoration Project (FIN1) found that there many people who for decades lived close to Lake Pyhäjärvi did not pay attention to eutrophication or restoration work – or news and information dealing with them – until they personally noticed unwanted symptoms, such as algae on the shore line owned by them. How information is provided plays a very important role for farmer behaviour.

150. People may not have a constant discount rate either. Although traditional economics assumes that individuals discount the future at a constant exponential rate, they often have hyperbolic discounting. People tend to apply a high discount rate for trade between the present and the near future, but a low discount rate for trade between the near and far future (Laibson, 1997; Gintis, 2000; Hepburn et al. 2010; OECD, 2012). A hyperbolic discounting explains that it is difficult to wait for a near future (because of a high discount rate), but it is possible to wait for a far future (because of a low discount rate). For example, individuals usually prefer to take USD 100 now rather than wait for a delayed reward of USD 110 tomorrow, but they tend to prefer USD 110 in 31 days to USD 100 in 30 days despite the fact that the delay is the same one day (Dowling and Chin-Fang, 2007). This time-inconsistency does not happen if we use a constant discount rate. A hyperbolic discounting is frequently used to explain myopic attitudes of human being and difficulty of self-control (e.g. procrastination and addiction). Because of a high discount rate for the near future, farmers may sometimes, tend to pursue a short-term gain (e.g. over-use of pesticides). However, once environmental problems emerge because of myopic attitudes, it takes time to overcome them. Indeed, collective action tends to be developed when agri-environmental problems become severe (Lubell et al., 2002). In order to overcome this tendency of pursuing a short-term gain, the importance of adopting a commitment device (e.g. declaration for adopting environmentally-friendly farming practices) is claimed (Hepburn et al. 2010; OECD, 2012).

151. New approaches are needed to deal with these internal factors. For example, education and advice targeted to raising environmental awareness and rewarding desirable behaviour can affect habits and cognition. Campaigning with a simple intuitive message and selecting policy options so as to take account of heuristics and bias are also important. Both external and internal factors are extensively reviewed in OECD (2012). In the next sub-section, "social factors" that are also important in terms of collective action are discussed.

3.2. Social capital, farmer behaviour and collective action

152. Social capital is a broad concept embracing many attitudes and characteristics related to social interaction, such as social norms, social networks, institutional arrangements and mutual trust. Strong social capital can lower the transaction costs of working together, facilitate harmonisation of interests among groups, and enhance the predictability of reactions among group members (Pretty, 2003; Davies et al., 2004). It follows that strong social capital among farmers makes it easier for them to act collectively. Approaches that recognise and seek to strengthen social capital can complement traditional public policy approaches using regulation, taxation, and pricing (World Bank, 2009). In this section, recent studies on social capital and farmer behaviour on collective action are reviewed and discussed in the context of the OECD case studies.

Social capital

153. The definition of social capital is generally considered as various aspects of social attributes and relationships that are conducive to achieving individual and/or collective goals (Davies et al., 2004). Ahn and Ostrom (2002) define it as "a set of values and relationships created by individuals in the past that can be drawn on in the present and future to facilitate overcoming social dilemmas." Social capital usually includes trust, reciprocity, obligations and expectations, values and attitudes, information and knowledge,

networks, formal groups, norms, culture, institutional arrangements and rules, and sanctions (Davies et al., 2004).

154. Many kinds of factors are included in this broad concept. According to Ahn and Ostrom (2002), there are three basic categories of social capital: trustworthiness, networks and institutional arrangements.[16] Mutual trust is essential for establishing social relationships. Networks, such as communities and neighbourhoods, encourage trust and stimulate social interaction. Individuals need to be linked together in social networks to generate social capital (Dowling and Chin-Fang, 2007). Institutionalised systems (e.g. local committees, schools, etc.) can further promote trust at an aggregate level. Enhanced levels of generalised social trust can increase returns to group action (Rudd, 2000). This section therefore first examines trust and its relationship with behaviour, and then reviews social networks and institutional arrangements.

Trust, reputation and reciprocity

155. Mutual trust can reduce transaction costs between people acting collectively by avoiding the need to monitor others, thereby saving money and time (Pretty, 2003). Baland and Platteau (1996) go further, stating that without mutual trust, individuals can potentially thwart or go against the group rather than co-operate with it. They argue that trust is relatively easy to establish in societies with long and well-established traditions of co-operation. However, they also note that trust can be created under the impulse of catalytic agents that often come from outside the community.

156. There are two ways in which a good reputation helps to establish co-operation. People are more respectful of mutual obligations when they care about maintaining their own social reputation. This deters them from free riding. Wade (1988) argues that the more people are concerned about their social reputation, the better the chance of successful collective action. At the same time, when the other members of the group have good social reputations, it is easier for an individual to make a commitment to the group and to accept any disciplines that group membership requires of him. A bad reputation deters co-operation. On the other hand, reciprocal trust between group members can lead to the development of a positive reputation (Ostrom, 1998; Rudd, 2000).

157. Reciprocity is a set of norms that induces individuals to undertake positive actions if they expect others to do the same; hence, reciprocity facilitates collective action (Ostrom, 1998).[17] If an individual lets the others down, others tend to do the same. But if people reciprocate, others are inclined to give in return. Individuals can understand the importance of other people's reaction to their own action. Thus, reciprocity increases trust and contributes to the establishment of long-term relationships (Pretty, 2003).

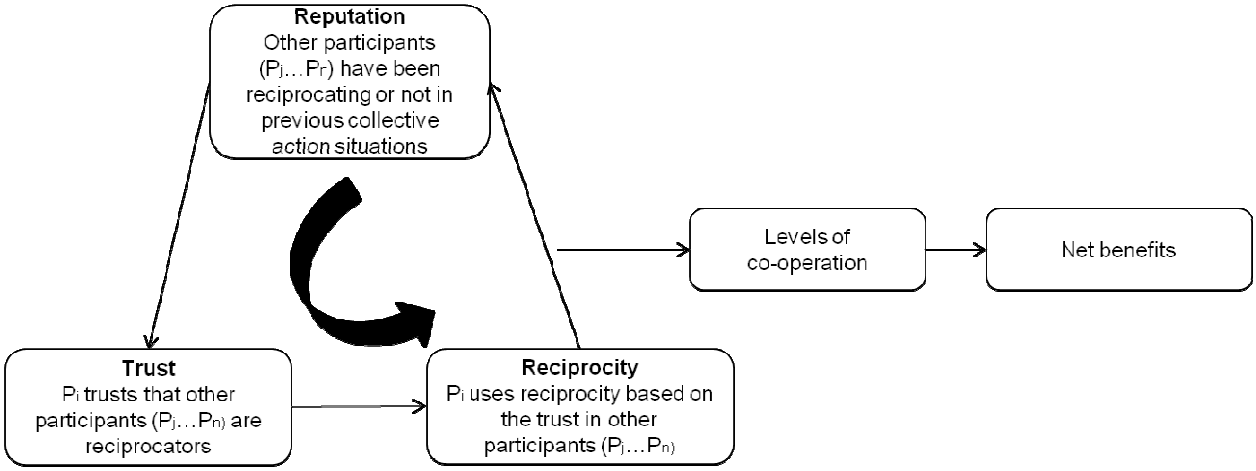
158. Ostrom (2007) synthesises the relationships between reputation, trust, reciprocity and co-operation as shown in Figure 3.3. In a group, a participant (P_i) decides whether to trust others or not based on the reputations of other participants' ($P_j \ldots P_n$) reciprocity in past collective action situations. The

16. There are other ways of categorising social capital. For example, some studies maintain that there are three basic types of relationship involved in social capital: bonding, bridging and liking (OECD, 2001; Pretty, 2003). Bonding refers to relations among members of families and ethnic groups and it creates homogeneous groups. Bridging refers to relations with distant friends, associates and colleagues and it creates connections with others who have different views. Linking refers to relations between different social strata in a hierarchy where power, social status and wealth are accessed by different groups, and it leads to engagement with external agencies. All types of social capital are needed to avoid social fragmentation (OECD, 2001, Furuzawa and Kiminami, 2009).

17. Axelrod (1984) used computer simulations to analyse co-operation and found that reciprocity can develop if individuals meet regularly and take future situations into consideration.

investment others make in trustworthy reputations leads P_i to trust them. Once P_i trusts others, it increases the probability that P_i will also reciprocate as a member of the group. This applies to other participants ($P_j \ldots P_n$) as well. Everyone in the group can then trust one another and reciprocate. This repeated cycle of reputation, trust and reciprocity leads to a higher level of co-operation and increases the net benefits of collective action. These three factors positively reinforce one another, and repetition of similar situations is a key facilitator of co-operation (Ahn and Ostrom, 2002).

Figure 3.3. Core relationship between trust, reputation, reciprocity and collective action



Source: Adapted from Ostrom (2007).

159. Many of the case studies have identified trust as a major factor for successful collective action. In the case of the strategic installation of buffer strips in the Dommel Valley (BEL1), the Dommel Valley Watering tried to be neutral and establish trust with farmers, local nature organisations, and other participants. This is because in Flanders there was a history of distrust between the agricultural sector and the nature conservation sector. When making contact with farmers, the Watering tried to think with them, on the same level, and used their jargon. It also tried to create goodwill towards the project with local nature organisations by asking their advice regarding grass mixtures to sow on the strips, which land they found valuable for creating buffer trips, and locations where the buffer strips could be connected to existing nature areas. Through its activities, it created greater mutual understanding by farmers of the relationships between nature and agriculture, and created a better local atmosphere. The Landcare association in Germany (DEU1) also identified trust as very important since various people and various representatives from different participating groups were involved in the action. To establish trust, respecting different interests and local knowledge and taking voluntary approaches are necessary; Landcare Associations facilitate ways to implement landscape conservation measures, which are pragmatic and acceptable to all relevant actors.

Networks and institutional arrangements

160. Networks and institutional arrangements are external aspects of social capital. They encourage trust and stimulate social interaction (Dowling and Chin-Fang, 2007).

Networks

161. Society, and the connections and networks derived therefrom, affect farmers' behaviour and their level of co-operation. A social network can be described as a set of relationships characterised by

familiarity with the others involved through past dealings and repeated interactions with them. If people are part of a social network that is composed of potential future partners of a transaction, they are more likely to reciprocate when trusted (Ahn and Ostrom, 2002). Thus, networks can increase the level of trust and co-operation.

162. The water company, Pidpa, has tried to build structured local networks through personal contacts (BEL2). In all their catchment areas, Pidpa has developed a local forum not only with farmers, but also with other actors such as volunteers from nature organisations and local sector organisations including famers organisations, hunting associations, and local governments. These local forums meet regularly and monitor farmers' activities. In the case of the Custody of the Territory in Tuscany (ITA1), an on-line information system based on *Google Maps* was created to expand monitoring activities to local inhabitants of periodical on-site controls of torrents and streams. This initiative can build social networks that enhance the formal and informal exchanges amongst local institutions, advisors and farmers. These initiatives emphasise the role played by network structuring and regular interaction in establishing a network.

163. Neighbours are also linked by social networks. Several studies have noted that participation by neighbours affects farmers' voluntary actions (e.g. White and Runge, 1994; Damianos and Giannakopoulos, 2002). If many neighbours are participating in a collective action, others tend to join. If information about others is not available, however, one tends not to co-operate (World Bank, 2009). This suggests that networks are stronger when members can identify with each other's situation and objectives, which is most likely when they are neighbours. In addition to information on whether neighbours participate or not, information on whether one's choice is below or above the standard is important. Already participating neighbours can be this standard. Individuals make their decision by referring to a benchmark, and not only on an absolute value ("status quo bias"). The German Landcare association (DEU1) identifies that even a farmer who is sceptical about landcare activities may be convinced if farmers are represented in the steering committee or he/she is confronted with positive examples in the area. In the case of buffer strip installation in the Dommel Valley (BEL1), the Dommel Valley Watering strives to convince key farmers who are then referred to as a reference or example for other farmers to follow. It is important to choose reference farmers to whom other farmers can relate, whom they can admire, and with whom they have no difficulties. This helps to expand collective action.

164. Fairness and justice are also conducive to co-operation. Traditional economics assumes that individuals choose options whose private benefits outweigh private costs. But this may not be true in collective actions if the gains are very unequally distributed among members. Moreover, even if benefits outweigh costs for each individual, some potential participants may reject transactions if some members have much higher net gains than others. People tend to expect and demand a certain degree of fairness. Sanctions against those who do not co-operate can be useful for increasing the perceived fairness of a collective action (Alvi, 1998). A democratic approach to designing the rules can also increase perceived fairness and justice. For example, in their collective action, Vittel and a multidisciplinary research team of researchers progressively elaborated technical and economically feasible solutions compatible with farmers' strategies (Déprés et al., 2008). Farmers could participate in designing the "rules of the game," which is likely to generate "procedural utility": farmers obtained utility not only from actual outcomes, but also from the conditions that led to these outcomes (Benz et al., 2004).

165. Policies can be designed so as to target social networks. The Japanese project for conserving and improving land, water, and the environment (JPN3) pays existing local action groups to preserve irrigation and drainage facilities at the distribution level. In this social network, farmers, farmer organisations, NGOs, local citizens, local organisations (e.g. neighbourhood council, schools), etc., participate. The project tries to target social networks, rather than just farmers or farmers' organisations, to preserve drainage and irrigation canals within the existing systems.

Institutional arrangements

166. Individuals have invested much time and effort in establishing various institutional arrangements to make collective action work. Common rules can ensure that group interests are complementary to those of individuals and give them the confidence to invest in the collective good (Pretty, 2003). In some cases, rules are formalised or even put in statutory form, in other cases they are tacit. Tacit rules are sometimes forged over a long history of human activity. Social norms and cultures can be considered as a set of tacit rules. According to Baland and Platteau (1996), under well established norms people tend to:

- adopt the other's viewpoint;
- be confident that others will follow the same code of good behaviour;
- rely on this code deal with conflicts of interests or other kinds of friction;
- feel guilty after they deviate from the moral rule; and
- feel vengeful and willing to punish detectable free-riders.

167. Thus, institutional arrangements (i.e. agreed, "institutionalised" rules and procedures) are an important form of social capital. They may prevent individuals from letting others down, or cheating, and can help them to act reciprocally (Ahn and Ostrom, 2002). Therefore, they should be taken into consideration when policy measures are designed. For instance, in order to reduce the drainage flow from agriculture into Lake Biwa, the Japanese policy for recycling water drained from agriculture (JPN2) used existing organisations and adopted their established rules to form collective action. It further encourages several irrigation districts to re-use the water drained from paddy fields by paying subsidies. The main question concerning this collective action was how each irrigation district could obtain consent from its member farmers without increasing transaction costs. This was overcome via the obligatory annual meetings held by irrigation districts. This institutional approach helped farmers to express their concerns through a formal process within their irrigation district and to make consensual agreements about collective action.

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4. POLICY MEASURES FOR COLLECTIVE ACTION

168. Collective action involving diverse participants can achieve various agri-environmental objectives. It can be useful not only in managing common pool resources, but also in providing public goods and club goods and reducing negative externalities. However, several barriers to promoting collective action have been noted, in particular the free rider problem, transaction costs, sceptical behaviour towards collective action and an uncertain policy environment. There are various steps that groups can take in order to overcome these difficulties themselves. For example, they can create their own local rules to prevent free riding and reduce transaction costs. However, they may need government support to cope with some challenges. External help from public agencies or other interested bodies is important when barriers are high but the benefits stemming from collective action outweigh the costs.

169. This section examines government support for collective action. First, collective action with and without government support is analysed. Second, collective action and policy measures are examined, and third, the cost-effectiveness of collective action is discussed. Lastly, policy implications are drawn.

4.1. Collective action with and without government support

170. When considering the policy aspects of collective action, as done by Davies et al. (2004), two types of collective action are distinguished: co-operation (bottom-up, farmer-to-farmer collective action) and co-ordination (top-down, often agency-led collective action). This typology is more useful than others because some collective actions do not need government intervention[18] (private-private partnerships), while others need some support and it is important to understand under what conditions government should provide support.

171. In the case of successful co-operation, private partners including farmers manage to reach agreement by themselves. This happens because the action achieves a Pareto improvement – that is, participants gain compared to the status quo without making anyone worse off. Sometimes, in order to secure a Pareto improvement for all, compensation is paid by those who benefit from changes to those who suffer from changes. If anyone is still likely to be worse off because of the changes, we assume he will not be party to the voluntary agreement. If a viable group can be formed and the objectives achieved in this way, government intervention is not needed.

172. It is more likely that participants cannot reach agreement by themselves. For example, it often happens that they agree on the ends, but not on the means of achieving those ends. Or even if ends and measures are agreed, the cost may be distributed over them unequally. Thus, an external authority, e.g. government, may be needed to help them to find solutions. However, government intervention does not always occur in a top-down way. For example, if farmers cannot agree on action due to difficulties like lack of knowledge or technical expertise, governments can provide these missing elements. In this case, government's role is more facilitation of collective action, rather than coercion of it. On the other hand, if providing information, mediation or compensation does not work, governments may need to force farmers to undertake collective action or strongly promote it, which is a case of top-down collective action.

18. OECD (2005) found that some public goods associated with agriculture *can* be provided by non-governmental approaches including co-operative activities among participants.

173. In reality, collective action can be bottom-up in its initial inspiration and in its implementation and operation, but it can benefit from some government involvement (e.g. financial assistance). In some cases, collective action can be launched in a top-down way by government, but participants start to take more initiatives and lead activities. In addition, whether governments should take top-down approaches or promote bottom-up approaches depends on each situation, and to understand which approach is suitable for which case, it requires a more formal and comparative research approach in the future. Nevertheless, the study identified that among 25 OECD case studies most cases are bottom-up collective actions with non-coercive support (encouragement or facilitation) from governments.

Local government or central government?

174. When analysing the policy aspects of collective action, both support from central and local governments should be considered. On the one hand, most collective action takes place locally and local governments generally have better knowledge of local issues. They can provide expertise and technical assistance that is adapted to each local situation. Moreover, if the public goods provided are of local benefit, funding by local government is most appropriate (OECD, 2006; 2008).

175. On the other hand, it may be necessary for central government to promote collective action through national programmes. Central government can provide more resources. Central government involvement is particularly relevant where the geographical boundaries within which the collective action targets its objectives go well beyond the boundaries of local jurisdictions, covering broad areas and implying large resource requirements.

176. Therefore, support from both levels of government is a priori possible and relevant for collective action. Each situation should be assessed on its own merits to determine the appropriate supporting government agency.

Government involvement in OECD cases

177. Table 4.1 distinguishes four typical cases of collective action based on these two points. Pure bottom-up collective actions do not involve any government intervention and consist of private-private partnerships (Case 1). Most collective action, however, involves government intervention to some extent. Nonetheless, even when governments intervene, most collective action is bottom-up in nature. However, at the opposite end of the spectrum from private-private agreements we find the case of top-down, coercive collective action where governments force or strongly stimulate farmers to act together. Collective action with government support can be further divided into three cases depending on the level of government from which the support comes: support from local government (Case 2); support from central government (Case 3); and support from both central and local governments (Case 4).

Table 4.1. Four typical cases of collective action according to government support

Bottom-up collective action[1] (Co-operation) ⟷ **Top-down collective action** (Co-ordination)	
Case 1: Collective action without government involvement	**Case 2:** Collective action with support[2] from local government
	Case 3: Collective action with support from central government
	Case 4: Collective action with support from both central governments and local governments

1. In some cases, bottom-up collective action receives government support.
2. Government support varies from facilitation or encouragement (e.g. technical assistance or financial assistance, including agri-environmental payments) to more coercive measures (e.g. regulations), and these forms of support are sometimes combined. See Table 4.3.

Source: OECD Secretariat, based on Davies et al. (2004).

Table 4.2. Government involvement in case studies

Case 1: Collective action without government involvement	• Community garden in Campania (ITA2) • Water quality protection by a mineral water bottler and farmers (FRA1)[2]
Case 2: Collective action with support from local government	• Policy for Preserving Biodiversity Associated with Agriculture, Shiga Prefecture (JPN1) • Policy to Recycle Drained Water from Agriculture in Shiga Prefecture (JPN2) • North Otago Irrigation Company (NZL3)
Case 3: Collective action with support from central government[1]	• Water quality management by a water provider and farmers (BEL2)[3] • "Upstream thinking" in the Southwest of England (GBR1)[4] • Söne Mad Grazing (SWE1)[5] • Sustainable Farming Fund (NZL1)[6]
Case 4: Collective action with support from both central and local governments	• Landcare Programme (Mulgrave Landcare and Catchment Group Inc) (AUS1) • Landcare Programme (Holbrook Landcare Network) (AUS2) • Strategic installation of buffer strips in the Dommel Valley (BEL1) • Group Environmental Farm Planning in Saskatchewan (CAN1) • Beaver Hills Initiative (CAN2) • Landcare association (DEU1) • Co-operation in drinking water protection (DEU2) • Wetland restoration in the Eider valley (DEU3) • Community water management (ESP1) • Common good practice against animal diseases (ESP2) • Pyhäjärvi Restoration Project (FIN1) • Custody of the territory in Tuscany (ITA1) • Mountain pastures in the Aosta Valley (ITA3) • Measures to Conserve and Improve Land, Water, and the Environment (JPN3) • Water, Land & Dijken Association (NLD1) • East Coast Forestry Project (NZL2)

1. EU policies are classified as support from central government. They facilitate farmers to undertake collective actions, but EU does not participate in collective actions directly.
2. There is indirect government involvement. For example, the Vittel area benefited from a land consolidation operation programme (OGAF), which facilitated the reorganisation of the lands within defined boundaries and helped farmers to change their practices to reduce non-point source pollution from intensive farming. But, there is no direct support for this collective action.
3. Although there are no policies that directly stimulate or help water providers to co-operate with farmers, representatives from the Flemish government participate in the local networks established by Pidpa (Provincial and Intermunicipal Water Company of the Province of Antwerp) and provide technical assistance.
4. The national government provides technical assistance through the government funded Environment Agency, but there is no direct financial support from government.
5. This case involves general agri-environmental subsidies, but they are not specifically for promoting collective action.
6. Some SFF projects receive support from local governments, but not all projects do.

178. Table 4.2 above shows the result of applying the typology set out in Table 4.1 to the 25 OECD case studies. It shows that, in most cases, collective action generally receives some support from governments. In fact, there are only two cases where no government support is received, namely the community garden in Campania (ITA2) and water quality protection by a mineral water bottler and farmers (FRA1). In ITA2, a local NGO co-ordinates a project called the "Eco-archaeological Park", where a degraded site was converted into a collaborative green space allowing local citizens to cultivate vegetables and produce environmental benefits (e.g. landscape, ecosystem services), as well as establish social relationships among its members. It is a case of a club good: the local NGO provides services (gardening opportunities) to members (local citizens) and members pay costs for the services. In FRA1, a group of farmers located in the Vittel's catchment area changed their practices to reduce non-point source pollution from intensive farming. A mineral water bottler designed an adapted and multidimensional incentive package to improve water quality co-operating with farmers. This is a private arrangement for improving water quality.[19] In general, however, we found government support often via collaboration of both local

19. There is indirect government involvement in the FRA1. For example, the Vittel area benefited from a land consolidation operation programme (OGAF), which facilitated the reorganisation of the lands within defined boundaries and helped farmers to change their practices to reduce non-point source pollution from intensive farming. But, the contracts between a mineral water bottler and farmers are private.

and central governments. Farmers often lack the funds for developing collective action and do not have scientific knowledge and technical information. Thus, government support plays an important role if benefits are more than costs associated with collective action.

4.2. Collective action and policy measures

179. Governments implement various policy measures for promoting collective action. They sometimes participate in collective action as a group member, providing technical assistance (e.g. data) or financial assistance. For example, in the case of Beaver Hills Initiative (CAN2), local government, provincial government and federal government all participate and provide both financial and non-financial support. In other cases examined, government provides support as a non-member of the group, facilitating and promoting collective action at local or national levels, for example, through funding programmes. For instance, the Sustainable Farming Fund (see NZL1) promotes grass-root activities led by farmers, growers and foresters through a funding programme that operates throughout New Zealand. Governments can either support a specific action, providing support tailored specifically to that action, or promote multiple collective actions through more general programmes. Whichever option is followed, as Polman et al. (2010) argue, governments can be effective in encouraging collective action.

180. Generally speaking, central governments provide support outside of groups, but local governments sometimes participate, co-operate with farmers and develop collective action. In both cases, government policies for collective action[20] vary from facilitation (e.g. technical assistance) or providing a financial stimulus such as an agri-environmental payment to more coercive measures like imposing regulations.[21] Collective action can be further classified according to the chosen policy measure (see Table 4.3). In reality, these policy measures (technical assistance, agri-environmental payment, etc.) are often implemented simultaneously. The typology in Table 4.3 is therefore highly simplified.

Table 4.3. Policy measures and collective action

	Bottom-up collective action (Co-operation) ← → **Top-down collective action** (Co-ordination)			
Method of participation by government:	Non-intervention	Facilitation	Financial stimulus	Coercion
Examples of policy measures	-	Technical assistance	Agri-environmental payments	Regulations
Cases	ITA2; FRA1	BEL2; GBR1	Others[1]	—[2]

1. In most cases government provides both technical assistance and agri-environmental payments. Among these cases, the degree of government involvement varies from facilitation or providing financial incentives to more prescriptive measures.
2. Although the 25 case studies do not include any cases of coercion by regulation, such cases do exist. For example, drought co-ordination committees in Japan require irrigation districts to reduce the use of water. In this case, farmer members of the irrigation districts have no choice but to act collectively (Shobayashi et al., 2011).

Source: OECD Secretariat based on OECD (1998) and Davies et al. (2004).

20. Policy measures (technical assistance, agri-environmental payments and regulations) can target both individual and collective actions to provide agri-environmental public goods and reduce negative externalities. Which type of action (individual or collective) government should target depends on each situation (some related points are discussed in the sub-section: *general agri-environmental payments and funding programmes for collective action*).

21. For example, regulations can force a group of farmers to adopt environmentally-friendly farming practices or to reduce polluting runoff. Also, regulations can establish background conditions or norms that facilitate collective action being formed and the collective actions adapt them to local circumstances.

181. Table 4.3 shows that in 23 of the 25 OECD case studies, government provides at least some support for collective action. In 21 of the case studies, financial support is provided. Thus, in most of the case studies technical assistance *and* financial support are used. This section discusses technical assistance and financial support.

Technical assistance

182. Technical assistance from government is important for collective action. Farmers do not always have enough scientific knowledge on how to manage resources. If they lack specific expertise, external experts, including those from government services and research departments, can provide farmers with technical assistance. Technical assistance can reduce transaction costs (search, bargaining, and monitoring and enforcement costs). Search costs can be reduced when local authorities provide appropriate information to help to identify potential group members from the locality (Hodge and McNally, 2000; Mills et al., 2010). Bargaining costs can be reduced by making a common template for contracts. Baland and Platteau (1996) argue that governments should provide a framework of basic rights, rules and objectives for collective action to serve as a guideline for managing common pool resources voluntarily[22]. Monitoring and enforcement costs can be also reduced by providing monitoring data and assistance with monitoring itself. In general, these types of technical assistance influence farmers' willingness to participate and the effectiveness of the action taken.

183. Although financial assistance for collective action is widely provided, there were two case studies that received technical assistance but no financial support from government, namely BEL2 and GBR1 (see Table 4.3). In all two cases, farmers work with a water company (Pidpa for BEL2 and South West Water for GBR1) and the company pays farmers to change their farming practices to ensure water quality. It is the compensation from the water company that makes collective action possible.

184. Even in these cases, some government help may be needed to bridge the gap between farmers, who lack water knowledge expertise and companies, which are unfamiliar with agricultural practices. For example, in GBR1, the national government provides technical assistance through the government-funded Environment Agency (EA). The EA provides the South West Water with data from its routine monitoring of water quality and other environmental parameters.

185. Government can also facilitate mutual understanding among members and provide policy information. For example, in BEL2, representatives from government at the Flemish level participate in the local networks established by Pidpa; they help to solve local conflicts and align Pidpa's policies with the policies and principles of government agencies. The Flemish Land Agency also helped to design Pidpa's user agreements with farmers.

186. The main measures used as technical assistance in the case studies include, but not exclusively:

- Data provision.
- Scientific and economic research support.
- On-farm information provision, and technical advice and assistance on planning and implementing farming practices.
- Guidelines for collective action.

22. Some OECD countries publish guidelines for collective action. For example, the Alberta Government (Canada) published a guide in 2001 for creating effective community partnerships for land and water stewardship (Alberta Agriculture, Food and Rural Development, 2001). This guide summarises some key points and steps to launch partnerships for farmers.

- Diffusion of information on best practices.
- Provision of conflict resolution services.
- Education, including that of farmers as well as local citizens and children.
- Outreach events for enhancing environmental awareness.

Financial support

General agri-environmental payments and funding programmes for collective action

187. Government financial support is given through either general agri-environmental policies or policy measures specifically for promoting collective action. In some cases, general agri-environmental policies may target outcomes without stipulating whether they are to be achieved by individual or collective activities. They can be used to foster collective action as long as it is not a specific requirement that the recipients must be individual farmers acting independently. Some OECD cases (e.g. the actions for buffer strips in the Dommel Valley (BEL1) and for biodiversity and cultural heritage in the Söne wetlands (SWE1)) draw on funding from the second pillar of the European Union's Common Agriculture Policy to finance their collective action. In these cases, farmers and other participants use general agri-environmental subsidies to provide agri-environmental public goods co-operatively beyond the boundaries of individual farms. However, general agri-environmental policies are more often taken up by individuals since, as long as they can access the payments as individuals, farmers are usually not motivated to form collective action groups in order to achieve the targeted objectives. .

188. Therefore, if it is better to tackle agri-environmental problems collectively (e.g. dealing with externalities that extend beyond the individual farm or dealing with threshold public goods associated with agriculture), policies that specifically target collective action are preferable. There are several such examples among the OECD case studies. Government programme for landcare associations (AUS1, 2 and DEU1) is delivered specifically to collective actions that deal with local environmental issues associated with agriculture. In Australia, about 40% of farmers are involved in Landcare and there are more than 6 000 Landcare groups across the country (Green, 2011). In Germany, the first Landcare Association (LCA) was founded in 1985 in Bavaria, and to date, around 155 regional LCAs generally at the district level have been founded in Germany, with more than 3 000 municipalities, 1 000 organisations and 20 000 farmer members. The Sustainable Farming Fund of New Zealand (SFF) is also earmarked for collective actions that deal with "communities of interests" involved in promoting goals like sustainable land management, novel production systems and human capability development (NZL1). As of 2010, the SFF had invested about NZD 100 million in 700 projects (MAF, 2010). The Japanese programme for conserving and improving land, water and the environment (JPN3) is also designed to achieve its aims specifically by promoting collective action between farmers, non-farmers, farming organisations, and non-profit organisations. In 2011, around 20 000 local action groups carried out activities under this programme, covering 1.4 million ha of farmland or 35% of total farmland in the agricultural promotion areas (MAFF, 2012).

189. In addition to these national programmes, local governments promote local collective action. An example is the "co-operation model" for drinking water protection in designated areas of the German Federal State of Lower Saxony (DEU2). The Government of Lower Saxony funds partnerships between groups of farmers and water suppliers to maintain or restore a high quality of drinking water. In 2009, co-operative initiatives were established in 370 watersheds supplying drinking water, on 303 778 hectares of utilised agricultural area (11.7% of total agricultural land in Lower Saxony). About 10 900 farmers have land within areas designated for drinking water protection, and there are on average about 65 farmers per designated area. The programme for preserving biodiversity in the Shiga Prefecture (JPN1) is also an

example of a directly funded local collective action programme. Currently, there are 32 groups covering a total of 117 ha. The average area per group is 4 ha, with approximately 13 farmers per group.

Financial support for initial costs and running costs

190. Initial costs include investment outlays and up-front transaction costs (especially search costs and bargaining costs). If initial costs are low, collective action may be launched without financial support from government. However, if the initial costs are high, collective action may not get started without financial support from external agencies including governments. Previous studies have noted the importance of financial assistance for collective action, particularly at the initial stage, because of the higher transaction costs compared with individual action (Mills et al., 2010).

191. In several of the OECD case studies, financial support was provided by government to cover the initial costs. For example, farmers who join the Group Environmental Farm Planning in Saskatchewan (CAN1) can access a stewardship programme for adopting beneficial management practices (BMPs). The group plans address issues identified within a geographical area, such as a watershed or an aquifer, to increase watershed awareness and give farmers opportunities to achieve their environmental goals within their watershed. The maximum funding available through the programme for each farm is CAD 50 000 over the five-year period of the current Canadian policy framework, called "Growing Forward" (2008-2013). The costs of this programme are shared three ways: producers pay a share ranging between 30-75% depending on the BMP, and the government payment is shared in the ratio 60:40 between the federal and provincial governments. The payment is intended to help farmers cover the initial costs of adopting BMPs. The Sustainable Farming Fund (SFF) in New Zealand (NZL1) also covers initial costs. It funds grass-root activities and helps innovation, research and other environmental projects by farmers, growers and foresters. The maximum investment available from the SFF to any one project is NZD 200 000 annually for three years. However, the SFF cannot fully fund projects, but requires a non-governmental contribution of at least 20%. The SFF only funds costs incurred by specific contracted project work and does not cover business-as-usual activities. Most SFF projects leverage a significant amount of cash and in-kind support from the applicant group.

192. Financial support for running costs can be justified where the costs related to the collective action outweigh the direct benefits to farmers, but not those to society as a whole. This can easily arise since agri-environmental public goods are rarely traded in markets, where farmers could receive remuneration for supplying them, and therefore farmers rarely have economic incentives to provide these goods voluntarily even when they are highly valued by local citizens and others further afield. Therefore, governments may need to provide support for running costs in these cases. Financial support can help overcome on-going transaction costs problems (Lubell et al., 2002). It has been observed that payments to farmers to produce public goods can encourage the emergence of "social entrepreneurs" who are willing and able to stimulate co-operative action in their local areas (Hodge and Reader, 2007). The question then arises as to how this contribution, which may be important for keeping the collective action alive, can be maintained. Since a co-ordinator or facilitator can play an important role in managing collective action, the continuity of the collective action may depend on secure funding for his salary. As an alternative to financial support for running costs, co-ordinators or facilitators may be provided as in-kind contributions by NGOs or local government staff (see, for example, the case studies CAN1and NZL1).

193. It is important for governments to pay attention to the continuity of collective action, whether or not they actually fund running costs over and above initial costs. For example, the group executive officer of Holbrook Landcare Network (AUS2) noted that government and industry grant funding based on a maximum of only three years, and the competitive application and assessment process that must be undergone to renew the support creates organisational uncertainty for the Network, particularly for the funding of base staff salaries and group overheads. When providing financial support, governments should

find a balance between ensuring that funding is conditional on performance and the continuity and stability of the group.

Financial support and characteristics of the agri-environmental public goods provided

194. The extent of government involvement also differs depending on the characteristics of the goods provided through collective action. The fundamental problem of various agri-environmental public goods is who bears the cost of the provision. In the case of club goods (e.g. NZL3, ESP2), club members share the costs of providing club goods. However, government support can supplement these club contributions when, for instance, initial investments costs are high (e.g. investment for building a new irrigation system (NZL3)) or club members not only produce club goods but also produce positive externalities associated with the club goods that can be enjoyed by non-club members (e.g. prevention of animal diseases (ESP2)).

195. In the case of pure public goods or common pool resources, by their definitions, they are non-excludable. Everyone can enjoy benefits from them at the same time. This non-excludability makes it difficult to exclude someone who enjoys benefits without paying costs, and causes a problem of a free rider or overexploitation of CPRs. Because of the difficulty of enforcing exclusion, asking beneficiaries of these services to cover the costs of the provision may be difficult. However, case studies on collective action provide some examples that demonstrate possibilities of asking beneficiaries of services to cover part of the cost of provision.

196. To analyse in which cases beneficiaries can cover the cost of provision or not, the distinction of values provided by public goods, i.e. use value or non-use value, would be useful. If there is use value, it suggests that there are users of these goods. Thus, if we can create some mechanisms to ask users to pay costs for the provision of goods, it might be possible to cover some cost not by governments, but by users. One type of examples identified in the case studies is about water quality management by water companies and farmers. Water quality is a public good. It is a non-excludable and non-rival good. However, sometimes, by creating a mechanism through agreements between water companies and farmers, water quality can be transacted. For example, water companies (beneficiaries of water quality) cover the cost of provision of better water quality supply by farmers in the case of BEL1, FRA1 and GBR1. They are the case of Beneficiary Pays Principle (OECD, 1996).[23] Of course, water companies are not the only beneficiaries of this service. But, they can represent all the members of the public that drink the water enjoying the benefits of better water quality[24]. Thus, if it is possible to create some mechanisms to ask users to pay for enjoying use value of public goods and CPRs, governments may not need to provide financial support as these three OECD cases.

23. The examples of the Beneficiary Pays Principle could also be seen as examples of Payments for Ecosystem Services (PES). PES are "agreements whereby a user or beneficiary of an ecosystem service provides payments to individuals or communities whose management decisions influence the provision of ecosystem services" (OECD, 2010a). They are agreements between at least "one" seller and "one" buyer of ecosystem services. Therefore, although collective action is not a pre-requisite of PES, PES often targets groups of sellers (or buyers).

24. Even if water companies pay for water quality (some part of it is transacted in a market), water quality has still characteristics of a public good: non-rival and non excludable good. Water companies cannot exclude others such as farmers, fishermen and local citizens from enjoying better water quality. Moreover, there is non-use value related with better water quality such as biodiversity enjoyed by the wider public. But still, water companies can cover *some* of the cost for the provision of this public good. Even in this case, to fully cover the cost of the provision of public goods and meet the social demand, in some cases, governments may need to provide financial support.

197. On the other hand, for non-use value of public goods, it is more difficult to ask beneficiaries to bear the burden of the costs for the provision of agri-environmental public goods. This is because beneficiaries of this type of public goods are wider communities and boundaries of beneficiaries are not clear. Even if we try to ask some of them to cover the cost of provision, it is difficult to decide to whom we should ask to do so. Thus, in some cases, governments may need to provide financial support by asking taxpayers to cover the cost of provision. However, it is important to note that even in these cases participants in collective action make in-kind contributions, including financial contributions to their group activities, because by forming collective action, it is possible to include some of beneficiaries (but not all) into conservation activities and ask them to contribute to the provision of agri-environmental public goods even if their values are non-use values. Involving wider communities and asking them to make in-kind and/or financial contribution can help the provision of public goods and also reduce the financial burden of governments.

198. This study also finds that collective action is useful for providing "threshold public goods" or "non-linear public goods." For the provision of this public good, a minimum amount of supply is required, and the public good is produced on a significant scale only beyond this threshold. Collective action can play an important role in ensuring that public good provision exceeds this threshold point.

199. However, appropriate government policies (e.g. regulation, payment, taxes and technical assistance) and approaches (targeting individual actions or collective actions) may differ depending on the characteristics of resource problems and provided agri-environmental public goods (e.g. biodiversity, water quality) and their values (use value and non-use value). This study just examined the role of collective action and it is not enough to elicit more implications. Thus, to further examine this point, it is necessary to compare various agri-environmental policies undertaken in OECD countries, not just about policy measures for collective action, and analyse their roles for each agri-environmental public goods. This point should be further investigated in future studies.

Strategic combination of financial and non-financial support

200. In some of the OECD case studies, governments provide both financial and non-financial support for collective action. For instance, in the case of mountain pastures in the Aosta Valley (ITA3), the regional government has passed many laws to ensure the appropriate management of grasslands, as well as funding collective management of pastures by farmers. Regional laws facilitate farmer access during the summer period to alpine pastures owned by other farmers. Thanks to both the local laws and financial incentives, farmers can move cattle between farms, manage pastures collectively, and maintain the traditional and extensive livestock system. In the case of the biodiversity preservation programme in the Shiga Prefecture (JPN1), the prefectural government makes agri-environmental payments to farmers and also provides numerous agricultural extension services for establishing community-based farms. It has also provided assistance to help each region to form groups by securing substantial human resources specifically to implement this policy.

201. Even where governments make financial support available for collective action, it may not effectively used. Indeed, Harris-Adams et al. (2012) identified the reasons of farmers' non seeking attitudes towards government funding in Australia. According to them, 23% of farmers did not apply for funding programme because they were unaware of its availability, 22% of farmers raised the complex application process as the reason of non-application and 13% of farmers did not apply for the programme because they found the application process too time-consuming. Enhancing awareness among farmers and supporting application process of farmers is important. Ecker et al. (2012) examined drivers of practice change in land management in Australian agriculture and found that farmers are tend to adopt management practices if support for natural resource management is provided by landcare or farmer production groups and other support providers including government extension offers. These results suggest that just

developing programme is not enough to deliver it effectively. Although governments are sometimes inclined to think that establishing new programme itself is a goal, to achieve real objectives, i.e. ensuring the provision of agri-environmental public goods, it is important to strategically deliver financial programmes with non-financial support including extension services together with existing social network (e.g. agricultural organisations, local communities).

4.3. Cost-effectiveness of collective action

202. Agri-environmental policy measures should be cost-effective: once an environmental goal is set, it should be achieved at least cost. Since collective action targets areas beyond the individual farm-level, cost-effectiveness needs to be examined at the targeted level (OECD, 2010b).

203. As many case studies show, providing agri-environmental public goods like landscape, biodiversity, or water quality may be impossible for a single farmer to achieve. The effectiveness of provision requires an appropriate scale of intervention. Hence, the actions of many farmers and other participants are needed to bring multiple, and preferably contiguous, farms into provision schemes, thereby allowing impacts to be achieved at the desired scale (OECD, 2012). Generally speaking, if environmental goals are defined at landscape-level or water-shed level, collective action by the actors involved may be a better way of achieving desired outcomes. For example, a targeted regional approach with fine-tuned management mosaics (grassland use patterns) is expected to provide better results compared with individual actions or a blanket general approach to bird protection (Oerlemans et al., 2007). In addition, collective action can reduce the cost of providing agri-environmental public goods because of economies of scale and scope. It can include various people who have different skills and who can pool their assets to provide public goods. However, it may not be "cost-effective" if the cost reduction due to these economies made possible by collective action is less than the additional transaction costs incurred by collective action.

204. In many cases there is no hard evidence of the cost-effectiveness of collective action versus unco-ordinated individual delivery of public goods. This is true of most agri-environmental policies and programmes. Although more research on the outcome of collective action and other policy approaches is necessary, some case studies have tried to examine the cost-effectiveness of their collective action. In the Vittel case (FRA1), cost-effectiveness was examined by comparing collective action with other approaches for improving water quality. Vittel considered and tried out several strategies for improving water quality issues simultaneously (Table 4.4). This approach allowed it to learn by doing, delay a final choice, and reinforce its ability to re-organise practices (Barbier and Chia, 2001; Déprés et al., 2008). After several trials, Vittel chose collective action, i.e. establishing contracts with a group of farmers working on fields surrounding the Vittel springs. Although it is difficult to provide accurate estimates of the overall costs and benefits of the contractual agreements, the arrangement was profitable for both parties (Déprés et al., 2008).

Table 4.4. Alternative options considered by Vittel to protect its water source

Option	Feasibility
1. Vittel does nothing	Too risky, might force Vittel to close down the business unit.
2. Vittel forces farmers to change their practices by taking legal action	Farmers' liability is unproved; risk of publicising Vittel's problem with counterproductive effects on its reputation.
3. Vittel relocates its activity by choosing new and non-contaminated springs	Loss of the Vittel label tied to its specific location and associated premium price.
4. Vittel buys all the land around the site ("quasi-integration")	Regulatory barriers and strong opposition if too much agricultural land is sold to non-farmers (45% of the catchment area acquired).
5. Vittel achieves a contractual arrangement with farmers	Remaining alternative but need to make interests of farmers coincide with those of Vittel.

205. Some of the case studies provide quantitative data showing the effectiveness of collective action. For instance, in the case animal health associations (ADSGs) in Spain (ESP2), livestock breeders have created ADSGs and aim to implement a common animal health programme on all their farms. As a result of ADSG activities, the prevalence of several animal diseases has decreased markedly over the last decade (e.g. the percentage of herds of sheep and goats affected by *brucella melitensis* decreased from 8% in 2002 to 1% in 2010 (EFSA, 2011)). In the case of the Aorere Catchment Project (NZL1), the collective action improved water quality dramatically. Whereas mussel farms operating near the Aorere River mouth could harvest during only 28% of the harvest days in 2002, after the three-year project of dairy farmers to improve water quality in the Aorere catchment, this percentage was up to 79% in 2009. These numbers indicate that collective action can effectively produce agri-environmental public goods and reduce negative externalities. In general, however, indicators of the effectiveness of collective action on a stronger scientific base are necessary. Furthermore, it is very important to bear in mind that, although effectiveness of an action in achieving an objective, is a necessary condition for cost-effectiveness, it is only the first step. A cost-effective policy is the one that achieves the target *at the lowest cost*.

206. Policy design can increase the cost-effectiveness of collective action. In the Australian Landcare support programmes (AUS1 and AUS2), preference has been given to grant applications from landcare groups that include significant inputs by the group themselves. Work is often carried out on private land across a number of farms, producing a mix of public and private goods, with some of the benefits accruing off-site. Since group members are themselves among the beneficiaries of the goods they provide, they are expected to contribute to activities through in-kind contributions like labour, technical support, and loans of equipment. This has contributed to the cost-effectiveness of the programmes. Although estimates vary, an evaluation of the landcare programme in 2007 valued project applicants' contributions at AUD 1.8 dollars for every dollar provided from programme funding (Hyndman et al., 2007). By incorporating mechanisms that ask some beneficiaries to share the cost burden, programmes are able to increase cost-effectiveness.

4.4. Policy implications

207. This study shows that collective action is useful in providing agri-environmental public goods and reducing negative externalities. It identifies several merits of collective action, compared with individual actions.

- First, collective action allows individual farmers to manage resources and farm practices at a geographically and ecologically appropriate scale, across legal and administrative boundaries and favours the provision of public goods whose supply has to reach a minimum threshold level before it becomes of benefit to society.

- Second, collective action allows the exploitation of economies of scale and scope, thereby enabling farmers to provide agri-environmental public goods at a lower cost compared with individual provision. To the extent that collective action is locally designed and implemented, it also achieves cost savings because farm practices required by the action can be optimally adjusted to local conditions.

- Third, collective action promotes knowledge sharing among members, which increases their technical and managerial capacities. This means that projects can be undertaken collectively with a larger pool of resources than could be contributed and afforded by individuals acting separately. For example, it can share and manage an effective spatial data management system that will enable the development of appropriate policies.

- Fourth, collective action can tackle local issues that are not necessarily best dealt with by central authorities or by unco-ordinated individuals because of its flexible forms and diverse members with different knowledge and skills. It can identify critical sites that are central to different environmental objectives and signal opportunities for groups of farmers, landowners, conservation groups and local authorities to collaborate in a joint group.

208. As several case studies show (e.g. Animal Health Associations in Spain (ESP2), the Vittel case (FRA1) and the Aorere Catchment Project (NZL1)), collective action can be an effective approach for providing various agri-environmental public goods because of these merits.

209. Farmers sometimes initiate collective action voluntarily without government support. If the benefits to farmers from collective action outweigh the costs they incur, they may take the initiative to provide agri-environmental public goods in collaboration with neighbours and others. However, barriers such as free-rider problems, high initial transaction costs, negative attitudes towards collective action and policy uncertainty may hinder the spontaneous development of collective action. Farmers can try to overcome these difficulties by themselves, but in some cases they will need external support in the form of scientific knowledge, technical information and financial assistance to overcome these difficulties. If farmers cannot take collective action by themselves, government support can promote collective action in cases where the total benefits arising from it outweigh its costs.

210. In some cases, it may be more useful for governments to adopt policies that promote collective action instead of other policy options that influence individuals acting independently. When tackling local agri-environmental issues that are beyond the control of individual farmers, governments should take policy measures for promoting collective action into consideration since collective action can identify local solutions to local problems more easily than other types of policy. In addition, transaction costs may be lower for collective action, particularly compared to setting up trading systems for environmental damage or benefits. Collective action is useful if it is necessary to leverage resources among various people, or tackle complex and multi-dimensional problems that may not be appropriately dealt with by individuals acting independently.

211. Eight policy implications emerge from this analysis.

Policies for promoting collective action should be given serious consideration at the policy design stage

- Collective action is key to improving the agricultural environment given its effectiveness in dealing with agri-environmental externalities that are beyond the capacity of the individual farmer to manage. However, relatively few agri-environmental policies are tailored for promoting collective action for providing agri-environmental public goods. Government policies should do more to promote collective action, and some policies (e.g. those for dealing with externalities

which extend beyond the individual farm or those for dealing with threshold public goods associated with agriculture) should explicitly encourage collective action, if farmers cannot undertake collective action voluntarily and if the benefits outweigh costs stemming from collective action.

Holistic approaches are necessary to promote collective action

- Farmer behaviour is affected not only by external factors (benefits and costs, both financial and in terms of effort), but also by internal factors (habits and cognitive processes) and social factors (societal norms and cultural attitudes). Advisory systems, extension, diffusion of innovation, training and social networks also play an important role in shaping attitudes and motivation, in addition to traditional financial incentives and disincentives.

- Campaigning with simple intuitive messages and selecting policy options carefully are important. Policy interventions that are coherently targeted and planned can achieve a greater impact on agri-environmental targets than measures implemented in a fragmented and *ad hoc* fashion. To promote collective action, holistic approaches (a strategic combination of financial support and technical assistance) are necessary.

Initial support, especially financial support, is important

- Collective action involves new transaction costs, especially at the beginning, which may prevent collective action from developing further. Thus, initial support from government, particularly financial support, can be useful in promoting collective action because both the institutions being developed and the financial base of farmers are weak.

- Funding should be adaptable and appropriate to local conditions. Flexible funding programmes can promote innovative collective action.

- Governments must be mindful of the need to preserve the continuity of collective action, taking account of the potential fragility of these voluntary groups. This means maintaining a balance between strict, formal procedures and more flexible or longer-dated arrangements, when providing financial support.

Technical assistance can empower farmers

- Scientific knowledge is needed to manage natural resources. Farmers sometimes do not have such knowledge, nor are they familiar with the management practices appropriate for the provision of public goods and the reduction of negative externalities. Governments and other external bodies can, however, provide these.

- Governments can contribute to collective action through various forms of technical assistance, including providing scientific information on natural resource systems, giving technical advice and assistance on planning and implementing farming practices, drawing up guidelines for collective action, providing a conflict resolution system, distributing information on successful cases and holding outreach events to raise environmental awareness.

- Since internal factors (habits and cognition) affect farmer behaviour significantly, education and targeted advice to raise environmental awareness and rewarding desirable behaviour can be useful for promoting collective action.

Policies should forge links with social networks and institutional arrangements

- Strong social networks can reduce transaction costs associated with collective action. They help farmers to develop collective action as well as to exchange information and leverage resources, as farmers are in favour of co-operating with their neighbours. It is important to strengthen social networks and involve the wider community, including the private sector.

- Funding processes that develop social interactions can stimulate partnerships and strengthen social networks. The development of partnerships between farm communities and scientists and universities to explore innovations and exchange knowledge can have a two-way benefit.

- Institutional characteristics (e.g. social norms and cultures) affect collective action. A formal legal framework for establishing and promoting collective action can sometimes be useful since legal status can increase the credibility and stability of groups and help them to raise funds.

- Since trust is needed to strengthen social networks, it is good to approach local leaders or "reference farmers" who have some influence on farmer behavior. Policies should try to incorporate links with existing networks and institutional arrangements in designing collective action.

Collaboration with intermediaries and co-ordinators is important

- Intermediaries and co-ordinators can play a vital role by providing local knowledge, connecting the right people, and enhancing the degree of co-operation. Policies should recognize this role. Funding programmes for agricultural or environmental NGOs that support collective action can indirectly promote collective action as well.

Co-operation between local and central governments is key

- When considering policy options for collective action, support from both central and local governments are important. Local governments play an important role, because most collective action deals with local issues and local governments have in general a better knowledge of them. If the public goods provided are local, funding by local governments is most appropriate. They can provide expertise and technical assistance that fits each local situation. Programmes should be flexible so as to adjust programmes to local conditions and ensure they can be implemented by existing institutions. Governments need to strengthen local management and allow more local decision-making without imposing external rules.

- On the other hand, central governments can provide support on a larger scale than is possible for local governments. Policy measures promoting agri-environmental public goods should be framed at the scale and within the boundaries consistent with the agri-environmental issue to be tackled, not according to administrative or jurisdictional boundaries. Where geographical boundaries that collective action targets cover very broad areas with large resource requirements, support from ceontral governments would be needed.

- Therefore, support from both levels of government is a priori possible and relevant for collective action. Each situation should be assessed on its own merits to determine the appropriate supporting government agency, and if both levels of government provide support, their co-operation is key to promote collective action.

More work on evaluating cost-effectiveness of collective action is necessary.

- Agri-environmental policy measures should be cost-effective: once an environmental goal is set, that goal should be achieved at least cost. Collective action targets outcomes defined on a scale beyond individual farms, and their cost-effectiveness should be examined at the same scale.

- Generally speaking, collective action may be more effective than independent individual actions if environmental goals target outcomes on a broad scale. Collective action makes it possible to bring multiple, and preferably contiguous, farms into agri-environmental schemes, which is necessary to achieve impacts at a higher scale. There is very little comparative or quantitative research on the outcomes of collective action. More work on evaluating both the effectiveness and the cost-effectiveness, of collective action is needed. It should be grounded in a strong scientific base, and the result of such evaluation should be used to design better policies.

212. This study provides an extensive literature review and analyses 25 case studies from 13 OECD countries, in order to examine how policies could and should be used to promote collective action. It also finds that the private sector, both local citizens and private firms, actively contributes to the provision of agri-environmental public goods. Indeed, in many cases, they participate in collective actions. Understanding their roles and how governments can facilitate them to co-operate with farmers are important points to be examined further.

213. The study finds that government policies have a considerable effect on farmers' behaviour. Government policies can promote collective action but, at the same time, an uncertain policy environment (e.g. frequently changing objectives and funding mechanisms) can have a negative effect on farmers' motivation to take collective action. Also, the study identifies that there are different types of agri-environmental public goods provided in OECD countries (e.g. biodiversity, landscape, water quality, common pool resources) and collective action has the potential to manage these issues effectively.

214. However, to figure out the best approach for dealing with agri-environmental issues, it is necessary to compare all related approaches (targeting individual actions or collective actions) and policy measures (e.g. regulations, agri-environmental payments, taxes, tradeable credits, technical assistance). Appropriate government policies and approaches may differ depending on the characteristics of the resource problem and the type of agri-environmental public good provided (e.g. biodiversity, water quality) and their values (use value and non-use value).

215. This study only examines the role of collective action, and there is insufficient evidence to permit the formulation of guidelines or prescriptions about when collective action is the *best* approach compared with other approaches and policy measures. Thus, in order to examine these questions further, it would be necessary to compare the whole range of agri-environmental policies undertaken in OECD countries, not only those promoting collective action, and analyse their roles for each agri-environmental public good. The factors that in each case determine the appropriate level and type of intervention (e.g. which policy measures are suitable for which type of resource problem, to what extent governments should provide support, whether governments should provide financial support for covering initial cost or running cost, whether provided public goods supported by governments meet their social demands) should be further explored and synthesised.

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ANNEX I.A. CASE STUDY SUMMARIES

1. Australia

Name	**Mulgrave Landcare and Catchment Group Inc. (AUS1)**
Brief description of the case	The Mulgrave Landcare and Catchment Group is a community-based environmental group, one of 26 landcare groups operating in the region.
Location	The Mulgrave River catchment (877 sq. km.) is located in the Wet Tropics Region of North Queensland (the State of Queensland is located in the northeast of Australia). Severe annual floods present the area with many challenges relating to land use. Approximately 66% of the catchment is natural forest, most of which is protected by World Heritage Estate. The predominant private land use is sugar-cane. Other local products include bananas, other tropical fruits and cattle.
Public goods	Riparian and wetland restoration, and improved water quality – the river discharges into the Great Barrier Reef lagoon, which itself provides major public goods.
CPR management	Advising the community the competing demands for groundwater between town water use and environmental river flows.
Emergence of the action	The group formed as an autonomous body in 2000 aiming to reduce the sugarcane farming industry's environmental footprint.
Group size	48 financial members and around 60 volunteers assisting with tree planting.
Participants	Predominantly farmers, sugar research and sugar mill staff. More recently, involvement of town and school communities.
Activities undertaken by the group	River restoration; development of farm machinery to improve fertiliser efficiency and reduce soil erosion; a programme for schools; public information sessions and newsletter; monitoring of soil nutrient status and water quality.
Farmers' role	Core of group, providing volunteer labour and equipment for group activities (machinery makes volunteer participation more pleasant); designing innovative farm implements; allowing access for riparian projects and hosting field days.
Non-farmers' role	Provide diversity of approach. Group co-ordination provided by a facilitator. Schools' programme supported by corporate funding (National Australia Bank).
Government's role	Group support. Project funding provided to the group on a partnership basis through competitive bidding process – from commonwealth, state and Regional Natural Resource Management Organisation (Terrain). Provision of planning and technical advice.
Factors affecting collective action	Community familiarity with community-based approaches. Established institutional arrangements at local, regional and state level for effective governance of such organisations.
Factors affecting famers' behaviour towards collective action	Clear vision, local leadership and camaraderie within community. Dedicated group facilitator. Activities are consistent with sustainable agriculture and improved productivity.
Others	Co-operation from researchers and Great Barrier Reef agencies.

Name	Holbrook Landcare Network (AUS2)
Brief description of the case	The Holbrook Landcare Network is active in addressing on-farm biodiversity and the uptake of sustainable farming practices.
Location	The group covers 240 000ha in the undulating high rainfall mixed farming zone of southern New South Wales (the State located in the southeast of Australia), with grazing, cropping and forestry being the main enterprises.
Public goods Reducing negative externalities	Enhancing biodiversity in grassy box gum woodlands mostly cleared for agriculture. Developing a culture of care for the environment and educating the community on sustainable farm practices for environmental and economic outcomes (public goods). Management of erosion and dryland salinity on and off-farm.
Emergence of the action	Originally established in 1988 as a "Trees on Farms" group. On becoming a landcare group in the 1990s, it broadened its coverage to address the growing land degradation problems in the area.
Group size	Some 350 members – around 75% of landowners in the area are members. Information is distributed to a network of 1 800 people.
Participants	Members are mainly associated with farm businesses. Environmental education activities often attract a range of urban and periurban participants.
Activities undertaken by the group	Revegetation and management of remnant vegetation within farm environs – aimed at "Rebirding the Holbrook Landscape", dryland salinity monitoring and management, and erosion control. Research and extension, and partnerships with industry organisations.
Farmers' role	Providing resources, volunteer labour and equipment – in-kind contribution more than financially matching grants received. Revegetation work undertaken on farms not only benefits biodiversity but addresses off-site effects of salinity and soil erosion.
Non-farmers' role	Some tree planting and agricultural projects are funded by corporate sponsors, industry bodies and philanthropic organisations. Staff includes an executive officer, landcare facilitator and administrative support.
Government's role	Provision of project funding – at commonwealth, state and regional levels. Co-ordination of planning and technical support.
Factors affecting collective action	Community familiarity with community-based approaches. The competitive bidding process for project funding creates uncertainty for the organisation.
Factors affecting famers' behaviour towards collective action	Local leadership, and farmer and community commitment, are essential. Changes to government support programmes in the mid-2000s caused the group to falter but it was reinvigorated largely through the efforts of the group facilitator and a committed board.
Others	

2. Belgium

Name	**Strategic installation of buffer strips in the Dommel Valley (BEL1)**
Brief description of the case	The Dommel Valley Watering is a local organisation responsible for water management in the Dommel river valley in the Belgian province of Limburg. In order to improve the water quality in the valley's rivers and streams, it set up the project "Management of river banks in the basin of the rivers Dommel and Warmbeek," which acts to convince farmers to manage interconnected buffer strips alongside brooks running through their land.
Location	Municipalities Bocholt, Hamont-Achel, Hechtel-Eksel, Lommel, Neerpelt, Overpelt and Peer in the Belgian Province of Limburg.
Reduction in negative externalities Public goods	Improving water quality in the valley's watercourses. Increasing biodiversity in streams and on their banks; accentuating the structure of the waterways in the agricultural landscape; increasing the attractiveness of the landscape by providing flowers and region-specific vegetation.
Emergence of the action	Co-operation started in 2006 with a small-scale pilot project of the Watering next to the Bolissenbrook in the municipality of Peer, in which nine farmers co-operated to install one 5 km long buffer strip. In 2008, the project received European co-financing by becoming part of the Interreg IVa project "Interactive water management on the border between Flanders and the Netherlands", which allowed the project to expand over seven municipalities in north Limburg.
Group size	Around 30 local farmers have created a total of 32 km of interconnected buffer strips.
Participants	The Dommel Valley Watering (initiator of the project), farmers in the seven municipalities mentioned above, Province of Limburg, Flemish Land Agency.
Activities taken by the group	Installing and managing interconnected buffer strips bordering watercourses in the valley of the rivers Dommel and Warmbeek.
Farmers' role	Managing the buffer strips.
Non-farmers' role	The Watering aims to remove as many practical barriers facing the farmer as possible: they install the buffer strips, take care of the paper work, link farmers to colleagues who can help them in managing the strips, etc.
Government's role	The Flemish Land Agency provides subsidies for the management of the buffer strips through agri-environmental schemes.
Factors affecting collective action	The Watering wants to improve the water quality in the valley without having to expropriate farmers' land. Farmers get compensation for managing the buffer strips, which do not produce agricultural value.
Factors affecting famers' behaviour towards collective action	Five factors contribute to the success of the co-operation: providing tailored solutions through personal (informal) contacts, creating trust by being neutral, giving responsibility to the farmers, seeking win-win solutions and giving farmers time to get used to the new situation.
Others	

Name	Water quality management by water provider Pidpa and farmers (BEL2)
Brief description of the case	The water providing company Pidpa co-operates with farmers who manage Pidpa-owned land in groundwater catchment areas and protection zones around the catchment. Pidpa also stimulates the management of nature areas by local farmers on its land.
Location	65 municipalities in the Belgian province of Antwerp.
Reducing negative externalities Public goods	Improving the water quality by reducing negative externalities. Increasing biodiversity and agricultural landscape.
Emergence of the action	In order to guarantee good quality of the drinking water provided in the province, Pidpa has a long tradition of co-operation with local farmers, which they continuously try to improve.
Group size	72 farmers manage 133 ha (about 27% of all Pidpa land) spread over 233 parcels.
Participants	Water-providing company Pidpa; farmers; nature organisation Natuurpunt; Flemish Land Agency and other central government actors; local organisations related to agriculture and the environment.
Activities undertaken by the group	Pidpa created user agreements with farmers managing its land. Farmers can only use the land as permanent grassland, they should refrain from any activities that might reduce the quality of the surface and groundwater, and they should avoid damage to landscape elements like hedgerows.
Farmers' role	Managing Pidpa owned land in agricultural areas and performing some activities (like grazing management) in nature areas.
Non-farmers' role	Pidpa sets up user agreements with farmers on its land and establishes local networks in and around the catchment areas. Local organisations belonging to the local networks monitor the farmer's activities and report abuse to Pidpa.
Government's role	Although there are no policies that directly stimulate or help water providers to co-operate with farmers, representatives from the Flemish government actors participate in the local networks established by Pidpa. These representatives help to create continuity in the co-operative undertaking, and to solve local conflicts. The co-operation with government also helps to align Pidpa's policies with the policies and principles of government agencies. The Flemish Land Agency has helped in designing Pidpa's user agreements with farmers.
Factors affecting collective action	Pidpa wants to improve the quality of the groundwater; farmers can use the land for free and activate rights and direct payments on the land.
Factors affecting famers' behaviour towards collective action	Four factors have contributed to the success of the co-operation: building a structured local network through personal contacts and linking this with supra-local government and sector organisations, striving for win-win solutions and for transparency in policies.
Others	

3. Canada

Name	Group Environmental Farm Planning in Saskatchewan (CAN1)
Brief description of the case	There are two approaches for Saskatchewan producers to access agri-environmental risk assessment programmes, either through an individual approach, i.e. Environmental Farm Planning (EFP) or a collective approach, i.e. Agri-environmental Group Planning (AEGP). Producers implement their action plans and adopt Beneficial Management Practices (BMPs) under the Canada-Saskatchewan Farm Stewardship Program (CSFSP).
Location	Saskatchewan.
Public goods	The Saskatchewan group plans focus most action on water quality, with other benefits such as air, soil and biodiversity remaining secondary.
Emergence of the action	The EFP was initiated in Ontario in the early 1990s and was eventually customised and adopted in other provinces. The AEGP approach was introduced in Saskatchewan around 2005.
Group size	EFP: one producer (+ support from several programme facilitators). AEGP: 75 to 500 producers per group (+ support from several programme facilitators, non-profit organisations and governments).
Participants	Producers, programme facilitators, non-profit organisations, provincial governments.
Activities taken by the group	EFP: each producer undertakes an assessment of the agri-environmental risks of his individual farm operation. AEGP: producers make a group plan for assessing agri-environmental risks within their combined geographical boundaries (such as a watershed).
Producers' role	Identify risks to the environment and develop individual action plans (EFP) or group action plans (AEGP); introduce sustainable farming methods, i.e. BMPs (EFP & AEGP).
Non-producers' role	A non-profit organisation, PCAB, delivers the programme (EFP & AEGP); Programme facilitators hold workshops and help producers develop their action plans (EFP & AEGP); Ducks Unlimited Canada and watershed organisations provide support (AEGP).
Government's role	Governments design overall programmes and provide funds with participants (EFP & AEGP); Saskatchewan Watershed Authority provides support (AEGP).
Factors affecting collective action	Common geographical boundary (AEGP); intermediary (AEGP); leadership of programme facilitators (EFP & AEGP); flexibility of action plans (EFP & AEGP); financial support from governments (EFP & AEGP); advice and support from non-profit organisations (EFP & AEGP).
Factors affecting famers' behaviour towards collective action	External factors (financial incentives); internal factors (cognition, e.g. environmental awareness); social factors (social capital, neighbouring producers' attitudes).

Name	Beaver Hills Initiative (CAN2)
Brief description of the case	The Beaver Hills area lies east of the City of Edmonton, the capital of Alberta. It is a unique ecosystem that faces extremely high development pressures. In order to deal with diverse pressure on the landscape and to conserve the area, the Beaver Hills Initiative (BHI) was launched. It involves various partners and shares their knowledge, data and skills for conserving the area.
Location	Alberta, Canada.
CPR management Public goods	The Beaver Hills area is a common pool resource. Public goods: Landscape, clean and abundant drinking water, clean air and biological diversity.
Emergence of the action	The Initiative evolved from a need to address land use pressures in close proximity to the boundaries of Elk Island National Park. This required the co-operation and co-ordinated efforts of many land managers from all levels of government and the five counties.
Group size	More than 30 organisations
Participants	Local governments (counties), provincial governments, federal governments, academia, industrial partners, Non-Government Organisations.
Activities undertaken by the group	Landscape-based approach to formal land-use planning and land management practices. Influencing policy development through the provision of geo-spatial information and data by voluntary collaboration and science-based analysis and research. Examining new policies such as market-based incentives for conserving the resources.
Producers' role	Managing farmlands and other natural resources (wetland conservation and reclamation, riparian management, tree planting and woodlot management, and soil conservation): sustainable grazing systems such as rotational, deferred, or extended season grazing: agri-tourism activities for increasing awareness of and promoting biodiversity.
Non-producers' role	Sharing expertise with partners; undertaking scientific studies and helping the BHI collect relevant data and share information.
Government's role	Making policies with reference to the recommendations made by the Initiative; providing financial support to the Initiative.
Factors affecting collective action	Multi-jurisdictional control of the natural resource; emphasis on information and data sharing; large-scale and long-term promotion of sustainable agriculture; heterogeneity and diversity; trust and social capital; shared long-term vision; appreciation of local knowledge; leadership in building understanding; effective organisational structure; commitment from all levels of government.
Factors affecting famers' behaviour towards collective action	External factors (financial support for introducing BMPs); internal factors (cognition, i.e. environmental awareness); social factors (leadership of local farmers, social pressure, reflecting their views in local rules and norms, rewarding stewardship and respecting local knowledge).

4. Finland

Name	**Pyhäjärvi Restoration Program (FIN1)**
Brief description of the case	Local voluntarily actions aiming to improve or maintain the good water quality of Lake Pyhäjärvi (measured as total phosphorus and chlorophyll concentrations and phytoplankton biomass and composition).
Location	South West Finland.
Reducing negative externalities CPR management	Preventing external nutrient load. Lake Pyhäjärvi is a common pool resource.
Emergence of the action	Arose from the need to stop eutrophication progressing and have more resources for restoration work.
Group size	17 organisations in Pyhäjärvi Protection Fund, including advisory board (with 30 active people), more than 20 national and international partner organisations in projects, over100 farmers, 20 fishermen.
Participants	Pyhäjärvi Institute (manager of the programme), municipalities and cities, land and water area owners, local industry, associations, local, areal and national authorities, schools, universities, farmers, fishermen, inhabitants.
Activities undertaken by the group	Governance of the resources and activities, applying additional resources from EU programmes and other funding sources. External load reduction, bio-manipulation, education, information services, research and monitoring.
Farmers' role	External load reduction, implementation of basic and more advanced measures.
Non-farmers' role	Funding, fishery, education, information services, research and monitoring.
Government's role	Funding, control, legislation and regulation. Agricultural and environmental policy issues. Monitoring.
Factors affecting collective action	Economic situation of local organisations and actors, rules and regulations of EU, EU funding possibilities. Scientific knowledge, leveraging resources among diverse stakeholders, effective institutional scheme. Results and effectiveness of the actions undertaken give a boost to motivation and willingness to continue.
Factors affecting famers' behaviour towards collective action	Economic development of agriculture. National and EU policies, rules and regulations. Financial support. Visible and measurable results.
Others	-

5. France

Name	Contract between Vittel (mineral water bottler) and farmers (FRA1)
Brief description of the case	A group of farmers located in Vittel's catchment area changed their practices to reduce non-point source pollution from intensive farming.
Location	Vittel, Vosges, France.
Public goods Reducing negative externalities	Biodiversity and landscape. Improving water quality.
Emergence of the action	In 1988, the production unit of Vittel noticed a slow but notably significant increase in nitrates.
Group size	About 40 farmers at the beginning with a decline over time (less than 30 now).
Participants	Vittel, Agrivair; farmers (mainly milk and cereals producers) located in the catchment area of Vittel; multidisciplinary research team.
Activities taken by the group	Co-building of a new farming system with the research team that reconciles the interests of farmers and those of Vittel.
Farmers' role	Adopting the co-built new farming system, which can deliver the results desired by Vittel.
Non-farmers' role	Designing an adapted and multidimensional incentive package.
Government's role	Strong political support; facilitating land operations of Vittel despite strong regulatory constraints.
Factors affecting collective action	Getting a better understanding of the relation between farming practices and water quality Ability of Vittel to take into consideration all dimensions of change (not only the technical and financial dimension), thanks to the research team. Transaction cost issues (valuation disputes, bilateral monopoly, third party effects).
Factors affecting famers' behaviour towards collective action	Maintaining farmers' income throughout. Addressing several related issues such as debt and land issues, plans of farmers and status considerations. Farmers as "rule-makers". Creation of Agrivair located very close to the farms, supervised by a strategic leader.
Others	Rivalry and jealousy among farmers inside and outside the catchment area; Loss of old professional networks replaced by new ones; Third party pressures.

6. Germany

Name	Landcare Associations (LCAs) in Germany (DEU1)
Brief description of the case	LCAs are regional non-profit associations, where farmers, local administrations and politicians as well as nature conservation experts work together with the aim of implementing nature conservation and landcare measures. LCAs assist in co-ordinating different interests, acquiring financial means and organising measures.
Location	About 155 LCAs at district level; long tradition in Bavaria (ca. 55 LCAs), less in north-west Germany; German Association for Landcare (*DVL)* as umbrella organization.
Public goods	Conservation of diverse landscapes, biotopes and biodiversity in cultivated landscapes (also partly linked to water and climate protection).
Emergence of the action	First LCA funded in Bavaria in 1985.
Group size	Large differences among LCAs (from less than 100 to more than 1 000 members).
Participants	*Members*: individuals, organisations, administrations or private companies. *Steering committee*: equal share of representatives of local politicians, land managers and nature conservation organisations. *Expert panel*: appointed by steering committee. At least one *co-ordinator*.
Activities taken by the group	Examples include planting of hedges, management of species-rich grassland, advice, assistance with marketing of high-quality products linked to landcare.
Farmers' role	Important actors in implementing measures; farmer's representatives in LCAs.
Non-farmers' role	- *Members*: election of steering committee, decisions on general issues, adaption of stated rules, height of membership fees, etc. - *Steering committee*: listing of measures, decisions on human resources, appointment of members of the advisory panel. - *Experts panel*: providing advice. - *Co-ordinators*: mapping, concretising actual measures, calculating of costs, application for subsidies, organisation and supervision of implementation, monitoring of results, co-ordination with local communities, authorities, conservation groups and land managers.
Government's role	- *Federal states*: main actors in designing and financing policy measures (e.g. agri-environment measures); partly financing personnel and overheads; (additional funding through membership fees, donations, trusts, etc.). - Experts from lower authorities represented in advisory panel.
Factors affecting collective action	Representation of different interests and common decision-making; decentralised approach enables adaptation to regional conditions; communication and environmental education; permanent co-ordinator as contact person; co-ordination of measures at landscape level (crucial for goals like habitat corridors).
Factors affecting famers' behaviour towards collective action	Permanent local contact person (co-ordinator); help with applications for funding; information on environmental aspects and potential measures; trust and balancing of interests; farmers are paid for management.

Name	Co-operation in drinking water protection (DEU2)
Brief description of the case	The “co-operation model” in designated areas for drinking water protection in the German Federal State of Lower Saxony involves establishing working groups of farmers, water suppliers and technical advisers. The co-operative venture helps to solve problems of maintaining or recovering a high drinking water quality.
Location	Designated areas for drinking water protection in Lower Saxony. In 2009, there were co-operations established in 370 drinking water-sheds of Lower Saxony, on 303 778 hectares of utilized agricultural area (11.7% of total agricultural land).
Reducing negative externalities	Maintenance and improvement of drinking water quality and reduction of diffuse pollution of groundwater especially caused by nitrate leaching.
Emergence of the action	The “co-operation model” was established in 1992, based on the 8th amend-ment of the Niedersächsischen Wassergesetzes (Water Law of Lower Saxony).
Group size	About 10 900 farmers have land within designated areas for drinking water protection. Many of them are participating actively in the co-operative groups, and most are reached by advice and perform voluntary measures for water protection. On average, there are about 65 farmers per designated area.
Participants	Farmers, representatives of water suppliers and contracted technical advisers are participating in the co-operations. Support comes from the farmers union, the Chamber of Agriculture, regional administration, and the Lower Saxony Water Management, Coastal Defence and Nature Conservation Agency (NLWKN).
Activities undertaken by the group	The co-operation establishes a protection concept for the area, develops and implements appropriate measures of water protection and performs monitoring and evaluation of farming, nutrient management, and water quality.
Farmers’ role	Farmers implement measures for water protection on their land, conduct field trials.
Non-farmers’ role	- Water supply companies are the counterpart of the farmers; they stipulate protection and improvement of drinking water quality. - Technical advisers approach farmers to improve knowledge of environmental problems and to promote water protection measures. - The Chamber of Agriculture is responsible for technical advice, information on measures and materials for technical advice, field trials, and publicity.
Government’s role	- NLWKN is organising the establishment and the funding of co-operations, and performs M&E activities and workshops at the level of Lower Saxony. - The Ministry of Environment, Energy and Climate Protection is responsible for the legal framework of co-operations and the funding through the “water cent”.
Factors affecting collective action	The establishment of co-operation based on agreements and equal rights of farmers and water suppliers is a pre-condition to receive funding derived from a “water cent”, a special charge paid by water consumers in Lower Saxony.
Factors affecting famers’ behaviour towards collective action	Permanent local contact person (co-ordinator); help with applications for funding; information on environmental aspects and potential measures; trust and balancing of interests; farmers are paid for better management.

Name	Wetland restoration in the Eider valley (DEU3)
Brief description of the case	Restoration of wetlands such as peat bogs and fens is an objective of environmental policy. Extensification of agricultural land use, deconstruction of drainage systems and rewetting of land need agreement with land owners and users. Therefore, wetland restoration is based on co-operative approaches.
Location	Eider valley between Flintbeck and Bordesholm, about 10 km south of Kiel, the capital of Schleswig-Holstein (north of Germany), with fens and flooding area.
Public goods Reducing negative externalities	Environmental objectives are mitigation of green-house gas emissions from peat decomposition, protection of biodiversity of wet grasslands, and improvement of water quality through improvement of filter and storage capacity, denitrification and a stop of nitrate emissions from peat decomposition. Recreational use of the area for the regional capital Kiel, and flood control.
Emergence of the action	During the 1980s, the nature conservation authority started to purchase land areas in the fen and marsh area of the Eider valley. However, until the late 90s land purchase could not be completed so that no reflooding was possible due to claims of other land users. In 1999, a co-operative project promoting extensive grazing was started with a 20-year perspective.
Group size	Group size is about 50 (land purchase or extensification contracts with 40 land owners, and currently 8 tenants of pasture land, one of them is the pasture association comprising several individual farmers). The case study area is about 400 hectares.
Participants	Water and land association (WBV) as organiser and intermediary; land owners and farmers; for the planning process, the administrations for agriculture, water and nature conservation; the Foundation for Nature Conservation Schleswig-Holstein (Stiftung Naturschutz) as land owner; University of Kiel for research.
Activities undertaken by the group	Organisation of large pasture areas for extensive grazing, allowing for “passive” rewetting (no maintenance and repair of the drainage system) and establishment of more structured, semi-natural landscape.
Farmers’ role	Negotiation of contracts to reduce land use intensity in the project area, managing the extensive grazing areas.
Non-farmers’ role	Water and land association: Promoting the planning process, negotiation in order to enlarge the project area under contracts or for purchasing land. Other special authorities promote the planning process or enable additional support of agri-environmental activities.
Government’s role	The Environmental Agency of Kiel (Staatliches Umweltamt) developed the project together with the WBV and the Environmental Agency of Schleswig-Holstein (Landesumweltamt), with the aim to reduce N and P pollution of the Eider.
Factors affecting collective action	Before, land purchase was insufficient for substantial changes of the water regime, as purchased parcels remained mixed with still intensively used, privately owned parcels.
Factors affecting famers’ behaviour towards collective action	WBV as intermediary and the co-operative approach; land use rights and contracts offered instead of purchase; land outside the project area in exchange; wet areas are of decreasing value for agricultural use.

7. Italy

Name	**Custody of the territory in Tuscany (ITA1)**
Brief description of the case	Initiative promoted by a territorial agency, which set up an agreement with local farmers for co-production of some environmental services such as the cleaning of rivers, riverbeds, rivers banks and canals.
Location	Mountain area of Tuscany, reclamation district “Media Valle del Serchio”.
Public goods	Hydro-geological management, landscape, resilience to flooding, social capital, institutional capital, new knowledge, capacity building, new networks.
Emergence of the action	In this district the hydro-geological management of the territory is increasingly recognised as one of the main environmental priorities, also as result of the numerous extreme weather events that have occurred during the last years. The local agency, due to the increasing difficulties in managing over 115 000 ha of mountain areas and about 1 500 km of streams and torrents has incentivised and supported this collective action.
Group size and area covered	During the last phase of the project (2010/2011) agreement was reached with 25 farmers and four co-operatives. In 2011 the local agency was then able to monitor 500 km of torrents and streams, corresponding to the 40% of the territory.
Participants	Actors directly involved: technicians of the local agency and farmers. Actors indirectly involved: municipalities, farmers’ organisations, other local agencies.
Activities undertaken by the group	Co-ordinated action to increase the resilience of flooding and to increase the hydro-geological management of the district.
Farmers’ role	(1) Monitoring activities: periodical on site controls of torrents and streams, with reports and pictures and (2) first maintenance intervention: execution of simple maintenance works such as removal of trees, timber and debris from riverbeds and dikes to avoid overflowing, together with the management of riparian vegetation.
Non-farmers role	Administrative support (farmers’ organisations), technical support (technicians working for the local agency), co-ordination and information (local agencies), monitoring activities (local communities).
Government’s role	Financial support (reclamation tax, used to finance the project through the local agency), setting the legislative framework (law on multifunctional agriculture) and external support (Rural Development Plan for Tuscany).
Factors affecting collective action	Social capital: trust and reciprocity; participatory events: involvement of local community; information/early warning system: IDRAMAP, joint inspection and co-production of knowledge.
Factors affecting farmers’ behaviour towards collective action	Payments for monitoring and first intervention works, complement to productive activities, integration in periods of scarce activities in the farms (i.e. during the winter and in raining days), increasing visibility and networking (opportunities to collaborate with other government agencies), enthusiasm and keenness for the environmental services to be provided, building a new identity of “farmers custodians”, involvement of farmers in decision-making process.
Others	IDRAMAP: a web site recently developed as an on-line information system with the objective of expanding the monitoring activities to the local inhabitants.

Name	Community garden in Campania (ITA2)
Brief description of the case	Since 2001 a local NGO has been co-ordinating a project called Eco-archaeological park, converting degraded site in a collaborative green space where urban gardens, environmental benefits and social relations are cultivated.
Location	Pontecagnano near Salerno (Southern Italy).
Club goods/ Public goods	Providing farming opportunities for members, this project results in a broad range of positive physical, social and psychological well-being outcomes for the gardeners (club goods). It also provides different ecological, social and cultural advantages for the whole population. From an environmental perspective, the community garden contributes to the landscape's beauty and to the enhancement of different ecosystem services (public goods).
Emergence of the action	Before the Eco-archaeological park project, the archaeological site was closed to the public and it was really a waste dump, despite the high cost of its maintenance. The local NGO, using community garden, restored the area, guaranteeing his maintenance and a citizen's free access.
Group size and area covered	About 80 gardeners with a relevant number of students. The Eco-archaeological park covers an extension of 6 hectares, including a public green space and community garden.
Participants	Retirees, students, members of the local NGO, people with physical or mental disabilities.
Activities undertaken by the group	Community garden cultivation, public urban green area management.
Farmers' role	No farmers involvement.
Non-farmers role	The local NGO promote, co-ordinate and support the project, providing knowledge and advisory system. The gardeners cultivate the common access green space.
Government's role	No government involvement
Factors affecting collective action	Simple and clear rules for governing the use of collective goods, shared as community heritage, with an effective system of self-control and sanctions; strong sense of community, high levels of social capital, key role of the local NGO in motivating the gardeners, promoting the project and its sustainable vision, facilitating communication, NGO serving as mediator in conflicts or negotiations as needed, sharing expertise, resources and experience, improving the gardeners environmental education.
Factors affecting farmers' behaviour towards collective action	No farmers involvement.
Others	The Campania Region in 2009 *allocated* EUR 1.8 million in order to support experimental community gardens, assuming the experience of Pontecagnano as an example of good practice to be more widely disseminated.

Name	**Mountain pasture management in the Aosta Valley (ITA3)**
Brief description of the case	The case study focuses on *Alta Val d'Ayas*. It describes the rules, norms and organisational patterns involved into the collective management of mountain meadows and pastures in this valley.
Location	Alta Val d'Ayas, Municipalities of Ayas and Brusson (Aosta Valley Region) about 185 km^2 in the high valley of the Evançon river.
Public goods	Hydro-geological management of the territory, Landscape maintenance, Biodiversity preservation.
Emergence of the action	In response to a need to maintain the traditional and proper use of meadows and pastures.
Group size and area covered	In *Alta Val d'Ayas* meadows and pastures are about 3 840 hectares; alpine pastures are 3 134 hectares. About 40 farmers manage *alpeggi* (cattle shed and mountain areas used primarily for grazing in summer) and there are about 108 sheds. About 2 980 cattle and about 300 sheep and goats are moved to alpine pastures in summer. Cattle transferred from one farm to another are about 1 000; sheep and goats are more than 80. Co-operativa Fromagerie Haut Val d'Ayas collects and processes the milk produced by about 50 local farms (about 2 100 000 litres) and sells Fontina PDO cheese (18 000 rounds every year) also according to organic standards.
Participants	Farmers, landowners and municipalities, Aosta Valley regional government.
Activities undertaken by the group	The sustainable management of mountain meadows and pastures relies on a complex network of local actors, involving local breeders, the owners of the *alpeggi* (including municipalities), cow's milk buyers (and *in loco* Fontina PDO cheese making) and the regional government.
Farmers' role	Farms placed in the valley floor give cows and young cattle to the farmers exploiting higher pastures who take care of dairy cattle for 90-120 days (June to September). Milk is used for *in loco* Fontina PDO cheese making or sold to cow's milk buyers.
Non-farmers role	Land owners (private owners and municipalities) let breeders use their pastures.
Government's role	Aosta Valley regional government supports and funds the appropriate management of meadows and pastures especially in the *alpeggi* through several measures (some of them are co-financed by EU) and local laws. The goal of public support is not only to warrant the production of Fontina PDO cheese but also to ensure the supply of a certain number of important environmental services including biodiversity conservation, soil functionality and preservation of landscape.
Factors affecting collective action	Need to transfer cattle among farms for extensive grazing, complex network of various local actors (local breeders, owner of *alpeggi*, milk buyers, etc.), specific agreements and payments for cattle moved from one farm to another, support from regional government.
Factors affecting farmers' behaviour towards collective action	Historical and socio-economic background of cattle breeding in Aosta Valley. Fragile farm economics and availability of financial incentives.
Others	-

8. Japan

Name	Policy for preserving biodiversity associated with agriculture (JPN1)
Brief description of the case	This is the Shiga Prefectural government policy for preserving biodiversity associated with agriculture. The prefectural government pays farmers who agree to raise the level of water in drainage canals so that a special type of fish residing only in Lake Biwa can swim from the lake to paddy fields to reproduce. In this case, farmers need to jointly increase the water level of their drainage canal.
Location	Shiga Prefecture.
Public goods	Biodiversity.
Emergence of the action	This policy was initiated by the Shiga prefectural government in 2006 for preserving biodiversity: protecting juvenile fish in Lake Biwa from being eaten by alien species, such as black bass.
Group size and area covered	Four hectares.
Participants	Farmers, local citizens, the Shiga Prefectural government.
Activities undertaken by the group	Farmers jointly increase the water level of their drainage canal to allow a special type of fish to swim up to paddy fields.
Farmers' role	Farmers jointly increase the water level of their drainage canal.
Non-farmers' role	-
Government's role	Policy design and provision of the payment. Technical and extension services for collective action.
Factors affecting collective action	Physical conditions would affect the size of transaction costs for organising farmers. Long history of the prefectural government in promoting collective action for farming activities has been a factor in the success of the policy.
Factors affecting farmers' behaviour for collective action	Because the policy totally depends on voluntary action, social trust among farmers is likely to be the main factor. In particular, they would see whether the benefits associated with their joining a project (e.g. payment from Government) are greater than the cost associated with their co-ordinating with neighboring farmers.
Others	The policy received the best policy award from the National Governors' Association in 2009.

Name	Policy to recycle drainage water from agriculture (JPN2)
Brief description of the case	This is the Shiga Prefectural government policy to recycle drainage water from agriculture. The prefectural government pays irrigation districts that reuse the water drained from paddy fields in order to reduce emission from agricultural non-point sources. In this case, farmers jointly recycle drained water for the use of irrigation.
Location	Shiga Prefecture.
Reducing negative externalities	Reducing emissions from agricultural non-point sources (water quality protection).
Emergence of the action	This policy was initiated by the Shiga prefectural government in 2004 to reduce the flow of chemicals from agricultural non-point sources into the Lake Biwa.
Group size and area covered	1 300 member farmers and 670 hectares.
Participants	Farmers, irrigation districts.
Activities undertaken by the group	Farmers jointly recycle drained water for the use of irrigation.
Farmers' role	Farmers jointly recycle drained water for the use of irrigation.
Non-farmers' role	Irrigation districts make collective contracts with the prefectural government for recycling drained water. Making use of the formal decision making process of irrigation districts can reduce the transaction cost associated with contracts compared to Individual contracts.
Government's role	Policy and institutional designs as well as the provision of payments.
Factors affecting collective action	Strategic intention of the prefectural government that collective action should be promoted by making use of the existing institutional setting was clear. This arrangement could contribute to reducing the transaction costs.
Factors affecting farmers' behaviour towards collective action	Farmers can express their concerns through the formal process within their irrigation district.
Others	-

Name	**Measures to conserve and improve land, water, and the environment (MCILWE) (JPN3)**
Brief description of the case	The MCILWE has two payments to preserve 1) irrigation and drainage facilities at distribution level and 2) the agricultural environment by encouraging farmers to reduce their use of chemical inputs by 50%. The first type pays the "local action groups" under contracts with local municipalities in return for the groups' implementing maintenance work for drainage and irrigation canals.
Location	Throughout Japan.
CPR management	Maintaining drainage facilities.
Emergence of the action	In 2007, the Japanese government (Ministry of Agriculture, Forestry and Fisheries) introduced a policy for preserving irrigation and drainage facilities.
Group size and area covered	53 hectares (excluding Hokkaido) with 58 farmers, and 12 non-farmers.
Participants	Farmers, non-farmers, farming organisations, and Non-profit Organisations.
Activities undertaken by the group	Residents of rural hamlets maintain irrigation and drainage facilities, which are common pool resources.
Farmers' role	Maintain irrigation and drainage facilities.
Non-farmers' role	Maintain irrigation and drainage facilities together with farmers.
Government's role	Central government: Policy design and financing 33% of the costs. Local governments: Not involved in the policy design, and sharing 33% of the cost (16.5% by prefectural governments and 16.5% by city governments).
Factors affecting collective action	Informal and historical networks have been the main reason for establishing local action groups according to rural hamlets.
Factors affecting farmers' behaviour towards collective action	Historical and social background of each village is likely to be a key in the decision made by each resident. In many cases, there may be no choice but to join because of social norms in their villages.
Others	-

9. Netherlands

Name	**The Water, Land & Dijken Association (NLD1)**
Brief description of the case	The Water, Land & Dijken Association is a regional farmers' co-operative for nature conservation in the Netherlands. The association organises and motivates farmers to conserve grassland. It also provides guidance on the content and location of conservation measures.
Location	The Laag Holland area (50 000 ha) in the province of North-Holland.
Public goods	Biodiversity (focus on grassland birds); landscape; farmland conservation; rural tourism; education and cultural heritage.
Emergence of the action	The association was founded in 1997 to professionalise the existing co-operation between farmers and conservationists, and to give shape to the need for an independent regional organisation for the "marketing" of public goods and services.
Group size	650 members, of which 500 are farmers.
Participants	Farmers and citizens.
Activities undertaken by the group	1) Acquisition of agri-environment contracts for grassland birds and wintering geese; 2) Elaboration of the management plan for grassland birds; 3) Enhancing other ecosystem services; 4) Training and education of conservation skills; 5) Negotiating adequate arrangements with farmers in conservation areas; 6) Promoting other rural development activities; 7) Fundraising for farmland conservation.
Farmers' role	Taking conservation measures to deliver public goods (protecting nests, mowing late); attending information and training sessions.
Non-farmers' role	Financially supporting the association, some being actively involved as conservation volunteers or advisors.
Government's role	Setting out the rules for a regional approach; paying for the association's work in the context of a collective approach, control, payment and monitoring.
Factors affecting collective action	Severe resource problem; long history of nature conservation; location close to big cities; farmers' autonomy; local leadership; pre-existence of agri-environment co-operation; economic fragility; decentralisation.
Factors affecting farmers' behaviour towards collective action	Presence of cross-farm public goods (like grassland birds); fragile farm economics and availability of financial incentives; trust in the regional association.
Others	In 2010, the Dutch government selected the association to be one of four pilot projects for "pilot projects for collective delivery of environmental services" under the post-2013 Common Agricultural Policy.

10. New Zealand

Name	Sustainable Farming Fund- Aorere Catchment Project- (NZL1)
Brief description of the case	MPI launched the Sustainable Farming Fund (SFF) in 2000 to fund grass-root activities by farmers, growers and foresters. The Aorere Catchment Project is led by members of the local community, including dairy farmers and marine farmers. SFF funds the farmers' group and helps address the complexities around sustainable water management.
Location	Golden Bay's Aorere community, the Tasman region of the South Island.
Reducing negative externalities Public goods CPR management	Improving water quality in the Aorere Catchment. Biodiversity. Aorere Catchment (a common pool resource).
Emergence of the action	Local marine farmers faced a risk of closure due to deteriorating water and raised their issues publicly. In order to improve water quality, local dairy farmers started to act together with assistance of an NGO and applied for SFF.
Group size	33 dairy farmers.
Participants	Dairy farmers, NGOs, Local government and Central government.
Activities undertaken by the group	Commissioning a scientific investigation for identifying possible causes of water deterioration; Changing management practices.
Farmers' role	Forming a farmer group to improve water quality; Changing farming practices for water quality improvement.
Non-farmers' role	Giving advice including scientific information; Helping farmers organise groups; Funding projects.
Government role	*MPI (central government)*: providing 3-year funding (*SFF*) for the activity (2006-2008), and expanding the programme to adjacent areas (2009-2011). *Tasman District Council (local government)*: providing fencing materials to help farmers exclude stock from streams.
Factors affecting collective action	Sharing the recognition of keeping common pool resources; Knowledge of environmental resources; Social capital and small group; Farmer-led initiative; Communication; Tailored individual planning; Financial support; Intermediary/co-ordinator; Involving wider community.
Factors affecting famers' behaviour towards collective action	Economic incentives; social capital; actions by neighbouring farmers.
Others	-

Name	East Coast Forestry Project (NZL2)
Brief description of the case	Gisborne region has a severe erosion problem. The East Coast Forestry Project (ECFP) of MPI provides landowners with a grant for planting trees and preventing severe soil erosion, which is complemented by the land use rule of the Gisborne District Council (GDC) that requires treatment of severe erosion.
Location	Gisborne region, in the north eastern corner of the central North Island.
Reducing negative externalities Public goods	Reducing soil erosion. Carbon sequestration, improved water quality and biodiversity (public goods).
Emergence of the action	Severe erosion causes long-term damage to agriculture and rural infrastructure and lowers water quality by increasing the amounts of sediment in rivers. In order to address the wide-scale erosion problem, the MPI launched the ECFP in 1992.
Group size	356 grantees, covering 35 552 hectares. Targeted areas are 60 000 hectares.
Participants	Landowners, Local government and Central government.
Activities undertaken by the group	Sustainable land management through afforestation, pole planting and reversion to the native forests by using grants; Providing information to landowners of eroding land; Commissioning research on soil conservation issues.
Landowners' role	Recognising soil erosion problems and contacting GDC/MPI; applying to MPI for funding; implementing treatments: forestry treatments, pole planting or reversion to native forests.
Non-landowners' role	-
Government's role	*Gisborne district Council (local government)*: Helping landowners prepare application and develop plans; establishing rules for targeting areas in the District Plan; and requiring landowners to implement treatment of soil erosion. *MPI (central government)*: Designing the ECFP and providing grants to landowners; auditing the annual claims for payment.
Factors affecting collective action	Severe resource problem; scientific knowledge; large group; commercial forestry; financial support from governments; regulatory measures by a local government; effective collaboration between central government and local government.
Factors affecting landowners' behaviour towards collective action	Economic incentives (funding); approaches from governments; regulatory measures for treatments.
Others	-

Name	North Otago irrigation Company (NZL3)
Brief description of the case	North Otago is a sub region on the east coast of the South Island in New Zealand. In order to access to reliable water, farmers took initiatives and set up the North Otago Irrigation Company Ltd (NOIC), which started the scheme for delivering water on a large scale in 2006, collaborating with local partners, Otago Regional Council (ORC), Waitaki District Council and other organizations.
Location	North Otago region, in the east coast of the South Island.
Club goods	Reliable water supply (club goods).
Public goods	Biodiversity, Cultural values (public goods).
Emergence of the action	Farmers in North Otago area were struggling to access reliable water supplies due to its dry environment and existing allocation pressure on the main rivers in the area. Strong demand for reliable water encouraged farmers to take the initiatives to establish NOC to deliver reliable water.
Group size	100 shareholders, covers approximately 14 000 hectares of farmland in North Otago.
Participants	NOIC, farmers, local governments.
Activities undertaken by the group	Providing farmers with reliable water; Improving water quality and the environment.
Farmers' role	Taking initiatives to form NOIC for accessing to reliable water; Having access to reliable water from the NOIC scheme if they become shareholders of NOIC; implementing the Environmental Farm Plan to achieve sustainable farming.
Non-Farmers' role (North Otago irrigation Company)	NOIC: Providing shareholders with reliable water; auditing farmers and confirming the implementation of Environmental Farm Plan; regularly reviewing environmental performance and reporting progress to Otago Regional Council and other stakeholders; promoting responsible and efficient use of water for achieving environmentally sustainable irrigation development.
Government's role	*Otago Regional Council*: developing water run-off policies with NOIC and has been involved in negotiating drainage agreements between neighbours. *Waitaki District Council,* a founding funder of the NOIC scheme: investing NZD 10 million in infrastructures.
Factors affecting collective action	Broad area; strong need for the resource; club goods (one provider delivers services to many club members); additional environmental requirements; monitoring; financial support from governments; working closely with local governments.
Factors affecting famers' behaviour towards collective action	Economic incentives (access to reliable water, profits from joining the scheme).
Others	-

11. Spain

Name	**Community of Irrigators of Bembézar Margen Derecha (ESP1)**
Brief description of the case study	There are 7 196 communities of irrigators (*Comunidades de Regantes* or CR) in Spain. These water users' associations are made up of owners of irrigated land who are collectively granted a water concession by the State, the resources of which are managed locally (distributed among individual irrigators) following their own water allocation rules. The CR of Bembézar Margen Derecha (right Bembézar river bank or BMD) is a typical community of irrigators taken as a case study.
Location	In the centre of the Guadalquivir river basin (Southern Spain), where irrigated agriculture is a major issue for rural development and water is an increasingly scarce resource.
CPR management Reducing negative externalities	Collective management of common pool resources (common irrigation infrastructures and water endowment) to maintain irrigation facilities and rational water use. Reduction of negative environmental externalities regarding water quantity (minimisation of water withdrawals) and quality (minimising run-offs and diffuse pollution).
Emergence of the action	The BMD irrigation district was established in 1967, after dry land becameirrigated land and owners were collectively granted irrigation water rights. Since then, the CR has managed irrigation infrastructures and water resources.
Group size	The BMD irrigation district covers 11 814 hectares, the CR consists of 1 296 irrigators.
Participants	Owners of irrigated land.
Activities undertaken by the group	Irrigation water was initially distributed by an open network and applied to crops by surface irrigation systems. Because of the large losses in conveyance and application and the increased water demand at basin level, in 2007 the CR modernised their infrastructures resulting in a total investment of EUR 53.8 million. Now the irrigation network is a pressurised system, drip being the dominant irrigation technique. As a result, Irrigation water supply from the reservoirs has been reduced by 40% and polluted return flows have significantly decreased.
Farmers' role	BMD members must pay their fees to cover all maintenance, operation and management costs. They also attend assemblies where the President and the members of the Council and the Water Jury of the CR are elected and other relevant decisions are taken.
Non-farmers' role	-
Government's role	The National government promotes CRs by setting out the basic rules for their operation and monitoring their performance. Furthermore, both national and regional governments partially fund (around 60%) new investments in irrigation infrastructures aiming at improving efficiency in water use (minimising negative externalities).
Factors affecting collective action	Economies of scale; autonomy and self-government; institutional arrangement (enforcement of rules, monitoring and sanctions); democratic government; transaction costs (conflict resolution); technology capacity; social capital; subsidies.
Factors affecting famers' behaviour towards collective action	Obsolete irrigation facilities; profitability enhancement; Improvement of irrigators' welfare through implementing new technologies.
Others	-

Name	Animal Health Association of Pedroches county (ESP2)
Brief description of the case	There are around 1 500 Animal Health Associations in Spain (*Agrupaciones de Defensa Sanitaria Ganadera* or ADGS), created by livestock breeders who aim to implement a common animal health programme in all their farms. The ADSG of Pedroches is a representative case study of these associations.
Location	In the county of Pedroches (2 300 km^2), an inner mountainous area located in the Autonomous Region of Andalusia (Southern Spain). The agricultural sector in this county specialises in extensive grazing animal production systems.
Club goods/ Public goods	Club goods: The primary role of ADSGs is to provide services (implementation of common health programmes) to their breeder members aimed at preventing diseases in their herds (and also presenting transmission of zoonoses). These services are for members only, i.e. club goods (excludable but non-rival goods). Public goods; animal welfare (prevention of disease in livestock) and public health and food safety (prevention of zoonosis). Furthermore, this collective action minimises the environmental impact of animal farming by controlling diseases in the wild fauna, treating zoosanitary residues and providing technical advisory services for sustainable production.
Emergence of the action	The first ADSGs in Pedroches county were established in the 1980s and 1990s. These associations were created at municipal level and included most of their livestock breeders (100-200 farmers each) in order to implement the common animal health programme in a co-operative way. In 2007, the nine existing associations in the county were integrated into a single and larger ADSG.
Group size	The ADSG of Pedroches currently includes 1 650 farmers and manages 85 000 cows (dairy and meat cattle), 230 000 sheep/goats and 140 000 sows at county level.
Participants	Livestock breeders.
Activities undertaken by the group	The implementation of animal health programmes to improve the sanitary status and control of the existing livestock in all farms included in the ADSG.
Farmers' role	Members of the ADSG must pay fees to finance the health and technical services provided. They also attend the Assembly, where the main decisions are taken and the President and the Council members are elected.
Non-farmers' role	-
Government's role	National and regional governments promote ADSGs by setting out the basic rules for their operations, partially funding the implementation of their animal health programmes and monitoring and controlling their performance (requirement compliance).
Factors affecting collective action	Economies of scale (size) and scope (different livestock species and provision of other services beyond animal health); external financial support (subsidies); democratic self-government; legal capacity; Institutional arrangement (enforcement of rules, monitoring and sanctions); social capital.
Factors affecting famers' behaviour towards collective action	Profitability enhancement (efficient provision and availability of subsidies) in a fragile farm economics environment; compliance with complex animal health and welfare requirements; past experiences of outbreaks.
Others	-

12. Sweden

Name	**Söne Mad Grazing Association (SWE1)**
Brief description of the case	The Söne wetland was historically used as a collective grazing land. In 1995, the NPO (Non-profit Organisation), Söne Mad grazing association, was established in order to restore an open landscape rich in biodiversity. The association receives agri-environmental subsidies for the management of the landscape. These payments are for the production of public goods, but they are general agri-environmental subsidies and do not specifically target collective action.
Location	Western part of Sweden, by Lake Vänern in the county of Västergötland.
CPR management	Management of wetlands (common pool resource).
Public goods	Biodiversity, landscape scenery and the recreation possibilities etc.
Emergence of the action	The Söne Mad was historically used as a collective grazing land. Even though ownership was privatized in the 18th and 19th centuries, it was grazed collectively until the mid-20th century, whereafter the land was used by the Swedish Air Force up to 1995. As a result, bushes had grown up. Then the NPO, Söne Mad grazing association, was established to restore the character of the local area, to exploit the grazing possibilities with the aid of the agri-environmental subsidies.
Group size	30 landowners including 3 farmers with cattle.
Participants	Landowners, farmers.
Activities undertaken by the group	Application for agri-environmental subsidies for restoration and maintenance of the fences, using the subsidies.
Farmers' role	Owners of cattle are responsible for maintaining the fences and for keeping a sufficiently high grazing pressure to fulfil the conditions for obtaining the subsidy.
Non-farmers' role	Landowners lease their land to the association.
Government's role	Financial support through the general environmental subsidies in CAP, but no specific involvement of government and no specific subsidy targeting "collective action".
Factors affecting collective action	Cost-savings because of common fencing and a single application for agri-environmental subsidies. A common interest in the current use of the resource in combination with the absence of beneficial alternative use of the area.
Factors affecting famers' behaviour towards collective action	Trust in others and culture of helpfulness, tolerance and flexibility. A small group with simple and sufficiently fair rules.
Others	-

13. United Kingdom

Name	**The "Upstream Thinking Project" of South West Water and the Westcountry Rivers Trust (GBR1)**
Brief description of the case	The Upstream Thinking project, funded by South West Water, aims to improve raw water quality through a collaborative approach that sees landowners informed and assisted in the protection of river catchments as part of an integrated approach to good land management. Tailored one-to-one advice and farm plans are supported by a capital grant scheme.
Location	Four catchments in South West England: the Upper Tamar, Roadford reservoir, Upper Fowey and Wimbleball.
Public goods Reducing negative externalities	Control of non-point source water pollution through measures that protect raw water quality and can in some instances conserve water supplies, mitigate flood risk, enhance biodiversity and capture or conserve carbon.
Emergence of the action	Development and expansion since late 2009 when Ofwat, the water industry regulator, approved all of the proposed investment in catchment restoration work included within the Upstream Thinking Project proposal.
Group size	Approximately 400 farms to date.
Participants	Land managers/farmers, Westcountry Rivers Trust, South West Water, Ofwat, the Environment Agency, University researchers, Dartmoor National Park Authority, Exmoor National Park Authority, Devon Wildlife Trust, Cornwall Wildlife Trust.
Activities undertaken by the group	A collaborative approach which sees landowners informed and assisted in the protection of catchments as part of an integrated approach to good land management. Tailored one-to-one advice and farm plans that focus on both the environment and the objectives of the farm business are supported by a capital grant scheme.
Farmers' role	Acceptance of advice, adoption of best management practices, co-funding of farm infrastructure improvements, and peer-to-peer advice, knowledge sharing and mutual monitoring of practices and water quality.
Non-farmers' role	Research, catchment characterisation and planning, knowledge sharing, outreach and communications, farm advice, fund raising, policy advocacy.
Government's role	Baseline regulation of good farming practice, wider environmental regulation, water industry regulation, water quality monitoring, scientific support, delegation of authority with accountability to locally co-ordinated catchment management.
Factors affecting collective action	A "shared vision" for dialogue and action. Local trust in and acceptance of farm advisors and the PES scheme intermediary. Reliable, fair and accepted regulation of baseline good farming practice. Genuine and sufficient opportunities for farmer and other stakeholder participation in programme planning and decision making, with governance arrangements that are transparent and accountable to local communities and local government. Effective co-operative partnerships between government and non-government organisations with relevant authorities and responsibilities.
Factors affecting famers' behaviour towards collective action	*External factors*: current regulation, potential future regulation, financial incentives including market trends and agri-environmental incentives under PES arrangements. *Internal factors*: production potential and profitability of the farm business, cognition, i.e. awareness of scientific evidence of farming impacts on water quality. *Social factors* including social capital and trust between farmers and with the PES scheme intermediary, WRT.

ANNEX I.B.

GAME THEORY AND COLLECTIVE ACTION

216. Annex I.B briefly provides several simple examples from game theory that relate to collective action. Sandler (1992) provides a more detailed theoretical exposition. The examples presented below show that although the socially optimal provision of public goods is difficult because of free-rider problems, their provision by collective action may be possible under some conditions. Communication and trust among members, repeated opportunities for co-operation and the size of the benefit from co-operating are factors that favour co-operation. In addition, sanctions and voluntary agreements among members can facilitate co-operation and ensure the provision of public goods associated with agriculture.

B.1. Prisoners' dilemma

217. The "prisoners' dilemma" game is typically used to explain why the outcome can be socially suboptimal when individuals act independently rather than co-operatively, and why the social optimum can be difficult to achieve. Game 1 (shown in Table Annex IB.1) is adapted from OECD (2001). Each individual can choose to contribute (at a cost of 8) or not to contribute (at a cost of 0). If only one individual contributes, a non-rival, non-excludable benefit valued at 6 is produced, whereas if both players contribute the value of the benefit doubles to 12. Thus, if only one player contributes, his net benefit is -2 (=6-8), whilst the non-contributing member has a net benefit of 6. When both players contribute, the total benefit of the game is 12 and each player's benefit is 4 (=12-8). In the matrix in Table Annex IB.1, the first number in each cell is the net benefit of Player A and the second is the net benefit of Player B. Clearly, in this game, the dominant strategy for each player acting alone is not to contribute because this yields him a larger benefit than contributing would, regardless of whether the other player contributes or not. However, this result is Pareto-inferior; when they both contribute, the social optimum (the sum of the two players' net benefits) is higher (8 rather than 4), and when only one contributes he is worse off although the other one gains.

218. This game shows that communication among players is important because when they both agree between themselves to contribute, they can reach the social optimum. However, there is a risk of cheating, because an individual's own benefit increases if he becomes a free rider. This illustrates the intrinsic instability of an agreement to contribute jointly. Therefore, trust and social norms that strengthen the keeping of promises are important for reaching the social optimum (Dowling and Chin-Fang, 2007).

Table Annex IB.1. Game 1 (Prisoners' Dilemma)

B's Strategy A's Strategy	Do not contribute	Contribute
Do not contribute	0, 0 (Dominant Strategy)	6, -2
Contribute	-2, 6	4, 4

Source: OECD (2001).

B.2. Repeated game

219. Game 1 is a one-shot game, but in the real world collective action usually occurs in a repeated sequence. Whether games are repeated or not affect the players' strategies. If the number of rounds is known, "backward induction" can be used to infer which strategies will be chosen. If Game 1 is repeated ten times, in the final round non-contribution is the dominant strategy because this last round is equivalent to the one-shot game. Going back to the 9th round, non-contribution is the dominant strategy because even if Player A contributes in the 9th round, Player B does not contribute since non-contribution brings higher benefits to Player B and both players will not contribute in the 10th round. This applies in 8th round and 7th round, and so on. In this way, each player chooses not to contribute in a finite repeated game according to backward induction.

220. On the other hand, the situation of an infinite repeated game is different. In this case, players cannot use backward induction and they know that contributing can yield larger benefits in a long run. Therefore, there is a possibility of co-operation in the infinite repeated game. Moreover, people tend not to think in a long-term perspective but in the short term. Thus, even in a finite repeated game in the real world, a player may decide to contribute. However, many laboratory experiments show that the free rider problem occurs in repeated public goods experiments (Ledyard, 1995). Studies of the benefits of co-operation are extensive and covering this broad field is beyond the scope of this report. The following three games simply illustrate situations in which co-operation might be chosen.

B.3. Privileged game

221. In the context of the public goods game, if an individual receives sufficient net benefits from his contribution, collective provision of public goods may occur spontaneously (Dowling and Chin-Fang, 2007). Game 2 (shown in Table Annex IB.2) is adapted from OECD (2001). It shows that the voluntary provision of public goods may occur if the payoff is high enough. In this game, each player's cost is 6 for a contribution and his contribution yields 8 as a non-excludable and non-rival benefit. If both players contribute, the total benefit of the game is 16(=8+8) and each player's benefit is 10 (=16-6). The dominant strategy is to contribute because contribution brings larger benefits to each player whether or not the other player contributes. This game is called a "privileged game". It "highlights the fact that public goods problems need not result in a Pareto-inferior outcome when net benefits are supportive of individual contributions" (Cornes and Sandler, 1996). Here, collective action may occur without the need for a co-operative agreement.

Table Annex IB.2. Game 2 (Privileged Game)

B's Strategy A's Strategy	Do not contribute	Contribute
Do not contribute	0, 0	8, 2
Contribute	2, 8	10, 10 (Dominant strategy)

Source: OECD (2001).

B.4. Co-ordination game

222. In Games 1 and 2, dominant strategies exist. However, in Game 3 (shown in Table Annex 1B.3), there is no dominant strategy. If there are no dominant strategies, an equilibrium concept called the "Nash equilibrium" is often used. A set of strategies is a Nash equilibrium if each player chooses the best

strategy, given the strategy chosen by the other players (Dowling and Chin-Fang, 2007). There are two Nash equilibria in Game 3; neither player contributes or both players contribute.

223. Game 3 is an example of a threshold/non-linear public good (Figure 2.2). The value of this public good increases significantly if a minimum level of supply is exceeded. In this game, each player's cost is 6 for a contribution and, if only one player contributes, his contribution yields a non-excludable and non-rival benefit valued at 3. However, if both players contribute, the value of the public good produced is 8. Thus, when only one player contributes, his net benefit is -3(=3-6) and that of the non-contributor is 3. If both players contribute, the total benefit of the game is 16 (=8+8) and each player's benefit is 10 (=16-6). Thus, the challenge of this game is to induce both players to contribute and achieve the social optimum by preventing free-riding. However, if the status-quo is non-contribution, neither player has an incentive to contribute unilaterally, since the other may try to be a free-rider.

Table Annex IB.3. Game 3 (Co-ordination Game)

B's Strategy A's Strategy	Do not contribute	Contribute
Do not contribute	0, 0 (Nash equilibrium)	3, -3
Contribute	-3, 3	10, 10 (Nash equilibrium)

224. One way to solve this problem is to introduce a sanction mechanism. Game 4 (Table Annex IB.4) introduces a simple sanction system: if a player does not contribute, he must pay a sanction of 10. By introducing the sanction, it is possible to change the game, and now contribution is a dominant strategy. This example shows that collective action can provide public goods if the rules of the game are changed. However, an important question that needs to be examined is that of *who* should implement the sanction. In addition, a voluntary contribution is ideally better than a sanction. The next example shows a game with a voluntary contribution.

Table Annex IB.4. Game 4 (Sanction)

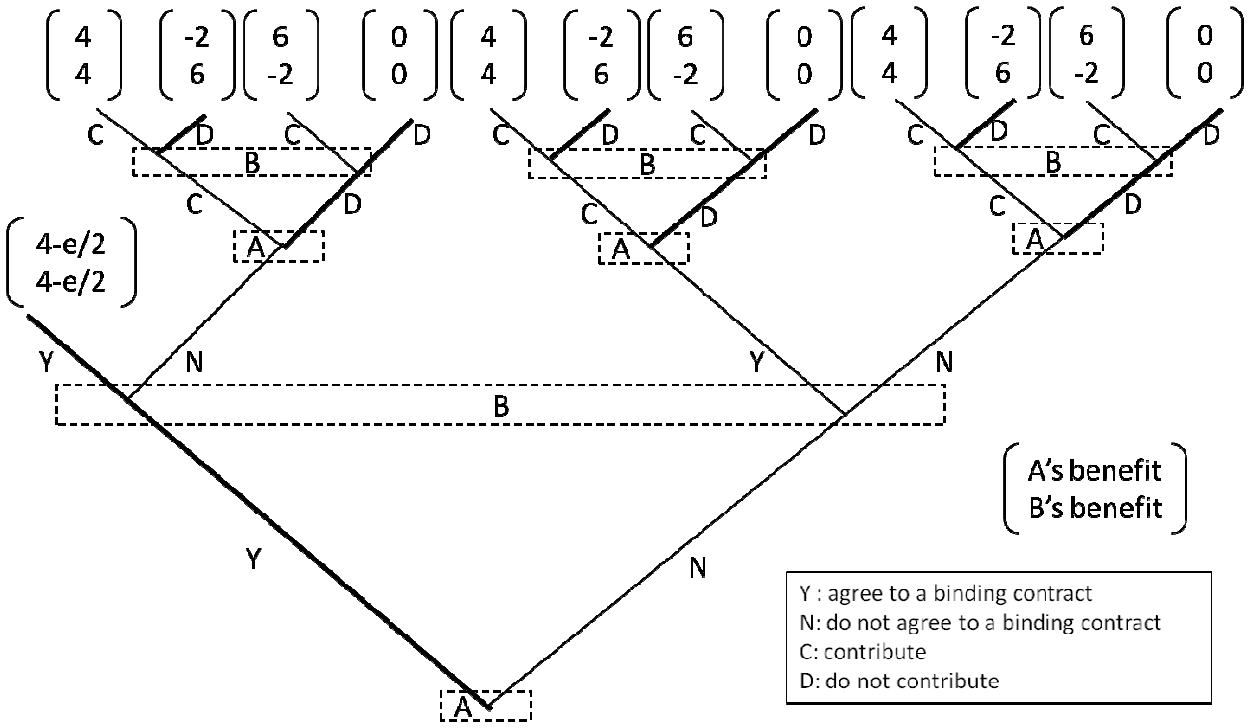
B's Strategy A's Strategy	Do not contribute	Contribute
Do not contribute	-10, -10	-7, -3
Contribute	-3, -7	10, 10 (Dominant strategy)

B.5. Binding contract

225. A binding contract for preventing free-riding designed by participants is able to overcome the prisoner's dilemma. Game 5 (shown in Figure IB.1) is based one presented in Ostrom (1990), but the matrix is the same as the Game 1. In this game, a parameter, *e*, is introduced to represent the cost of *enforcing* an agreement between players. Players need to decide whether they agree or not to make a contract that is binding, i.e. enforceable. It is assumed that the only possible agreement is that both players share the cost of enforcing the agreement equally. Otherwise, players think that the contract is not fair and will not agree to it. This game can be solved by backward induction. If there is no agreement, the result of the game is non-contribution and there are no benefits. However, if a binding contract is made, their benefits are "4- *e*/2". If the enforcement cost of each player (*e*/2) is smaller than "4", players will try to establish an agreement. Clearly, *e* will be lower, the higher the degree of trust and the stronger the social

norms shared by the players. This game shows that contracts designed by participants themselves can lead to collaboration.

Figure Annex IB.1. Game 5 (Binding Contract)



Source: Adapted from Ostrom (1990).

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PART II.

COUNTRY CASE STUDIES

5. THE AUSTRALIAN CASE STUDIES[25]

5.1. Landcare in Australia

226. Landcare is a grass roots movement grounded in local volunteer efforts and stewardship of the land and other natural resources. As members of landcare groups, people across Australia have been taking part for many years in this unique community-based approach that has played a major role in raising awareness, influencing farming and land management practices, and delivering environmental outcomes across Australian landscapes (Australian Framework for Landcare Reference Group, 2012).

227. Landcare groups form when like-minded community members decide collectively to address local environmental issues. Such issues vary widely and might include, for example, prevention of soil erosion, conservation of native vegetation, controlling animal and plant pests, coastal dune management, improving water quality, or protecting indigenous cultural sites. Membership is open to all with an interest and groups set their own agenda and choose their own project sites which may be on private or public land or a combination of both. Groups may apply for funding from a variety of different sources to support their work including local, state and federal government programmes and industry, philanthropic and commercial organisations.

228. Since landcare was formally recognised by the state government in Victoria in the mid-1980s, and later by the Australian Government and other state and territory governments, it has grown and groups could now number as many as 6 000 Australia-wide. Many landcare groups are farmer-based but there are also urban, peri-urban and coastal groups.

229. Successive governments have encouraged the landcare movement and enlisted landcare groups, with their drive and enthusiasm, as partners in addressing national land degradation and environmental problems. Government policies for landcare over the last 26 years have included:

- *Australian Government legislation*, based on sustainable development principles, to provide for grant funding of natural resources management (natural resources are defined as soil, water and vegetation) and to establish an Australian Landcare Council to advise the government on landcare and broader opportunities to support natural resource management at the national level;
- a number of national *grants programmes*, currently the Caring for our Country initiative, which combines sustainable agriculture and environmental objectives,[26] as well as grant programmes provided by local, state and territory governments;

25. These case studies were prepared by Charles Willcocks, a former manager of the National Landcare Program.

26. Broadly grants have been made to support: on-ground works (for example, tree planting, fencing, riparian zone protection, erosion control); resource assessment and planning; innovation; farm management courses; group facilitators and co-ordinators; and, awareness raising.

- a *National Landcare Facilitator*, an individual with special skills to provide a communications link between the landcare movement on-the-ground and the government;
- *associated investment* in land and water research and development.

230. Government support for landcare represents only one element of a range of policies and programmes in Australia for sustainable agriculture and the environment.

231. Non-government support for landcare has included:

- joint support at the national level from the National Farmers' Federation and the Australian Conservation Foundation;
- Landcare Australia Limited, a not-for-profit company which raises awareness for landcare in the broader community, supports the biennial national conferences and national, state and territory landcare awards, and enlists corporate support and sponsorship for the movement;
- a number of state and territory landcare organisations that represent landcare groups' interests collectively, including organising state and territory landcare conferences and award ceremonies in collaboration with Landcare Australia Limited and the government.

232. The principles behind government policies for landcare have been two-fold: one concerned with the repair and rehabilitation of a degraded resource base where the benefits of repair outweighed the cost of undertaking the work; the other aimed at the longer term improvement of management skills, particularly of farmers and pastoralists who own and manage some 60% of Australia's land. This recognised that physical damage to the landscape – an eroded gully, for instance – was the symptom of a problem, the causes of which lay in factors that influenced farmers' management decisions that allowed the erosion to occur. Such factors might include lack of knowledge or understanding, limited finances, attitude to risk or lack of skills (Willcocks, 2008) and the programmes have aimed to remove or reduce these impediments.

233. On-ground work is often carried out on private land across a number of farms, producing a mix of public and private goods, where some of the benefits accrue off-site. Accordingly, preference has been given to applications for grants from landcare groups that have included significant inputs by the group themselves – often in-kind, in terms of labour, including skilled labour, technical support, and loans of equipment. This has contributed to the cost effectiveness of the programmes. Estimates vary, but an evaluation of the landcare programme in 2007 valued project applicants' contributions at AUD 1.8 dollars for every one programme dollar provided (Hyndman *et al.*, 2007).

234. In establishing programmes which encourage community ownership of resource management problems, governments have accepted the principle that communities are likely to value highly their local environment as well as any resource management projects and activities that they had planned themselves. The combination of the "bottom up", independent local community groups, operating within the "top down" framework of government policies and programmes and regional and catchment natural resource management planning is a key feature of the landcare movement in Australia. This is the context for the two farmer-based landcare case studies provided below.

5.2. Mulgrave Landcare and Catchment Group Inc.[27]

Outline of the case

235. The Mulgrave River is one of two perennial waterways that drain the coastal and alluvial flood plains to the south of the city of Cairns in far north Queensland. The major natural resource management issues in the area are: nutrient and soil runoff from agriculture into waterways and thence into the sea affecting the Great Barrier Reef World Heritage Area; weeds and feral animals; and, loss of riparian vegetation resulting in habitat loss and poor water quality. An emerging issue is competition for aquifer water to supply Cairns while maintaining environmental flows in the dry season.

236. A farmer-based environment group, the Mulgrave Landcare and Catchment Group (MLGC), has been active for some years in addressing the natural resource management issues in their area.

Area

237. The Mulgrave catchment lies in the wet tropical region of north-east Australia, a region characterised by high seasonal rainfall ranging from 2 000 mm to 5 000 mm annually. The catchment area of the Mulgrave River is 877 sq km and the alluvial plain, bounded on the east and west sides by mountain ranges, averages 3 km in width. The Mulgrave River joins the Russell River just before discharging 17 100 megalitres annually between them into the Great Barrier Reef lagoon. Severe annual floods give the area many of its land-use challenges.

238. Most of the catchment is rugged mountain range and remains in a relatively pristine state, with about two thirds of the catchment protected as part of the Wet Tropics World Heritage Area. Some 16% of the region is developed for agriculture with sugar cane production the dominant activity. Bananas and other tropical fruits and beef cattle are also produced.

239. There are 26 community-based groups operating over the region's seven catchments. Terrain Natural Resource Management Limited, one of the 56 regional and catchment management bodies in Australia charged with natural resource management administration and planning, provides support for these groups through memoranda of understanding in the form of coordinators, offices, vehicles, equipment and administrative support.

The group

240. The MLCG formed originally in 1990 after local farmers, on a visit to a neighbouring area, were impressed by a rehabilitated creek adjoining farmland and decided to do the same thing in the Mulgrave catchment.

241. The MLCG was established in its present form in 2000. It started as a farmer-driven group; three quarters of the membership were farmers and the balance was made up of others associated with the sugar industry such as researchers and mill staff and townspeople. It now has a wider membership with more people from the local urban centres participating. Currently the MLCG has 48 financial members, and 60 volunteers who regularly assist with tree planting projects.

242. The MLCG's priorities are:

27. The assistance of Fiona George, regional landcare facilitator at Terrain, and Bruce Corcoran, the MLCG coordinator, in the preparation of this case study is gratefully acknowledged.

- riparian and wetland restoration;
- sustainable and profitable agriculture;
- water quality;
- community engagement and partnerships.

243. The group has had a full-time co-ordinator since 2002, paid for by Terrain through Australian Government programmes. Landcare coordinators (or facilitators) provide support for their groups, assisting with planning and administration, communications and organisation of activities. Coordinators and facilitators have become critical to the effective operation of landcare groups and important figures in their local communities. The current coordinator, Bruce Corcoran, has been with the MLCG for 12 years.

Public goods provided by collective action

244. The prime focus of the group's programme has been on the Mulgrave River, and on streams and wetlands in the catchment. On-ground works undertaken by the group have contributed to the amenity of the catchment, improved water quality and habitat for native birds and animals. A major public benefit is a reduction in the level of sediments and nutrients discharging into the Great Barrier Reef lagoon.

245. In addition, the group has been active in raising awareness about issues affecting the local environment such as demands for water for urban supply, waste management and sand mining.

Group activities - collective action

246. MLCG has undertaken 18 major projects (and numerous minor ones) over the past ten years and, in addition, has three projects currently underway. Its activities can be categorised under three broad headings: river, stream and wetland projects; on-farm projects; and, community awareness and conflict resolution. Because of the nature of the on-ground work, there is some overlap between these activity groups.

247. Revegetation has been the most significant activity across all project activities. The group has estimated that it is planted nearly 70 000 native trees over the last eight years and spent AUD 850 000 on on-ground works.

River, stream and wetland projects

248. Riparian rehabilitation has included removal of weeds, revegetation of stream banks with local native trees and shrubs and, where necessary, earth and rock works undertaken and sediment traps installed to limit further damage; removal of debris and repair of the damage caused to waterways by natural disasters (in one case following cyclone Larry in 2006); mapping of the catchment's wetlands; and, demonstrations to landholders of sediment trapping and waterway revegetation.

On-farm projects

249. Wanting to lighten the sugarcane farming industry's environmental footprint, in 2005 the MLCG focussed on developing three on-farm management practices – variable rate fertiliser application, direct drilling of legumes through the cane trash blanket and strategic minimum tillage for cane planting. These practices had the potential to reduce nutrient and sediment loads in the Mulgrave River and its tributaries thereby reducing damage to the Great Barrier Reef. Lack of equipment to apply these techniques was inhibiting the adoption of new low-fallow management practices on sugarcane farms.

250. MLCG members, with the aid of grant funding, designed and constructed three items of equipment – a zonal tillage implement which reduced soil disturbance, a direct-drill legume planter and a variable-rate fertiliser applicator. The group undertook trials and demonstrations of the equipment across the region with the result that the rate of adoption of the equipment has steadily increased and the use of zonal tillage in particular is now industry-wide, with the equipment being manufactured commercially. The outcome has been the achievement of the group's aim to develop cheap and reliable machinery which combined profitable farming with environmental outcomes.

Community awareness and conflict resolution

251. MLCG is active in the community, with a landcare centre in Gordonvale, the main town in the catchment, a website and a newsletter. The group organises community volunteers for tree planting events, raises awareness of the community about environmental and sustainable agriculture issues and engages local schools in landcare activities. The group makes active use of the local press in its communication activities. The group's corporately funded schools programmes is aimed at raising the environmental awareness of upper primary and high school students, and engaging them in practical activities such as tree planting.

252. A major current issue for the community is the possibility that water for the city of Cairns may be drawn from the Mulgrave River aquifer. This could reduce surface flows in the region's waterways in the dry season with possible adverse effects on fish breeding, riparian vegetation and amenity. The MLCG is taking an active part in reviewing the feasibility study and advising the community of developments.

Funding for activities

253. Funding for MLCG's projects has come mostly from successful competitive bids to a range of Australian Government, and state and local government natural resource management programmes. Applications may be triggered either through an offer from the regional organisation (Terrain) or in response to calls from the various programmes. The availability of programme funding to address priority issues in the regional natural resource management plan is a major influence when the group is drawing up its forward plans. The capacity of the group to undertake and complete the project is an important consideration when bids are being assessed, as are the group's own contributions and its ability to engage the community and raise awareness of the resource management issues being addressed by the project.

254. MLCG's works have been undertaken on both public and privately owned land, with farmers providing access for the group's riparian projects and hosting landcare field days and tours. In some cases, where farmers own the stream banks, they have given up use of land to enable trees to be established and usually assist with this. The group facilitator estimates the value of volunteer and in-kind support to be in the order of AUD 50 000 annually.

Roles of stakeholders

255. The following table summarises the roles of farmers, non-farmers and governments for this collective action.

Table 5.1. Roles of stakeholders (MLCG)

Farmer's roles	Non-Farmer's roles	Governmental roles
• The core of the MLCG's management committee, which manages the group's activities and plans it programme of activities. • Provide a large proportion of the volunteer effort of the group as well as machinery and other equipment used in site preparation and infrastructure works. • Have been active in the design, construction and trialling of innovative sugarcane farming equipment and provide access to land and riparian zones for community projects.	• The non-farmer members of the MLCG are drawn from the local urban and peri-urban community and include staff from the local sugar mill and sugar research station. • Provide volunteer labour and diversity in approach to handling resource management issues. • Active school principals, staff and parents and significant corporate funding support the schools' programme.	• Project funding through long-running government funded natural resource management programmes. • Technical and scientific information from a range of public research agencies. • Funding for a group facilitator. • Administrative support. • A comprehensive regional institutional and planning framework.

Factors affecting the group's operations

256. MLCG attributes its successful operation to the following factors (Australian Government, 2007):

- strong support from the regional natural resource management body (Terrain);
- staying independent and locally focussed;
- high levels of practical skills;
- innovative members who design and trial new equipment;
- strong partnerships based on peer groups;
- building linkages between issues such as biodiversity and water quality and the ideal of sustainable and profitable agriculture.

257. What is not so evident in this list are a number of other factors that underpin group functioning and vitality and are present in the MLCG:

- *strong local leadership* – individuals in the community that work tirelessly to articulate a vision, encourage participation and build the political coalition necessary to support landcare (Curtis, 2003);
- *long-term membership* – provides for stability and continuity - three current farmer members have been members since 1999 and one has not missed a meeting in that time;
- *an experienced, committed and well-qualified coordinator/facilitator* – the current coordinator, who has been with the group for 12 years, has a science degree and business experience, is a farmer and has considerable practical skills;

- *sound governance arrangements* – MLCG
  - is established as an incorporated not-for-profit association under the Queensland Incorporated Associations Act, and has an executive committee of 4 comprising a chairman, vice-chairman, secretary and treasurer (most government programmes require groups to either be a legal entity or be sponsored by legal entity enabling them to take contractual responsibility for managing any grants);
  - members pay a nominal subscription;
  - holds monthly meetings (apart from monthly executive committee meetings) which are open to the public, generally with a guest speaker;
  - manages an annual budget of around AUD 110 000 which is likely to rise to AUD 140 000 a year in the future, with funding recently approved for a large six-year biodiversity project.

258. The group co-ordinator has reported several factors that work against effective group operations. These include a preference of some farmers in key locations to work independently, divisions of opinion about the best courses of action and lack of resources or difficulty in gaining access to resources. Many landcare groups and group co-ordinators complain about the "level of bureaucracy" associated with applying for and managing grants, generally a reflection of the time required to prepare applications and progress reports, and audit expenditure. Group members would agree, however, that proper management of, and accountability for externally sourced funds are appropriate and necessary requirements.

5.3. Holbrook Landcare Network[28]

Outline of the case

259. The Holbrook Landcare Network, in various forms over more than 20 years, has been active in the Holbrook region in south-eastern Australia in undertaking landcare activities which address the main natural resource management issues on and off-farm of habitat loss, dryland salinity and soil erosion.

Area

260. The town of Holbrook is situated on the south west slopes of New South Wales, a mixed farming region of south-eastern Australia. The area is characterised by gently undulating hills ranging in elevation between 300 m and 600 m. The climate is cool temperate and rainfall at Holbrook averages 700 mm annually. The region borders to the south on the River Murray, one of Australia's major rivers. Agriculture is the dominant land use and the region supports a diverse agricultural sector with grazing of sheep and cattle, dryland cropping and forestry being the main enterprises. Farm sizes range from 400 ha to 3 000 ha. The region is characterised by acid soils of medium fertility which are prone to erosion, especially on steep slopes. Dryland salinity, a problem is some areas, is less evident following prolonged drought and extensive planting of perennial pastures.

261. Vegetation in the region has been significantly modified with 85% of the original vegetation removed and replaced by introduced pastures and crops. As a result, the grassy box[29] woodland, the predominant ecosystem in the region is classified as endangered. Such woodlands contain a high proportion of threatened bird species (Murray Catchment Management Authority, 2007).

28. The assistance of Chris Cumming, the Holbrook Landcare Network Executive Officer, in preparing this case study is gratefully acknowledged.

29. Box is a group of eucalyptus species comprising, particularly in this region, White Box (*E. albens*) and Western Grey Box (*E. microcarpa*).

262. The south west slopes region is part of the River Murray catchment and natural resource management in the catchment is the responsibility of the Murray Catchment Management Authority (Murray CMA), one of the 56 regional and catchment management bodies in Australia. The Murray CMA provides support for landcare groups and networks in the area and project funding through partnerships and competitive bidding processes. In 2011, there were 16 active landcare and farm producer groups in the Murray catchment.

The group

263. The Holbrook Landcare Group was originally established in 1988 as a "Trees on Farms" group to address the growing land degradation problems within the Holbrook area. It was re-formed and subsequently expanded to cover a wider area and increased membership as the Holbrook Landcare Network, generally known as Holbrook Landcare. The network has grown to cover 240 000 ha in the region but it provides services and distributes information well beyond the core area. It has a current membership of 350, representing about 75% of landholders. Information is distributed to a network of 1 800 people. Some smaller landcare groups in the area have amalgamated with Holbrook Landcare, and Holbrook Landcare supports and mentors other groups which benefit from the access, information and services it provides.

264. Holbrook Landcare has an office in Holbrook. It has a full-time facilitator, the network's executive officer, who has been with them since 2008. There is also a number of project and administrative staff to service Holbrook's expanding work programme.

265. Holbrook Landcare's environmental and agricultural aims are to support its members to:

- be productive and profitable;
- reside within a strongly connected and supportive community;
- reside in a community with a culture of care for the land;
- be independent land managers with access to a range of information to support decision making.

266. The group has managed external funding of around AUD 500 000 annually over the last three years, which together with its own in-kind contribution of an estimated AUD 400 000 and contributions from partners of AUD 160 000, has meant that the group is currently investing some AUD 1 million a year in its sustainable agriculture and environment programmes. The group estimates that for every dollar of external funding received for on-ground work the group contributes four Australian dollars' worth of in-kind support in the form of volunteer time and equipment.

Public goods produced and negative externalities reduced by collective action

267. Public benefits in Holbrook Landcare's area are associated largely with vegetation management and include biodiversity enhancement, increasingly, establishment and protection of carbon stores, and addressing the negative externalities associated with dryland salinity and soil degradation and erosion. The value of paddock trees also lies in the shelter and shade they provide for livestock, the connectivity for wildlife and the beauty in the landscape.

268. Public benefits are also produced by activities which raise the awareness of the community, particularly the farming community, about sustainable agriculture and environmental issues and provide advice on management techniques. Giving farmers the capacity to understand and address degradation problems such as soil erosion or dryland salinity at source – on the farm or on a number of farms - has the effect of reducing off-site effects such as salt, sediment and nutrient loads in streams. In addition to

servicing its members, Holbrook Landcare members are represented on catchment planning, research and industry committees. In this way, Holbrook Landcare considers that it is contributing significantly to the agricultural, social and emotional resilience of their catchment.

Group activities – collective action

269. Holbrook Landcare engages in a wide range of activities which fall under the broad headings of vegetation management, awareness raising and partnerships

Vegetation management

270. Trees and planted perennial pastures have reduced soil erosion and, where planted on groundwater recharge sites, reduced waterlogging and the rise of saline groundwater in discharge areas which may be located some distance away from recharge sites. Revegetation can contribute to the maintenance and enhancement of carbon stores. It can also improve the functional connectivity of habitat for native flora and fauna populations and improve gene-flow, previously interrupted by fragmentation.

271. Holbrook Landcare has planted or supported the planting of an estimated 3.5 million trees and shrubs and has protected 5 000 ha of remnant vegetation. Plantings have been funded from a range of Australian Government and New South Wales state government natural resource management programmes, sourced by the group by applying through competitive bidding processes.

272. The group has also received corporate funding for tree planting under the eTree programme. The eTree programme is a partnership between Computershare, a company which manages a share register for a number of major Australian companies, and Landcare Australia, the company that amongst other things raises corporate sponsorship for landcare Australia-wide. eTrees, launched in 2004, is an environmental incentive scheme under which companies make a donation to landcare each time a shareholder elects to receive company reports and information electronically rather than in hard copy form.

273. Research has confirmed the value of Holbrook Landcare's vegetation work. Assessments were undertaken in 2004 to 2006 by CSIRO[30] Sustainable Ecosystems of the contribution of tree plantings on woodland birds (Barrett et al., 2008). The results showed, amongst other things, that planted sites provided suitable habitat for woodland species, with increased diversity of birds in planted sites relative to paddock sites. Planted sites, with their increased volume of low, dense vegetation cover made these sites preferable for bird breeding activity. Predation of pest insects such as caterpillars, beetles and grasshoppers by birds contributed to the health of paddock trees in planted sites.

Awareness raising

274. Holbrook Landcare is active in keeping the group and the community abreast of developments in sustainable agriculture and the environment. It has an office or landcare centre in Holbrook, which provides a drop-in centre for the community and communication hub for dissemination of information across the area to a contact list of 1 800 people. Awareness raising activities organised by the group include farm field days and tours, seminars and workshops and projects examining fertiliser use, management of native vegetation, management of crop stubble and direct drilling of crops and pastures to reduce soil disturbance and erosion. Communication activities make use of newspaper articles, district newsletters and school projects.

30. CSIRO, the Commonwealth Scientific and Industrial Research Organisation, is Australia's national science agency.

Partnerships

275. Holbrook Landcare has been successful in developing partnerships with a number of research, industry and environment agencies. Holbrook Landcare is also a partner in the Slopes to Summit programme, part of the Great Eastern Ranges initiative which aims to improve the connectivity, condition and resilience of landscapes and habitats in eastern Australia and achieve an associated halt to further decline and loss of species.

Roles of stakeholders

276. The following table summarises the roles of farmers, non-farmers and governments for this collective action.

Table 5.2. Roles of stakeholders (Holbrook Landcare)

Farmer's roles	Non-Farmer's roles	Governmental roles
• Holbrook Landcare describes itself as a producer (farmer) organisation with "a passion for innovation and excellence in agricultural and environmental pursuits." • Nine of its eleven member management board are producers, some with many years on the board and several with a mix of backgrounds including research and financial management. • Provide volunteer effort for the range of group activities including managing on-ground works, field days, demonstrations, talks and presentations and representing the group on external committees. • Provide land and livestock for field trials.	• Non-farmers, including people from local towns, contribute to group activities as volunteers. • Scientists and agricultural industry specialists sit on Holbrook Landcare advisory groups and sub-committees, including soils, grazing, beef and climate change, and a number of project committees, covering such areas as fertiliser use, bore monitoring, pasture management and biodiversity. • One member of the management board is an accountant and one an agricultural research director.	• Project funding through long-running government funded natural resource management programmes. • Technical and scientific information from a range of public research agencies, • Funding for a group facilitator. • A comprehensive regional institutional and planning framework. • Holbrook Landcare in particular has been active in engaging government research agencies in projects in its region.

Factors affecting the group's operations

277. Holbrook Landcare's success is based on *sound governance* (Holbrook Landcare is established as a not-for-profit Australian public company under Australian Government legislation) and *an active and innovative 11 member board* comprising a mix of farmers and other specialists with many years of board and land management experience. *Local leadership and community familiarity* with community-based arrangements for managing local services is important to the stability and continuity of local institutions: for example, the local bushfire brigade and emergency services rely on volunteers and are managed under governance arrangements similar to those applying to the landcare group, with many of the same people serving on more than one executive committee.

278. The Holbrook group almost closed down in the mid-2000s as a result of *changes in government policy and funding regimes*. The board and the group's executive officer have been instrumental, since 2008, in reviving the group, changing its structure and broadening its coverage. The executive officer's efforts were recognised when she was nominated for a landcare facilitator/coordinator award in the 2010 National Landcare Awards. *Recognition and celebration* of outstanding performance by groups and individuals is an important feature of the landcare movement in Australia.

279. *Prolonged droughts* during the decade to 2010 were a major factor influencing farmer profitability and environmental health and community group activity. By maintaining a strong communication network the landcare group has helped to keep the community engaged, encouraging farmers to work together, learn from each other and develop a shared culture of care for the land, resulting in a high level of uptake of best practice agricultural practices.

280. According to the group executive officer, *climate variability* has had a major impact on farming systems as farmers move to adapt to a possibly drier climate by increasing the proportion of cropping in farm enterprises. Education aimed at maintaining resilience in farming systems in response to market and environmental changes is a priority for the group.

281. The group executive officer has pointed out that *government and industry grant funding* based on a maximum of three years and a competitive application and assessment process presents problems for the group by creating organisational uncertainty, particularly in the funding of base staff salaries and group overheads.

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6. THE BELGIAN CASE STUDIES[31]

6.1. Introduction: the provision of public goods by farmers in Belgium

282. The provision of public goods by farmers in Belgium is regulated primarily at the regional level by subsidy schemes organised by the regional (Flemish and Walloon) governments,[32] with European co-financing. The most important instruments in this category are the agri-environmental schemes of the second axis of Pillar II of the Common Agricultural Policy (CAP) which provides funds for individual contracts with farmers to protect green areas, specific landscape elements, or limit external inputs that endanger the environment. Projects financed by the European Regional Development Fund (Objective 2 and Interreg projects) are also important in promoting the provision of public goods and government agencies can also involve farmers directly in the management of public nature areas. Furthermore, some sector organisations (either linked to nature protection or agriculture), or regional organisations (e.g. the Regional Landscapes in Flanders and Parcs Naturels in Wallonia) involve farmers in the management of nature conservation areas or the provision of specific public goods. Finally, and the subject of this case study, new forms of co-operation between farmers and private companies or semi-private organisations are emerging. Private or semi-private organisations engaging in this area are usually those that benefit from improved water quality (e.g. a water company) or landscape (e.g. tourist organisation or interest group).

283. Two case studies in the Flemish region where agri-environmental public goods are provided through collective action are presented. The first concerns the strategic installation of buffer strips in the Dommel Valley in the province of Limburg, a project initiated by a local organisation that is at the interface of agriculture and nature protection. The second describes the co-operation between a water-providing company and farmers in the province of Antwerp. Both case studies are examples of collective action by providers and beneficiaries of public goods that are neither initiated nor led by the government. The aim of both projects is to reduce the negative externalities of agriculture and, more specifically, to improve the quality of surface and groundwater.

6.2. Case studies

Strategic installation of buffer strips in the Dommel Valley

284. This case study describes the co-operation between farmers and the local water management institute, the so-called "Watering" in the Dommel Valley in the north of the Belgian province of Limburg. Co-operation is organised within the framework of the project "Management of brook banks in the basin of the Dommel and Warmbeek Rivers" initiated by the Watering of the Dommel Valley, the province of Limburg and seven municipalities in the north of the province. A brief description of the case is provided first, followed by more specific information on the type of collective action and the public goods which are provided through the project. In the third section, the factors influencing the successful co-operation with farmers is examined. The final section will examine more closely the role policy measures play in

31. This case study was prepared by Evy Mettepenningen and Guido Van Huylenbroeck from the Department of Agricultural Economics, Ghent University, Belgium.

32. Since the Lambermont agreement in 2001, almost all authority regarding agriculture in Belgium was transferred from the federal to the regional levels.

promoting co-operation. The description of the case studies is based on reports and an interview with Annelies Gorissen from the Watering, who was the main person responsible for the project until end of 2011.

Description of the case

Watering the Dommel Valley

285. Waterings are one of the oldest institutions in Belgium, with the first recording dating from the 12th century, and they are included in the Constitution. Originally, Waterings were associations of land owners and users who performed works aimed at draining land for agriculture. But from the 1980s onwards, as a result of heavy floods and the decay of nature and landscapes due to bad water management, the Waterings were gradually transformed into organisations responsible for integral water management at the local level. They attempt to find a balance between their original draining responsibility and respect for other land uses, nature and landscape. Flanders counts 35 Waterings and all people owning more than 3 ha of land in the operational area of a Watering are by law members of its General Assembly. A Governing Board is responsible for implementing the decisions of the General Assembly and its daily management. This board is composed of nine board members, a chairman and a vice-chairman, who are elected every six years by the General Assembly.

286. The Dommel Valley Watering was founded by the Royal Decree of 15 July 1959. Situated in the north of Limburg, in the municipalities Peer, Hechtel-Eksel, Overpelt and Neerpelt, it covers an area of about 1 830 ha. They pursue a differentiated policy, depending on the spatial planning destination and land use of the area. In agricultural areas, they work in close co-operation with the local farmers, citizens and other land users (Watering the Dommel Valley, 2012).

Co-operation of the Watering with farmers

287. Over the years, different regulations have resulted in a lot of pressure on the banks of waterways. As a result, it is now forbidden to apply manure on land within 5 metres of the waterway, to use pesticides, to tillage, and objectives specific to nature have been developed (for example, to build green corridors). The need to comply with the European Water Framework Directive (2000/60/EC), which states that by 2015 European rivers and brooks should be in a good state also plays a role in the new approach to waterways. The Flemish Decree Integral Water Management of 18 July 2003 states that local governments are allowed to expropriate the banks of rivers and brooks to achieve a good water quality.

288. There is much pressure on the Waterings to improve the water quality of rivers and brooks within their territory, but also on farmers who face a risk that the government will change the designated use of their land (from agricultural to nature protection area, resulting in many extra restrictions) with the result of their land being expropriated. To achieve good water quality of brooks in the agricultural areas of the Dommel, the Watering decided to explore the option of working with farmers on the basis of voluntary measures (coupled with subsidies).

289. For several reasons, the Watering was originally not in favour of imposing measures on farmers nor to expropriate them. It is highly connected to the agricultural sector, and many of its board members are farmers who want to preserve agriculture in the valleys. In addition, the Watering is a regional organisation in close contact with the local people and wants to maintain their support for its activities. Finally, the Watering prefers to encourage farmers to take action themselves, to try to use the inferior pieces of land (from an agricultural perspective) for other profitable purposes before any attempt by the government to impose stricter rules. This would, ideally, also improve the image of agriculture. The

Watering believes that if farmers take action to improve the water quality of the brooks, this will decrease the probability that government will expropriate the brook banks in order to secure better water quality.

290. Thus, the objective of the Watering was to find a win-win situation where farmers would receive compensation for their less valuable land on the banks and the Watering would be assured of good water quality and facilitation of the yearly process of cleaning the brooks. It is for this reason they launched the project "Management of brook banks in the basin of the rivers Dommel and Warmbeek". This project is supported, financially and operationally, by the province of Limburg (as a partner of the Watering) and all the municipalities located in the valley of the Dommel and Warmbeek Rivers (Bocholt, Hamont-Achel, Hechtel-Eksel, Lommel, Neerpelt, Overpelt and Peer). Its aim is to motivate farmers to install interconnected buffer strips alongside the brooks and to manage the land strips. This project was inspired in part during a visit of the Watering employees to the Netherlands where they met the managers of the project "Active Bank Management in Brabant," which sought to encourage farmers to engage in the management of river and brook banks.

291. The project, which began in 2006, is distinguished by three main stages. The first consisted of setting up a small-scale pilot project alongside the Bolissenbrook in the municipality of Peer, and in which nine farmers co-operated to install a 5 km-long buffer strip. This pilot project was used as an example and received the financial and operational support of the province of Limburg and the Flemish Land Agency (government actor at the Flemish level). In the second stage of the project, the Watering explored the potential to expand it and additional buffer strips were installed. Finally, in the third stage, the project received European co-financing by becoming part of the Interreg IVa project "Interactive water management at the border between Flanders and the Netherlands." This new financing allowed seven municipalities in the north of Limburg to join the project and over the years, 32 km of buffer strips have been installed.

Collective action and providing public goods

292. The project seeks to create interconnected buffer strips, which are 6 metres wide and covered with a grass mixture, on the banks of brooks that run through agricultural land. The main objective is to improve the water quality of brooks by reducing the runoff, leaching and drift from fertilisers and pesticides, and thereby the negative externalities of intensive agriculture. Furthermore, the ban on fertilisers and pesticides and the adapted mowing of the buffer strips should increase the biodiversity of brooks and their banks. This has advantages not only for nature, but for the agricultural sector as buffer strips attract pollinators (such as bees) and predators of aphids, caterpillars and other harmful insects. Finally, buffer strips accentuate the structure of the waterways in the agricultural landscape and increase their attractiveness by providing flowers and region-specific vegetation. The project specifically strives to ensure that buffer strips are interconnected so as to increase their effectiveness.

293. In Flanders, the Flemish Land Agency provides subsidies to farmers who install and manage buffer strips. The project tries to make use of these existing subsidies and promotes them to farmers who have land bordering the brooks they are interested in. They visit each farmer personally and as it usually takes two or three visits to convince a farmer to have buffer strips, it is a very intensive way of working. In promoting the agri-environmental scheme, the project tries to remove all practical barriers for the farmer, for example by helping farmers when they apply for a tree felling permit,[33] or by advising them on problems with other Waterings, nature organisations or municipalities. People from the Watering also provide advice and practical solutions to manage buffer strips, such as providing machinery or organising help from another farmer. Installing buffer strips to ensure easy maintenance is done by the Watering itself.

33. This is necessary in Flanders to be authorised to remove trees.

294. An indirect effect of this project is that it can help increase the popularity of nature and landscape management in the farming population. In Flanders, nature and landscape management is not popular in agricultural circles. One reason is that there are many sandy soils, especially in the region where the Watering is active, which require much effort to be transformed into good agricultural land. So farmers are tied to their land and do not easily give up a part of it for nature protection purposes. Secondly, Flemish farmers fear that creating nature elements on their land will result in the government changing the designated use of the land from agricultural to nature protection land, with the result that many extra restrictions on farm management will be enacted. This has been the case in the past in other areas and is a sensitive issue in Flanders where agricultural land is scarce. However, the brook banks project is mainly about improving the water quality. The project tries to convince farmers who are not against this aim in principle, that nature and landscape management do not necessarily pose a threat to the agricultural sector and may even secure a stronger acceptance of this sector in society.

295. Finally, the project aims to motivate other water managing organisations (like other Waterings, drinking water companies, government bodies, etc.) to promote voluntary measures to install buffer strips alongside brooks as a worthy alternative to expropriating agricultural land. In the province of Limburg, two other Waterings have set-up a similar project in the municipality of Lanaken with the support of the province.

Factors influencing the success of collective action

296. There are five factors that contributed to this successful co-operation: providing tailored solutions through personal (informal) contacts; creating trust by remaining neutral; giving responsibility to the farmers; striving for a win-win situation; and giving farmers time to get used to the ideas of this project.

Providing tailored solutions through personal (informal) contacts

297. There are many different attitudes amongst farmers towards buffer strips and how to manage these. Whereas some prefer a wilder appearance, other farmers like to keep their buffer strip short and neat. This preference depends not only on the farmer himself, but on how his local peers manage their buffer strips. It is difficult to know beforehand how much effort will be required to convince a farmer and how he would like to manage the buffer strip. Therefore, it is important to go to the farmer personally and to talk about the situation and his preferences, and then work on a tailored solution.

298. The Watering is a local organisation, familiar with the local situation and people, and the people know the project managers of the Watering. This provides opportunities for informal contacts, which are very important to identify problems. Knowing the farmers is also important in order to choose a good reference farmer. Indeed, when the Watering tries to convince farmers to participate, they usually refer to other farmers who are already involved. Thus the importance of choosing a farmer who is trustworthy and admired by his peers. Choosing such a farmer requires a good knowledge of the local situation and people.

Creating trust by being neutral

299. As mentioned above, promoting nature and landscape management in agricultural circles is not easy in the Flemish context. There is much distrust between the agricultural sector and organisations or government administrations related to nature. However, because of its activities and the composition of its board, the Watering is not considered as belonging to agriculture or nature protection, nor as politically connected; on the contrary, it enjoys a neutral profile. This was especially important in municipalities

where there is significant polarisation between agriculture and nature because of incidents from the past[34] or conflicting characters.

300. In their contact with farmers, the Watering tries to see things from their perspective as well as to use the farmer's jargon. This contributes to building trust. The Watering also tries to create goodwill towards the project with local nature organisations by asking their advice on grass mixtures to sow on the strips, lands they find valuable for creating buffer trips, locations where buffer strips can be connected to existing nature areas, etc. Through its activities, it contributes to greater mutual understanding between nature and agriculture, in addition to a better local atmosphere.

301. Finally, the project managers of the Watering try to connect with relevant organisations that work at the interface between agriculture, nature and water outside the region to learn from their experiences.

Giving responsibility to the farmers

302. The Watering tries not to provide concrete solutions to farmers to manage the buffer strips. It will occasionally give practical advice, but leaves the farmer to discover himself what is best practice on his land. Avoiding excessive regulation is appreciated by farmers who already operate in a very complex administrative environment. Leaving them the initiative also enables farmers to demonstrate their skills.

Striving for a win-win situation

303. The Watering itself does not have the resources to give a financial compensation, but assists farmers to apply for government subsidies (e.g. to obtain support from the agri-environmental schemes offered by the Flemish Land Agency). The Watering also aims to remove as many practical barriers for the farmer as possible: it installs the buffer strips, performs paperwork, links farmers to colleagues who can help them to manage the strips, etc. Finally, when the Watering project managers visit farmers with regard to maintenance of buffer strips, they try to help the farmer with other issues or problems, e.g. by referring them to the appropriate government agencies.

Giving the farmers time to get used to it

304. For some farmers, managing nature is something completely new and it is important to introduce this gradually. The project managers of the Watering start by explaining the effects of the strips on water quality. In the beginning, the buffer strip is sown with a predominantly agricultural grass mixture. After a certain time has passed and the farmer is familiar with this new situation, the Watering begins to introduce other elements related to nature and the landscape, as well as promote a different composition of the buffer strip, e.g. one containing more flowers.

Role of policies in stimulating co-operation

305. In order to set up the buffer strip project, the Watering received support from the province of Limburg and the municipalities of Bocholt, Hamont-Achel, Hechtel-Eksel, Lommel, Neerpelt, Overpelt and Peer. However, their main source of financing was provided by the Interreg IVa project "Interactive water management at the border between Flanders and the Netherlands" (2008 to 2012), which allowed a significant expansion of the project. This project also helped in establishing new contacts with other organisations. The co-operation with the Flemish Land Agency, which provides subsidies to farmers through agri-environmental schemes, also proved to be valuable. To promote the project, the Watering

34. These incidents usually concern farmers who introduced nature elements on their land, after which the government decided to change the designated use from agricultural to nature land.

participated in a competition for the best rural project organised in 2010 by the Flemish Rural Network (which brings together all organisations and governments involved in the Pillar 2 of the CAP at the Flemish level). The winning project created a lot of publicity in Flanders, and abroad as the nominees were communicated at the European level.

Water quality management by a water provider and farmers

306. This second case study describes the co-operation between the company Pidpa, which provides water, and farmers in the Belgian province of Antwerp. In order to guarantee good quality drinking water, Pidpa has a long tradition of co-operation with local farmers, which they continuously try to improve. A brief description of the case is followed by more specific information on the co-operation between Pidpa and farmers. In the third section, the factors that influenced the success of this exercise in co-operation are discussed. The final section looks more closely at the role of policy measures in promoting or inhibiting co-operation. The description of this case study is based on an interview with Karel De Mey, Head of the Department of Water and Environment at Pidpa. This department is responsible for integral water management, undertakes studies (for example, to obtain environmental permits), and has an advisory role towards governments and other actors. The information from the interview is complemented by insights from reports and government documents.

Description of the case

Water provider Pidpa

307. The Provincial and Intermunicipal Water Company of the Province of Antwerp (Pidpa) was established in 1913 and has become one of the biggest Flemish water companies today, providing drinking water to almost 1 200 000 inhabitants in 65 municipalities in Antwerp. The drinking water provided by Pidpa is purified groundwater (Pidpa, 2012a). About 40% of the drinking water distributed in Flanders comes from groundwater (Databank Ondergrond Vlaanderen, 2012).

308. Pidpa was originally established as an intercommunity company without private interests. Its shareholders are the province of Antwerp, the biggest shareholder, 65 communities within the province, and Antwerp Water Works (AWW, another water company operating in the province). The shareholders are represented on the Board of Directors, made up of 79 members, which makes policy decisions on a monthly basis. A board committee of seven members takes care of the daily governance. Daily management rests with the General Management who translates policy aims into practical projects (Pidpa, 2012a).

Co-operation of Pidpa with farmers on agricultural land

309. Up to the 1950s, Pidpa's groundwater extraction and purification facilities were located near urban residential areas. Since then, a network of extraction points has been developed throughout the province in order to reduce dependency on a limited number of sources, which is undesirable in crisis situations. However, as groundwater extraction became more difficult near urban residential areas because of the pressure from economic and household activities on groundwater quality, as well as the nuisance caused for residents by the water purification plants, Pidpa gradually moved its activities to open landscapes and agricultural areas.

310. In agricultural areas where Pidpa installed groundwater extraction facilities, co-operation with farmers was established to prevent groundwater pollution by agricultural activities as the use of pesticides poses a substantial threat to groundwater quality. The delineation of catchment areas and protection zones

around the catchment is prescribed by law in the decree of 24 January 1984[35] (Databank Ondergrond Vlaanderen, 2012). However, to secure protection of these vulnerable zones, Pidpa prefers to buy the land that poses a potential threat to groundwater quality; this often includes agricultural land or other types of land (like military zones) on which there are agricultural concessions.

311. As an intercommunity company, with municipalities and the province as shareholders, Pidpa also has the power to expropriate, but to date has not done so for agricultural land. If agricultural or any other type of land is bought, it is done in consultation with the owner and the users of the land as the company prefers a continuation of the agricultural activities, subject to some limitations. Continuation of activities is preferred as this decreases Pidpa's costs of managing the land and helps to maintain good local relations. In this regard, user agreements are set up with farmers in the protected zones around catchment areas that allow farmers to use their land, now owned by Pidpa, subject to some limitations. Section "Collective action and provided public goods" provides a detailed explanation of these user agreements.

Co-operation between Pidpa and Natuurpunt

312. Pidpa also stimulates grazing management in nature protection areas on their property by farmers. Over the years, it has increasingly acquired nature areas so as to comply with the European Water Framework Directive (2000/60/EC), in which article 7 (§ 3) stipulates that "*Member States shall ensure the necessary protection for the bodies of water identified with the aim of avoiding deterioration in their quality in order to reduce the level of purification treatment required in the production of drinking water*". Extracting groundwater from nature areas allows for better quality and reduces the level of purification required.

313. However, groundwater extraction in nature areas can also lead to dryer conditions, which in turn can have a negative impact on nature and biodiversity values. Given the increasing attention to nature and biodiversity, groundwater extraction in nature areas has become more difficult and Pidpa has been forced to move to agricultural areas. In some areas, there has also been resistance from nature organisations which fear a decline in nature and biodiversity values because of lower groundwater tables. This resistance has occurred despite efforts by Pidpa to avoid overexploitation and retain the natural fluctuations of the groundwater level. To avoid further conflicts in nature areas, Pidpa decided in 2010 to streamline its co-operation with, Natuurpunt, which manages the majority of Flanders' nature areas, by establishing a charter in which both actors acknowledge their common goal to improve water quality and to support the specific goals of the other party. Pidpa will support the maintenance and development of the European Natura 2000 Network and the Flemish Ecological Network, and Natuurpunt will respect Pidpa's demand for legal security in extracting groundwater. Both parties agreed to meet regularly to discuss issues concerning the buying of nature areas, nature management, and to exchange knowledge and information. They also committed themselves to stimulate other actors, public and private, to take into account nature in the management of their lands (Pidpa, 2012b). In this regard, the charter between Pidpa and Natuurpunt also influences user agreements between Pidpa and farmers on agricultural land, which include measures for the provision of nature, landscape and biodiversity, in addition water quality. However, Pidpa emphasises that incorporating these extra provisions in their contracts with farmers also originates from their own concerns for nature, landscape and biodiversity as a company with public shareholders.

Collective action and provided public goods

314. Two types of co-operation between farmers and Pidpa have been mentioned: user agreements for agricultural land owned by Pidpa, and grazing management agreements by farmers in Pidpa's nature protection areas (as part of the agreement with Natuurpunt). In total there are 72 farmers managing 133 ha

35. Their location can be found on the website of the Databank Subsoil Flanders, *dov.vlaanderen.be.*

(about 27% of all Pidpa land) spread over 233 parcels. In this section, we will look more closely at user agreements of agricultural land, which is the most important form of co-operation.

315. The current user agreement is a standardised contract designed in co-operation with government bodies such as the Flemish Land Agency, but also nature and agricultural organisations. Farmers entering a user agreement are allowed to use a specific parcel of land under Pidpa ownership for free (lease-land). Pidpa opted for the lease-land option because otherwise the agreement would be subject to the strict tenancy regulation, thereby limiting Pidpa's rights on the land. Letting farmers use Pidpa-owned land for free is also considered as a form of compensation for the farmers' loss of land. The contracts differ depending on the protection zone in which the land is located. For strictly protected zones, the contract stipulates the following.

- *Regarding the use of the land*: The land can only be used as permanent grassland, which cannot be scalped unless specific written approval is granted by Pidpa. It is prohibited to leave the management of the land to other people except the one signing the contract, to construct animal shelters or any other type of construction on the land, or to hunt on the land or to provide hunting rights to other parties. The land can be reclaimed at any time by Pidpa, or accessed by the company in the case where works need to be done (e.g. maintenance works to the pipe system).

- *Regarding the use of products on the land*: Farmers should abide by the protective measures that are valid in the protection zone where the land is located and should refrain from any activities that can reduce the quality of the surface and groundwater. It is forbidden to sprinkle wastewater on the land, to store manure in clamp silos or ground silos, or to conduct any other activities that conflict with the safety norms for catchment areas and water purification. It is forbidden to apply more than 245 kg N/ha year, of which a maximum of 140 kg/ha year from livestock manure, 170 kg/ha year from other sources of manure, and 245 kg/ha year for chemical fertiliser. The contract foresees exemptions to this rule for farmers who adopted the agri-environmental "Water" scheme with starting date before 1 January 2007, and on agricultural land in less vulnerable catchment areas determined by Pidpa. Pidpa encourages farmers to register for the agri-environmental "water" contract which grants a financial compensation for following stricter fertilisation rules. The use of pesticides is forbidden unless specific written approval is granted by Pidpa.

- *Regarding the protection of nature and the landscape*: Damage to hedgerows or any other plantation should be avoided. The removal of black cherry (*Prunus serotina*) by Pidpa or others commissioned by Pidpa should be allowed.

316. In cases where farmers do not respect the contract, they are barred from using the land. There are no other sanctions. To summarise, co-operation between farmers and Pidpa is primarily aimed at reducing the negative effects (externalities) of agriculture on groundwater quality, although Pidpa also encourages the provision of positive externalities by farmers, such as hedgerows and other valuable landscape elements.

Factors influencing the success of collective action

317. In general, Pidpa is very positive about the co-operation with farmers in their catchment zones. Four specific factors can be identified that contribute to this successful co-operation: building a structured local network through personal contacts, linking with supra-local organisations, striving for a win-win situation, and striving for transparency in policies.

Building a structured local network through personal contacts

318. According to Pidpa, the most important factor is building structured local networks through personal contacts. In all their catchment areas, Pidpa has tried to develop a local forum with farmers and other actors active on the land, such as volunteers from nature organisations. Moreover, Pidpa tries to involve local sector organisations, such as the Rural Guilds (or *Landelijke Gilden* in Dutch, which are local associations connected to Flanders' main farmers organisation Boerenbond), hunting associations, and local governments. These local forums meet a minimum of once a year, more often if there is a complex local situation or specific conflict. Pidpa emphasises the importance of these personal contacts as they help to avoid problems with farmers who do not follow the rules. Where this is the case, people of the local Rural Guild or volunteers of the nature organisations can indicate the correct management rules to the farmers, or contact their representative at Pidpa and report the abuse. According to Pidpa, this approach is intensive and although not easy to establish, it is an important factor to success.

Linking with supra-local organisations

319. In local forums, Pidpa also tries to integrate actors from supra-local organisations or governments (e.g. at provincial or Flemish level). This is done to align Pidpa's policies with the policies and principles of other organisations and vice versa (we refer here again to the charter signed by Pidpa and Natuurpunt), but also having people who are not directly active in the area may help to solve local problems. Finally, involving these supra-local actors ensures continuity in local co-operation.

320. Based on their experience, Pidpa did note that it is not good to formalise or institutionalise these local forums too much as this would reduce people's willingness to participate.

Striving for a win-win situation

321. For Pidpa, co-operation with farmers in catchment areas and protection zones is probably the least expensive option to manage the land under their ownership. Farmers are allowed to use the land for free, subject to some restrictions as explained in the previous section. They can also activate manure rights on this land (up to the legal limit in water winning areas) and they can add this area to their total amount of permanent grassland, which can be important for receiving direct payments from Pillar 1 of the Common Agricultural Policy (for maintaining the reference area needed for their amount of direct payments). In addition, in some areas agriculture also benefits from a lower groundwater table, improving the quality of the soil. The fact that Pidpa buys the land has also protected some agricultural areas from being parcelled into a development zone. This is an interesting option for farmers since present demand by farmers for land under Pidpa ownership is higher than the amount of land available.

Striving for transparency in policies

322. The section above noted that user agreements with farmers in protection zones evolved from simple agreements to a standardised contract. This contract allows the same treatment for all farmers, which is clear and transparent. This positively influences continuity in farm management and makes it easier for Pidpa to monitor compliance with the agreements. The laws regarding the protection of catchment areas and location of protection zones in Flanders are easily accessible via the website of the Databank Subsoil Flanders (*dov.vlaanderen.be*). This also improves transparency of the policies.

Role of policies in stimulating or inhibiting co-operation

323. There are different policies that indirectly stimulate co-operation between Pidpa and farmers, such as the groundwater, manure and environmental permits decrees mentioned above, but also policies or regulations that are expected in the future. Examples include the incorporation of water safety plans in the

European Drinking Water Directive (Council Directive 98/83/EC) and stricter measures for pesticide reduction at the Flemish level (as a result of the implementation of Council Directive 2009/128/EC). Pidpa is also involved in the design of special conservation measures in Natura 2000 areas at Flemish level, following the provisions of the European Birds (2009/147/EC) and Habitat (92/43/EEC) Directives. The results of this process will influence the content of user agreements with farmers.

324. At the Flemish level, Pidpa is a member of the working group Ecological Water Management, part of the Coordination Commission on Integral Water Management (responsible for the preparation, planning, control and monitoring of integral water management in Flanders). This working group also stimulates water providers to monitor agricultural activities in groundwater catchment areas or riparian zones.

325. There are no policies that directly stimulate or help water providers to co-operate with farmers or other actors active in protection zones. Governments are positive about this co-operation and were willing to provide advice for the design of the user agreements, but gave no financial support for this kind of project. In the opinion of Pidpa, co-operation between water providers and farmers would be easier if the different European legislations on water, nature and agriculture would be better aligned.

6.3. Conclusions

326. Both case studies that have been presented are examples of collective action by providers and beneficiaries of public goods that were not initiated or led by the government. The aim of both projects is to reduce the negative externalities of agriculture, more specifically to improve the quality of surface and groundwater. It has been demonstrated that collective action in the provision of agri-environmental public goods generates significant benefits: it allows management of the environment, nature and the landscape on a geographically appropriate scale, builds social capital, and tries to create a win-win situation for all actors involved.

327. A critical factor for both case studies is the personal contact between providers and beneficiaries of the public goods, and the existence or development of a strong local network. It is important that farmers trust the beneficiary, which can only be achieved through personal, transparent and neutral communication. However, although the personal approach is very effective it also creates high transaction costs. Both case studies show that institutionalising the local co-operation structures may affect the motivation of farmers to participate in a negative sense. Finally, the Dommel case study indicates that it is important to give farmers time to get used to new arrangements and the Pidpa case study reveals the importance of linking local co-operation with supra-local organisations and governments to guarantee its continuation and the ability to resolve problems.

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7. CANADIAN CASE STUDIES

328. Addressing key environmental challenges such as water quality and water use, climate change and greenhouse gas emissions is an important issue in Canada. Farmers adopt beneficial management practices (BMPs) on their own or with support from federal and provincial governments and farm organisations. Environmental organisations, researchers, industry partners, municipal governments and local residents can also play a role providing knowledge and joint action. Each of Canada's provinces and territories has a different approach to addressing agri-environmental issues, some of which involve collection action. Among various examples of collective action related to agriculture and environment in Canada, this study analyses two cases: Group Environmental Farm Planning in Saskatchewan and the Beaver Hills Initiative in Alberta.

7.1. Group environmental farm planning in Saskatchewan [36]

Brief outline of the case

329. In Canada, agricultural policy is co-ordinated through a five-year federal/provincial/territorial framework. The current policy framework, launched in 2008, is called "Growing Forward" (2008-2013) and builds on the success of the previous "Agricultural Policy Framework" (2002-2008). Through Growing Forward, governments are investing CAD 1.3 billion[37] over five years, cost-shared on a 60:40 basis between the federal and provincial/territorial governments. Canadian governments provide the agriculture industry with the tools and assistance they need to improve their profitability and competitiveness with this initiative (AAFC, 2012). Provincially/territorially delivered on-farm agri-environmental risk assessment programmes (generally called "Environmental Farm Plans") have been a part of this support under both the current and previous policy frameworks across Canada.

330. Saskatchewan is a prairie province in Canada. Agriculture is an important part of the economy and farmers produce various crops and livestock. Through Growing Forward, Saskatchewan producers have access to agri-environmental risk assessment programmes that provide technical and financial support to assess the environmental risks on their operations and adopt BMPs[38], and which minimise negative impacts and risks to the environment. There are two approaches for Saskatchewan producers to participate in an assessment, either through an individual approach, i.e. Environmental Farm Planning (EFP), or a collective approach, i.e. Agri-Environmental Group Planning (AEGP). Although the individual EFP approach is the most common in Canada, Saskatchewan is one of the provinces where the group AEGP

36. This section is based on the information available through the websites (Agriculture and Agri-Food Canada, Saskatchewan Ministry of Agriculture and Provincial Council of Agriculture Development and Diversification Boards for Saskatchewan Inc.) and information provided by Canadian governments.

37. Only some of this funding is for agri-environmental programmes.

38. Beneficial management practices (BMPs) are agricultural management practices which ensure the health and sustainability of resources which positively impact the long-term economic growth and environmental sustainability.

approach is very active (Hewitt et al, forthcoming). This case study examines these two different approaches and identifies what kinds of factors affect collective action.

Individual action and collective action for improving the environment

Environmental farm planning: Individual action

331. The EFP programme is a voluntary programme which encourages producers to assess their farm operations holistically, identify areas of environmental risks (e.g. soil erosion) and establish action plans for addressing those risks by adopting sustainable farming practices.[39] It is completed for an individual farm operation so that actions undertaken under this programme are individual actions. However, this does not mean that producers have to do everything by themselves. In Saskatchewan, there are programme facilitators and government experts that provide technical support to help local producers develop their plans. Facilitators share their experiences and expertise with producers and try to help them improve their farming practices. The EFP programme is open to any producer interested in understanding and addressing environmental issues in agriculture. It is delivered by the Provincial Council of Agricultural Development and Diversification Boards (PCAB), a non-profit organisation representing grassroots agriculture in Saskatchewan.[40]

332. In Saskatchewan, there are five main steps to develop an EFP. First, producers need to attend the Workshop 1 and which is organised by programme facilitators. This free workshop offers producers introductory sessions to the programme and the EFP workbook. Second, producers review all aspects of the operation and complete a workbook at home after the workshop. They are expected to start identifying possible solutions for environmental risks and begin to develop their own action plans. Third, with a completed workbook and the help of the EFP facilitators, producers finalise their action plans to manage any identified risks and prioritise action items by attending Workshop 2. Fourth, producers submit their completed action plans to a Peer Review Committee for confidential and anonymous review by a panel of producers who have already endorsed action plans. Lastly, once the Peer Review Committee has endorsed the action plan, producers begin to implement their action plans and become eligible to apply for cost-shared funding to adopt BMPs under the Canada-Saskatchewan Farm Stewardship Program (CSFSP).

Agri-environmental group Planning: Collective action

333. The AEGP is another programme option which encourages Saskatchewan producers to assess agri-environmental risks, but unlike the EFP that targets individual farm operation, the AEGP addresses issues identified within a geographic area, such as a watershed or an aquifer.[41] While the EFP usually deals with many agri-environmental issues (e.g. water quality, soil quality, air) within a single whole farm, the AEGP tends to focus on a single common priority environmental issue, usually water quality on many farms (Hewitt et al., forthcoming).

334. The AEGP process is supported by PCAB advisors and staff from Saskatchewan Watershed Authority and Ducks Unlimited Canada. Watershed groups in Saskatchewan also encourage many producers to participate in the AEGP (Hewitt et al, forthcoming). Each AEGP has a committee composed

39. Environmental Farm Planning was initiated in Ontario in the early 1990s and was eventually customised and adopted in other provinces.

40. Delivery organisations are different depending on provinces. Although PCAB, a third party non-profit organisation, delivers the EFP in Saskatchewan, in other provinces, such as Manitoba, the programme is delivered by provincial governments.

41. The AEGP approach was introduced in Saskatchewan under the policy framework preceding Growing Forward around 2005. Group planning has been piloted in other provinces as well.

of producers that discuss and determine issues within the watershed and develop an action plan to address these issues with help from a group plan co-ordinator. The group then submits a proposal outlining the issues and the plans to address them to the Saskatchewan Ministry of Agriculture. Once these plans are approved by the Ministry, producers then develop their individual action plans, which are based on the group action plan, and are able to apply for the CSFSP for funding to implement BMPs.

335. The Government of Saskatchewan has promoted AEGPs strongly, particularly in order to improve water quality in catchments. It collaborates with the Saskatchewan Watershed Authority and other non-profit organisations. As a result, 28 AEGPs have been initiated and approximately ten of these have been in place since the initiative began. These ten groups are more likely to have connections to broader watershed planning work with stakeholders beyond the agricultural sector. The group plans increase watershed awareness and give producers opportunities to achieve their environmental goals within their watershed (Gulka, 2009).

Beneficial Management Practices and Canada-Saskatchewan Farm Stewardship Program

336. Both the individual and the collective risk assessment processes provide producers with opportunities to access to the funding for adopting BMPs under the CSFSP. There are about 70 BMPs available for funding in Saskatchewan, including: relocation of livestock facilities away from stream banks and lakeshores; planting forages for to establish buffers that protect stream banks and lake shores; and to modify equipment for improved pesticide application. Producers require a completed EFP or to be part of an AEGP in order to apply to the CSFSP. Proposals are assessed based on programme criteria and priorities. Limited programme funding means that not all proposals receive funding. In addition, not all producers apply for the CSFSP for various reasons such as the lack of in-kind financial contribution, the extent of environmental risks on their farms (e.g. some producers find no particular environmental risks as a result of EFPs), and the timing of introducing BMPs.

337. If proposals can meet programme criteria and are accepted, producers have opportunities to access to the funding. The maximum funding available through the programme for each farm is CAD 50 000 over the five-year period of the policy framework. This is cost-shared funding, i.e. producers must pay between 30-75% of the cost, depending on the BMP.

Individual action and collective action by various stakeholders

338. In both the individual EFP and the collective AEGP approaches, producers participate with other stakeholders, working together to preserve agro-ecosystems in Saskatchewan. These two programmes undertake different actions, however. In the EFP, each farmer takes actions to assess agri-environmental risks of their individual farm operation, although it involves working with programme facilitators and a peer review process by other producers. Therefore, the EFP is an individual action to improve the environment within farms that receives technical assistance from others. This is not regarded as a collective action. On the other hand, in the AEGP, producers develop a group plan to assess agri-environmental risks within a geographical area, such as a watershed. Although each producer still has to implement BMPs individually and apply for the CSFSP, they share common interests and follow the group plan. Thus, the AEGP is a collective action.[42]

42. A general definition of collective action is: "action taken by a group (either directly or on its behalf through an organisation) in pursuit of members' perceived shared interests" (Scott and Marshall, 2009). Meinzen-Dick and Di Gregorio (2004) also define it as a "voluntary action taken by a group to achieve common interests".

339. For both the EFP and the AEGP, the provincial government (Government of Saskatchewan) and the federal governments provide financial support and technical assistance. Also, for both EFP and AEGP, the active participation of programme facilitators and non-profit organisations such as PCAB is a key factor to their success. Table 7.1 summarises some features and roles of stakeholders of the EFP (individual action) and the AEGP (collective action).

Table 7.1. Comparison of EFP (individual action) and AEGP (collective action)

	EFP	AEGP
Type of action	*Individual action*: An individual action with technical assistance from non-profit organisations and governments.	*Collective action*: Farmer's collective action, i.e. making their group plan with other producers together, collaborating with non-profit organisations and governments.
Geographical boundary	Individual farms	Producers' common geographical boundary (e.g. watershed, aquifers)
Farmer's roles	• Producers make *individual* action plans for identifying risks and possible solutions within *their farms*.	• Producers make *group* action plans for identifying risks and possible solutions within *their geographical boundary* (e.g. watershed).
	• Producers adopt sustainable farming methods, i.e. Beneficial Management Practices.	
Non-farmer's roles	• A non-profit organisation, PCAB, delivers the programme.	
	• Programme facilitators, staff of the PCAB, hold workshops and help producers develop their action plans (technical assistance).	• Programme facilitators, staff of the PCAB, help producers make AEGPs (technical assistance). • Ducks Unlimited Canada, another non-profit organisation, provides support for some AEGPs (technical assistance).
Government roles	• Federal and Provincial governments design overall programmes and provide funding and technical assistance to producers.	
		• Saskatchewan Watershed Authority**Error! Reference source not found.** provides support for some AEGPs (technical assistance). • Some AEGPs are closely connected with watershed organisations, non-profit organisations, who obtain financial support from government and other stakeholders.

1. The Saskatchewan Watershed Authority is a department of the provincial government.

Public goods provided by collective action

340. Collective action provides public goods, i.e. non-excludable and non-rival goods. The objectives are to address agricultural risks to the quality and supply of water, air and soil resources and to promote compatibility between biodiversity and agriculture. Securing the provision of public goods, i.e. air, soil, water and biodiversity, is the main purpose of the AEGP.

Factors affecting collective action

Farmer behaviour

341. Many producers participate in the EFP and the AEGP for several reasons. These reasons can be classified into three categories: external factors (e.g. monetary cost), internal factors (e.g. habits and cognition), and social factors (e.g. social capital and the behaviour of neighbouring producers) (OECD, 2012). According to the testimonials of the PCAB, the main motivations of producers who participate in the programmes are the funding from the CSFSP (external factors) and the desire to improve and preserve their environment (internal factors). Obviously, financial incentives, i.e. external factors, are important (OECD, 2012). Not all producers voluntarily participate in the programme because they have strong interests in the environment. However, the interesting finding is that participants learn from and improve their environmental awareness even if this is not originally a concern (PCAB, n.d.). Other producers decide to join the programmes because they care for the environment and future. These motivations are more internal factors. Although people tend to place a higher value on profits in the near future, some have a different discount rate and consider future issues more seriously. They want to know how to improve their practices and how to assess environmental risks on their farms. These external and internal factors are applicable to both the individual and collective actions.

342. The difference between the individual and collective actions can be seen in terms of social factors. Previous studies (e.g. OECD, 2012) show that social factors, such as neighbouring producers' attitudes and social capital, affect producers' behaviour. Producers may feel social pressure from neighbouring producers when they develop group plans and take actions. For example, producers who join AEGPs may be more willing to take actions and adopt BMPs with greater public benefits, despite the fact that adopting BMPs is totally voluntary even for members of AEGPs. This tends to affect more significantly collective actions like the AEGP than it does individual actions such as the EFP.

Factors affecting collective action

343. This section examines factors affecting collective action taken with respect to the environment and agriculture. The factors affecting collective action can be classified into four groups. Based on this classification, Table 7.2 summarises successful factors of the AEGP in Saskatchewan.

Table 7.2. Factors affecting collective action (AEGP in Saskatchewan)

Resource system characteristics	**Group characteristics**
Common geographical boundary	Intermediary Leadership of programme facilitators
Institutional arrangement	**External environment**
Flexibility of action plans	Financial support from governments Technical from both governments and non-profit organisations

Resource system characteristics

- *Common geographical boundary:* AEGPs are based on geographical boundaries such as watersheds and aquifers. Assessing agri-environmental issues and solving them are common interests among producers within the boundaries. This approach based on geographical areas helps producers to identify common issues and act collectively. If it is necessary to tackle agri-environmental issues which are beyond the boundary of each farm, adopting collective action may be necessary. It is also important to note that a geographical area should be based on an ecological boundary, and not based on an administrative jurisdiction.

Group characteristics

- *Intermediary:* Collective action includes collaborative bargaining among group members. To determine their different interests, an intermediary with expertise can play an important role. It can provide a forum, share experiences and encourage farmers to establish a group plan. In the case of the AEGP, Ducks Unlimited Canada, Saskatchewan Watershed Authority and watershed organisations help producers develop a group plan.

- *Leadership of programme facilitators:* The active and enthusiastic participation of programme facilitators are key factors for the success of the AEGP. Facilitators have extensive experience and expertise, and good reputations. The latter can help producers to trust facilitators and follow their advice, increase the number of participants and the level of co-operation, as well as bring larger benefits. This leadership is important for promoting collective actions.

Institutional arrangement

- *Flexibility of action plans:* Action plans are developed by each group (AEGP) with support from several stakeholders, such as programme facilitators and non-profit organisations. The number of BMPs eligible for cost-share funding in Saskatchewan is more than 70 and producers can select best practices from them. This flexibility allows producers to adjust AEGPs to each local situation and implement effective BMPs, which makes the collective action successful.

External environment

- *Financial support from governments:* Financial incentives are one of the most important reasons for producers to join the collective approach as without it the AEGP would not attract enough producers. It is necessary to note that even in the AEGP case, producers must apply for the funding programme individually; thus, there are no concerns of fairness regarding the allocation of funding among group members. If the funding were paid to a group this would perhaps affect the producers' behaviour differently.

- *Technical assistance from both governments and non-profit organisations:* Non-financial support from both government (e.g. Saskatchewan Watershed Authority) and non-profit organisations (e.g. PCAB and Ducks Unlimited Canada) help producers develop their action plans and introduce BMPs. These organisations can provide expertise which producers may find difficult to acquire (e.g. scientific information). This external support is important for collective action.

Federal and provincial governments

344. The EFP and its subset the AEGP are collaboratively funded by the federal and provincial governments under the five-years programme, Growing Forward. The federal government allows for flexibility so as to reflect differences among regions and each provincial government has a stronger role in designing and delivering their specific programme. Technical assistance is also provided by both governments: the federal government delivers overarching technical assistance, such as scientific data and general guidelines, and the provincial governments provide more one-to-one technical assistance at the farm level. To provide an effective programme, collaboration between both governments is necessary.

Assessment and conclusion

345. The EFP and the AEGP take different approaches to improve the environment. The EFP targets individual farm operations while the AEGP targets watersheds and aquifers. Both approaches are important

in Saskatchewan, but generally speaking, if targeted geographical areas are large, collective action tends to be necessary. Collective action includes larger number of stakeholders and new transaction costs for managing different interests. An intermediary with expertise and a good reputation can facilitate negotiations among members and reduce transaction costs. Leadership by programme facilitators, and flexibility, financial and non-financial support for the programmes are key factors. However, the quantitative comparison of cost-effectiveness of agri-environmental performances between the individual and collective actions, i.e. between the EFP and the AEGP, is still missing. This point should be examined in the future.

7.2. Beaver Hills Initiative[43]

Brief outline of the case

346. The Beaver Hills area lies east of Edmonton, the capital of Alberta, and it lies within five rural municipalities (Strathcona, Leduc, Beaver, Lamont and Camrose). The area is a 1 600 km^2, disjunct portion of the Dry Mixedwood Boreal Forest natural region and is approximately 80 km from north to south, and 40 km from east to west. The landscape is composed of an upland, hummocky surfaceform with low to high relief, in which many wetlands and small lakes were created at the time of the glacier retreat over 10 000 years ago. It has a higher elevation compared with the adjacent Aspen Parkland natural region, and a cooler and wetter climate. As a result, the geo-morphology and climate have created the unique natural ecosystem of the Beaver Hills area. Indeed, the Nature Conservancy of Canada selected the Beaver Hills area as one of Canada's 15 Masterpiece Landscapes (Swinnerton, 2010). The Beaver Hills Initiative has recently submitted a nomination for a Beaver Hills Biosphere Reserve under the Man and Biosphere (MAB) Program of the United Nations Educational, Scientific and Cultural Organization (UNESCO) and anticipates a ruling by summer 2013.

347. The agricultural potential in this area for conventional, extensive agricultural cropping systems is generally low compared with surrounding prairie landscapes. This has contributed to the conservation of the natural resources and the creation of several parks which are protected as federal and provincial crown lands. On private lands, agriculture remains the predominant land use and production systems focus on agroforestry, livestock and forages, rather than on annual crop production. As of 2008, approximately 89% of private lands in Beaver Hills were used for agriculture.

348. The Beaver Hills area faces increasing development pressures from all land-use sectors. The Alberta Capital Region, where the Beaver Hills are located, is one of the fastest growing metropolitan areas in Canada. Demand for non-agricultural land uses, i.e. recreational, urban and country residential land use is very high. Land values are also high, often exceeding the market viability of agricultural production, and land owners often subdivide and sell their land to realise the financial gain (Swinnerton, 2010). Conversion of agricultural land to other non-agricultural uses is a prime concern for this unique ecosystem, as fragmentation or parcelisation of the landscape detrimentally impacts biodiversity and provision of ecosystem services.

349. In order to respond to land use pressures in the Beaver Hills area, the Beaver Hills Initiative (BHI) was launched in 2002. This case study examines the BHI's activities and identifies factors affecting collective action and the role of governments.

43. This section is based on the information available through the websites (Beaver Hills Initiative), information provided by Canadian governments and personal contact with the people participating in the BHI.

Common pool resources and public goods provided by collective action

Common pool resources

350. The Beaver Hills area can be defined as a common pool resource (CPR) because this area is non-excludable and rival. It is a region rich with natural resources and accessible to public and private citizens (non-excludable). Local residents and visitors enjoy recreational activities; the development industry builds new housing for the expanding population in the Alberta Capital Region; and agricultural producers grow a range of livestock, forages and horticultural crops. Land uses compatible with the landscape's finite natural resources are most desired, however development pressures and economic demand and competition for land are high (rival). In particular, private lands in the Beaver Hills area are in danger of losing their ability to provide a rich supply of ecosystem services. To preserve this CPR, a special collective arrangement is necessary.

Public goods

351. This CPR also provides several public goods (non-excludable and non-rivalry goods): landscape, clean and abundant drinking water, clean air and biological diversity, and which are valued by both area residents and Albertans in general. Managing CPRs, conserving and providing public goods in the Beaver Hills area are key objectives of the local population.

Collective action – the Beaver Hills Initiative

352. The Beaver Hills Initiative (BHI) was developed by federal, provincial government and municipal agencies alongside locally-active non-governmental environmental groups, academia and industry. In early 2000s, there was a proposal of oil and gas development in proximity to Elk Island National Park (EINP), which is located within the Beaver Hills area. In response, the EINP started to increase the awareness on the need for a co-ordinated and long-term approach for better land-use planning and land management (Swinnerton, 2010). The BHI target area crosses five rural municipalities, and each has their own statutory plans and non-statutory policies. In order to deal with diverse pressure on the landscape, local decision makers and technical specialists deemed that it was necessary to co-operate and co-ordinate the efforts of land managers, including the federal, provincial and local governments. In 2002, the BHI was officially launched. Its mission is "working together for a sustainable region, through shared initiatives and coordinated action" (BHI, 2006).

353. The BHI undertakes several project-specific activities to develop new and innovative tools for land-use decision makers to apply to their policies to ensure conservation of the BHI target area is supported. Through the Alberta Government's Land Use Framework, an opportunity for increased conservation and stewardship of lands of ecological/agricultural significance is possible by the utilisation of Market-Based Instruments (MBI) such as Transfer of Development Credits (TDC). The BHI has undertaken a three-year pilot study to establish the framework of a TDC program scheme respective of *The Alberta Land Stewardship Act 2009,* which provides enabling legislation for TDC programs. By developing a pilot TDC program, a valuable land-use planning tool is benefiting the five municipalities in the Beaver Hills, and the first of its kind in Alberta; results in a shareable tool for others in Alberta and Canada.

354. Through collaboration and collective action, the BHI provides a forum for stakeholders to discuss common issues and to identify the policy implications of local decision makers. Among its various activities, the BHI has worked extensively to establish, share and manage an effective spatial data management system to ensure accurate and robust data that will enable to develop the appropriate policies. Geomatics and subject matter experts come together and collaborate in a BHI working group by sharing

their cross-sector and multi-discipline mapping and modelling expertise. As a result of this collaboration, it became clear through the use of the Ag Capture Tool (a geo-spatial, agricultural land-use inventory and mapping tool developed by Agriculture and Agri-food Canada), for example, that approximately 89% of private lands in the Beaver Hills area were used in 2008 for agriculture. Until then, the extent of various land-uses in the Beaver Hills area was not fully known. The mapping data shows that consistency between agricultural and environmental policies is necessary to conserve the Beaver Hills area and that both of these policy areas should not be considered separately.

355. Another example of the importance of mapping can be seen in an ecologically-based approach to conserve the Beaver Hills area. Through the science-based BHI Land Management Framework developed in 2006, the BHI established the importance of the landscape-based approach to land-use planning, linking protected areas to the wider landscape and conservation of appropriate ecological areas. Traditionally, protected areas tend to be operated by central governments without the participation of local governments/citizens and are managed as "islands". However, owing to the geographical information system (GIS) established by the BHI, it is clear that linking with neighbouring ecological systems, highlighting the importance of conserving appropriate ecological areas on a landscape scale and adapting ecological and environmentally-focused approaches are necessary to conserve protected areas. This was foundational to the collaborative approach to land management in the Beaver Hills. The BHI not only established recommended buffers, corridors and ecological networks, but also proposed integrated approaches by linking with ecological and human systems around the Beaver Hills area and adjacent areas (Swinnerton, 2010). The outputs and mapping resulting from the geospatial analysis was subsequently adopted into Strathcona County's Municipal Development Plan, a statutory planning document that governs the local government's land-use for 10-15 years. These examples illustrate the importance of science-based approaches for the success of long-term planning. The BHI focuses on voluntary collaboration, and provides local policy makers with recommendations based on evidence-based, science based research.

356. According to Swinnerton (2010), there are several benefits to the BHI. First, it can share information and scientific data among members and develop consistent planning and practices across the region. Local knowledge and learning from local landowners are shared with others, including policy makers in the region. It can build a better understanding of community-based stewardship across multi-sector and multi-disciplined partners. Second, it can effectively leverage resources (e.g. funding and technical expertise) and make it collectively possible to undertake projects with a larger pool of resources which could not be supported or afforded at the individual municipality level.

357. There are nevertheless several difficulties. First, the BHI's recommendations may not be adopted by local governments because each rural municipality keeps its autonomy and decision makers make their own decisions. Since its inception, the BHI has emphasised voluntary action and involvement. The BHI is not a formal actor (i.e. legislated authority). Second, it is difficult to achieve timely outcomes due to the fact that BHI resources are voluntary and collective, and as that its members often have to adjust to multiple and competing priorities. Third, involvement of the general public in the BHI is not necessarily sufficient. However, recent efforts to establish a Stewardship Engagement working group (since November, 2011) will address this concern.

358. Partnership building is a key goal in the BHI Business Plan. Stakeholders join the BHI and work collectively to address a wide range of issues. Their roles are summarised in the Table 7.3.

Table 7.3. Roles of stakeholders

Farmer's roles	Non-farmer's roles	Government roles
• Managing farmlands and other natural resources: Wetland conservation and reclamation, riparian management, tree planting and woodlot management, and soil conservation. • Sustainable grazing systems such as rotational, deferred, or extended season grazing. • Agri-tourism activities for increasing the awareness of and promoting biodiversity.	• NGOs: Providing expertise and expressing their concerns at the working groups. • Academia: Undertaking scientific studies and helping the BHI collect related data • Industrial partners: Sharing their interests (mainly concerning oil and gas related issues) with other stakeholders. • Land trusts (Edmonton and Area Land Trust, Nature Conservancy of Canada, Ducks Unlimited Canada, Alberta Fish and Game Association, Alberta Land Trust Alliance, Alberta Conservation Association)	• County: Developing land-use policies and bylaws for managing the Beaver Hills area (e.g. zoning, TDC) and funding. • Government of Alberta: Providing scientific and technical resources and initial financial support for launching the BHI. • Federal government: - *National Park Agency*: managing the Elk Island National Park : providing technical resources, data and information on biodiversity and protected ecosystems and funding - *Agriculture and Agri-Food Canada (AAFC)* : providing technical support, data and information regarding agricultural production systems, agricultural land use and agricultural BMPs (best management practices) and funding.

359. Although farmers are not official partners of the BHI, several of the elected officials from local governments serving as members of the BHI are farmers, and as about 90% of private land in this area is used for agriculture, agricultural producers are considered by the BHI as important stakeholders. Also, local elected officials are selected to participate on provincially required Agriculture Service Boards. Farmers implement sustainable farming practices and try to express and share their views by attending workshops and organising agri-tourism activities, which can increase understanding of their roles among local people, including local policy makers.

360. The BHI has recently developed a Tourism Development Opportunity Assessment (2009-2011) where "agritourism" is identified as a key theme and local agritourism operators were invited to a series of workshops to discuss their needs and issues. Through a series of five workshops over the winter-spring of 2012, the BHI hosted surrounding municipalities/towns/villages and non-government organizations seeking input for the development of a Stewardship Engagement Strategy. These projects are on-going and are a priority in the BHI's 2012-15 Business Plan. Thus, although the BHI started from the approach from the government side, a shift is occurring whereby local residents, business operators and visitors to the area are having a voice, and by working together, are having an influence and are playing a leadership role in this initiative.

361. A unique aspect of the BHI is its diverse partnerships. Its partners include more than 30 organisations including: five counties, the provincial and federal governments, academia, industrial partners, and NGOs. These organisations contribute to the BHI, through the BHI Board and several working groups. This collective action is based on ecological boundaries, and not jurisdictional ones, and manages broad areas. All levels of governments provide technical and financial support. This collective

action provides a forum for various stakeholders to develop science-based data and information, discuss issues concerning the conservation of the Beaver Hills area and provide recommendations that will ensure on-going conservation of the Beaver Hills. The BHI is guided by a business plan developed by all working groups and endorsed by the Board of Directors.

Factors affecting collective action

362. The factors affecting the outcome of collective action in Beaver Hills can be classified into four groups. Table 7.4 summarises some of the successful factors.

Table 7.4. Factors affecting collective action (Beaver Hills Initiative)

1) Resource system characteristics	**2) Group characteristics**
• Multi-jurisdictional control of the natural resource • Strive for information and data sharing on the natural resources • Large-scale and long-term promotion of sustainable agriculture for ecosystem services	• Heterogeneity and diversity • Trust and social capital • Sharing long-term vision • Appreciating local knowledge • Leadership in building understanding
3) Institutional arrangement	**4) External environment**
• Effective organisational structure	• Commitment from all levels of Government

Resource system characteristics

- *Multi-jurisdictional control of the natural resources:* The five counties of Beaver Hills have its own statutory plans which guide development for approximately ten years. The land-use bylaw describes land-use zoning requirements and is non-statutory. There are different land-use issues and priorities among them. Therefore, it is necessary to work collaboratively to develop a co-ordinated approach for preserving the resource (Swinnerton, 2010). The BHI is based on ecological boundaries, not jurisdictional boundaries.

- *Strive for information and data sharing on the natural resources*: Reliable data is essential to predict the future of the environment and conserve it. To obtain such data, co-operation among experts is necessary (Swinnerton, 2010), and indeed, this is a key area of BHI activities.

- *Large-scale and long-term promotion of sustainable agriculture for ecosystem services*: Promoting sustainable agriculture for the provision of ecosystem services is necessary to conserve the Beaver Hills area, where about 90% of the private lands are used for agriculture. However, individual activities by individual producers have limitations in managing large-scale natural resources. In addition, improving the environment takes time. This implies that large-scale and long-term promotion of sustainable agriculture by collective action is necessary for the provision of ecosystem services. The BHI promotes the adoption of BMPs, and technical specialists within the network of BHI members help to assess risks either on-farm or to parks and protected areas within the context of a landscape-based approach by offering technical assistance, information and data analysis.

Group characteristics

- *Heterogeneity and diversity*: Diverse partners of the BHI bring various skills and expertise to the Initiative. This heterogeneity of endowments of the group is one of the strong benefits and a key

factor of this successful collective action. Participants can share knowledge and skills and increase their capacity to act productively. However, given the different views among participants, it can take the BHI time to achieve outcomes.

- *Trust and social capital*: Trust-building among diverse members was a big challenge for the BHI. This was achieved by identifying similar interests, and through education and social learning. Building trust through demonstration and education helped break down misperceptions and allowed the BHI to adapt to change over time, in terms of new issues and changes in personnel. A combination of the right people, the right place, the right time and strong social capital are important for success (Patriquin, 2012).

- *Sharing a long-term vision*: Although sharing a long-term vision is sometimes difficult because of the different views held by various stakeholders, the BHI shares a long-term land use planning that has clear and consistent goals and objectives the among partners, owing to the science- and evidence-based data (Swinnerton, 2010). This long-term vision is clearly stated in their business plan.

- *Appreciating local knowledge*: Partners of the BHI appreciate the local knowledge brought by diverse members, including farmers. Understanding and sharing the importance of collective action, including central authorities, is a key to success. It is essential not to fall into the trap of an armchair plan without local knowledge in order to implement effective collective action.

- *Leadership in building understanding:* Municipally elected officials are responsible to direct and implement land-use policy as outlined in Alberta's *Municipal Government Act*, for their respective local government jurisdiction. The role of the municipal elected official to understand the diverse land-use pressures impacting the Beaver Hills is very important. In order to build awareness of the importance of conserving and stewarding the Beaver Hills landscape, the BHI has established science-based, evidence-based information and data within a planning document called the BHI Land Management Framework. Through the Framework, as well as the BHI working groups and BHI Board of Directors, the BHI provides recommendations, and innovative planning tools that promote conservation of the Beaver Hills for consideration by municipal elected officials. By providing a direct, science-based approach to planning, confidence among elected officials to make sound and effective decisions is increasing. This allows informed debate and often difficult, long-term decisions to be made that will ensure land-use policy within their respective local governments' statutory documents supports on-going, long term conservation of the unique Beaver Hills landscape.

Institutional arrangement

- *Effective organisational structure*: The BHI involves different levels of government and different agencies. In addition, NGOs and private landowners play key roles in conservation stewardship in the region. To manage complicated issues among diverse stakeholders, the BHI established several working groups composed of different stakeholders (Swinnerton, 2010). Establishing effective organisational structure is essential to manage these diverse stakeholders; Ostrom (1990) pointed this out as one of the key factor for managing large-scale common pool resources.

External environment

- *Commitment from all levels of government*: The BHI involves federal, provincial and local governments for co-ordinating broad issues. Financial and non-financial support from all levels of governments is important for this diverse and multi-layered collective action.

Government policies for the Beaver Hills Initiative

363. A unique point of the BHI is the participation of multiple levels of government, academia, NGO agencies, and industrial associations that participate in the BHI. The main goal of the BHI is to reflect their science-based and evidence-based views in local policies. Although the BHI provides information and recommendations to decision makers, it does not make decisions for the municipalities. However, municipalities make their Municipal Development Plans and related Land Use Bylaws based on discussions with the BHI and other municipalities/counties. For example, for the BHI's TDC project currently underway, Strathcona County is preparing to launch an on-the-ground pilot TDC project with communication and co-operation with the BHI. The County will decide on conservation and development areas, the administrative framework and statutory policy for the trading of the development credits. In this example, input from the BHI is going to local government, but governments (at all levels) can also provide input into the BHI.

364. There are mainly three types of contribution from government to the BHI: a) technical assistance, b) financial contributions, and c) acceptable policy recommendations. Technical assistance, such as data and information provision regarding agricultural production systems, agricultural land use and agricultural BMPs, help the BHI develop science- and evidence-based proposals to manage the Beaver Hills areas. In addition, financial contribution from governments, especially when launching new initiatives, is very important to cover costs associated with staff and managing various study groups. A third level of input into the BHI is overall support either through recognition of accomplishments by using the BHI information in local governments' statutory plans, promotion of value or benefits of the BHI as a real-world working model in various communication channels, or raising the profile with inter-governmental networks and communities of practice by issue or topic area.

365. As mentioned above, the Beaver Hills area is located within five counties. In order to conserve this natural resource, linking it with adjacent ecological areas is necessary as it is impossible to conserve this area by just a single organisation. By working together, it is also possible to reduce costs such as collecting data on natural resources. Thus, although to date there are no quantitative economic data, it seems collective action is a cost-effective approach for managing the Beaver Hills area as the landscape-based approach to land-use planning is influencing local statutory planning and policy development and implementation in the BHI. Through the collective action of the provision of science-based and evidence-based information and data by an integrated network of multi-stakeholder, multi-discipline and multi-sector partners, decision makers are better equipped to make informed decisions, and are more confident in supporting long-term, often difficult, choices about sustainable (economic, social and environmental) development.

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8. THE FINNISH CASE STUDY: SÄKYLÄN PYHÄJÄRVI RESTORATION PROGRAMME[44]

366. Southwestern Finland is an important food provider in Finland, covering the whole production chain from farms to food industry with important consequences for local land use development, employment and the economy. Intensive agriculture together with forestry, developing municipalities, and industry with waste waters has had, however, undesired side effects since the 1950s. Local water bodies have received very high external nutrient loads with a resulting deterioration of water quality, clearly visible to users since the 1980s and early 1990s. In Finland, the recreational use of water bodies is intensive during summer due to the sauna culture and water quality problems, especially algae blooms, are immediately noticed by water users. Since the 1980s, concern about increased eutrophication has led to collective action in water protection works, especially for specific catchments. In 1995, Finland joined the European Union and most farmers became committed to the EC's and Finnish national agri-environmental programme (European commission, 2005) that required implementation of basic water protection measures, such as a reduction in the application of fertilisers. However, in some cases it was estimated that these basic measures would not reduce the nutrient load rapidly enough and more advanced collective actions were promoted locally.

8.1. Case study area: Säkylän Pyhäjärvi

367. This case study introduces a locally important lake, Säkylän Pyhäjärvi, in the centre of an intensive agricultural area in southwest Finland. It is an example of a large and shallow lake suffering from eutrophication. It has been classified as having good ecological status based on the European Water Framework Directive (2000/60/EC) criteria, but this status is seriously threatened by high external nutrient loading. At present, industrial and municipality waste waters are treated in waste water treatment plants and are not directly fed into the lake.

368. The lake is located in the boreal temperate zone (cool climate type). In winter, mean air temperature is about -2.1ºC and the lake is normally frozen for 141 days on average. The catchment is also normally covered by snow in winter. Recent climate variation seems to pose new challenges to the restoration work (Ventelä et al., 2011).

369. Pyhäjärvi has been an important fishing site and drinking water source for local people for centuries. Today, the lake is used for recreational activities, commercial fishery and local industrial processes.

8.2. Collective action and provision of public goods

370. Collective co-operation in Pyhäjärvi region began in the 1970s when Turku city, located 75 km south from Pyhäjärvi, was planning to install a massive pipeline to transport drinking water for its 170 000 inhabitants and industry. This plan generated a large variety of academic lake ecosystem research and monitoring of Pyhäjärvi, but also strong protests by local municipalities, industry, organisations and the local population. Pyhäjärvi Lake Association was founded in 1973 and local actors participated actively in

44. This case study was prepared by Anne-Mari Ventelä from the Pyhäjärvi Institute.

this "water war" to prevent the export of drinking water. The plan was rejected for economic reasons in 1992 by the city of Turku.

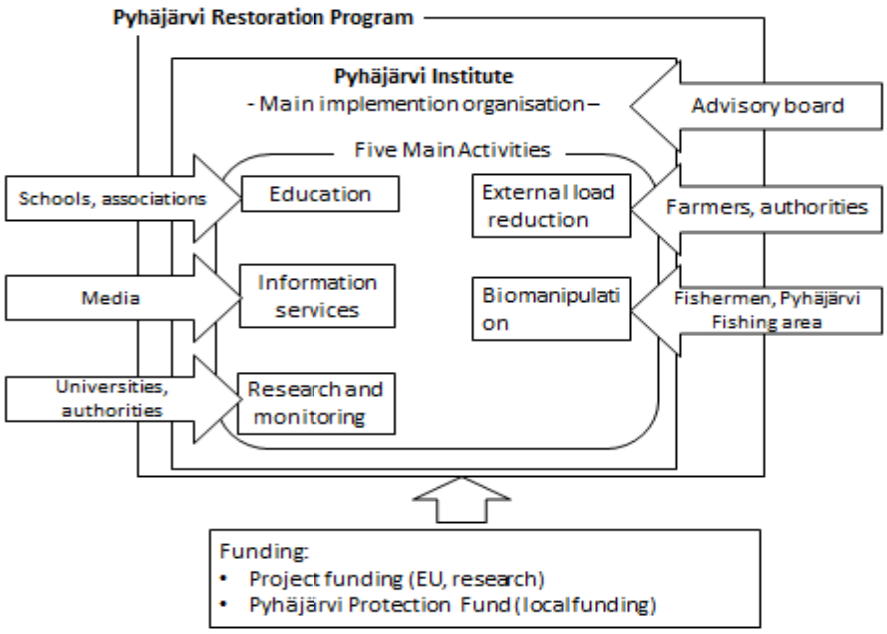
371. A new threat appeared in the late 1980s when the first signs of eutrophication were observed in long-term monitoring data. This received much attention in the local media, generating more local activity to develop new collective methods and funding structures to stop eutrophication from developing further. Voluntary-based river basin scale co-management groups were established by regional environmental administrations and municipalities in 1989-91 to promote water protection measures in agricultural areas. In 1995, local municipalities, private industry and local associations founded the Pyhäjärvi Protection Fund (PPF) which along with the help of regional environmental and agricultural authorities seeks to guarantee the necessary funds for long-term restoration work on both the lake and the catchment area (Mattila et al., 2001; Ventelä and Lathrop, 2005; Ventelä et al., 2007, 2011). The basic annual funding collected from members was originally FIM 1 million in total per year (EUR 160 000). This kind of fund with voluntary but active long-term participation of municipalities and industry was unique at the time.

Table 8.1. Advisory board of Pyhäjärvi Restoration Program

Organisation	Role in PRP
Central Government	
South West Finland Centre for Economic Development, Transport and the Environment. – water section -	• Authority in lake monitoring, water level regulation and legislation. • Important funding organisation (EU programmes). • Connection to national and EU water policy. • Implementation of Water Framework Directive (WFD).
South West Finland Centre for Economic Development, Transport and the Environment – fishery section-	• Biomanipulation issues and funding. • Authority in fishery and legislation. • Connection to national EU fishery policy. • Implementation of WFD.
South West Finland Centre for Economic Development, Transport and the Environment – agriculture section-	• Authority in agriculture, legislation, implementation and control of EC's agri-environment programme. • Funding organisation, connection to national and EU agricultural policy. • Implementation of WFD.
The Central Union of Agricultural Producers and Forest Owners (MTK), local units	• Experts in agriculture. PRP measures are implemented in co-operation with farmers, in their own fields. • Landowners of arable land. • Connection to national and EU agricultural policy.
Local government	
Municipalities of Säkylä and Eura	• Representing municipality members and authorities (Table 8.2).
Private organisations	
Industry (Lännen Tehtaat plc.)	• Representing local industry (see Table 8.2).
Pyhäjärvi Fishing Area	• Water area owners, legal actor and local administrator in Pyhäjärvi fishery (see Table 8.2).
Pyhäjärvi Lake Association	• Representing lake associations (see Table 8.2)
University of Turku	• Connection to scientific community and long term Pyhäjärvi research. • Knowledge of research funding possibilities.

372. PPF has now been operational for 17 years. It offers basic funding for the Pyhäjärvi Restoration Program (PRP), which is managed by the local non-profitable Pyhäjärvi Institute. The structure of PRP is presented in Figure 8.1. Employees at the Pyhäjärvi Institute are professionals in different fields of lake and catchment management. This kind of local independent unit has proved to be very good at implementing and promoting local voluntary actions by acting as a bridge between local inhabitants, regional and national administrations, the science community, and industry. In addition, it has good knowledge of other available funding possibilities.

Figure 8.1. Pyhäjärvi restoration programme



373. The goal of this program is to improve and maintain good water quality in Pyhäjärvi (measured as total phosphorus and chlorophyll concentrations, and phytoplankton biomass and composition). Reduction of negative externalities (external nutrient load) and provision of public goods (water quality) are achieved by this collective action.

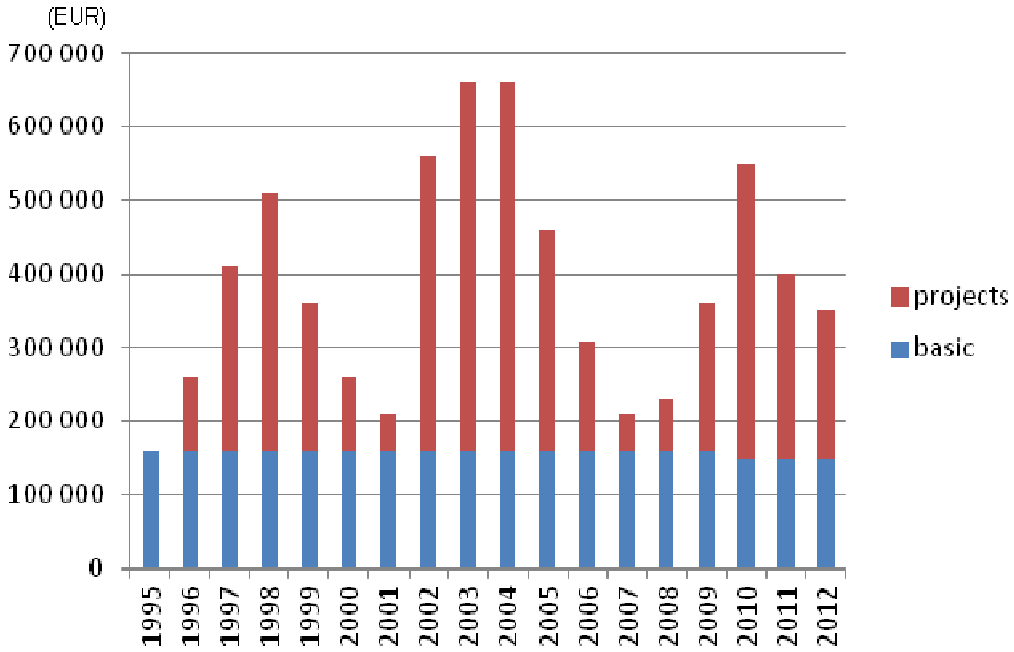
374. In order to attain this goal, five main actions are implemented (Figure 8.1): 1) external load reduction, 2) biomanipulation, 3) education, 4) information services; and 5) research and monitoring. The annual work plan and report are established by Pyhäjärvi Institute, with the support of the Advisory Board (Table 8.1) which meets four to five times a year. The funding members (Table 8.2) approve both documents at one of two annual meetings. As both advisory board and member delegations consist of a wide variety of professionals, PRP is well linked to local, regional and national administrations, decision-making, industry and science communities. In all, most of the work is done in co-operation with other participants, including the advisory board and delegate members.

Table 8.2. Founders and funding members of Pyhäjärvi Restoration Program

Organisation	Years of participation	Description
Local government		
Eura municipality	1995-	• Municipality is using lake as drinking water source. • Owner of water area and shore line areas. • Lake is an important recreational site, municipality is maintaining fishing harbour for professional fishermen.
Säkylä municipality	1995-	• Important recreational and touristic site, owner of water area and shore line areas, professional fishery. • River Pyhäjoki catchment is source of external load (16% of annual phosphorus load): agriculture, forestry, rural area waste water.
Yläne municipality	1995-2008 (joined Pöytyä municipality)	• Important recreational and touristic site, owner of water area and shore line areas. • Municipality is situated in the catchment area, River Yläneenjoki is the source of external load (56% of annual phosphorus load): agriculture, forestry, rural area waste water.
Kiukainen municipality	1995-2008 (joined Eura municipality)	• Owner of shore line areas.
Pöytyä municipality	2008-	• See Yläne.
Oripää municipality	1995-	• Municipality is situated in the catchment area, River Yläneenjoki is the source of external load (56% of annual phosphorus load): agriculture, forestry, rural area waste water.
Alastaro municipality	1995-2008 (joined Loimaa city)	• Municipality is situated in the catchment area, River Yläneenjoki is the source of external load (56% of annual phosphorus load): agriculture, forestry, rural area waste water.
Loimaa city	2008-	• See Alastaro.
Turku city	1995-2005	• Recreational area.
Rauma city	1995-	• The drinking water source of Rauma city is the outflow of Pyhäjärvi, River Eurajoki.
Central government		
Finnish Defence Forces, unit in Säkylä	1995-2002	• Owner of shore line and catchment areas. In 1960s, source of external load.
Private Organisations		
Jujo Thermal Ltd	1995-2011	• Paper factory, using lake water in industrial processes.
Ahlström Tampere Ltd	1995-2011	• Paper factory, using lake water in industrial processes.
UPM	1995-2006	• Paper factory, using River Eurajoki water in industrial processes.
Lännen Tehtaat plc	1995-	• Food (vegetable products, fish) factory, using lake water in industrial processes.
Sucros Ltd	1995-	• Sugar factory, using lake water in industrial processes.
HKScan Corporation	1995-	• Food (meat products) factory, using lake water in industrial processes.
Pyhäjärvi Fishing Area	1995-	• Water area owners, legal actor and local administrator in Pyhäjärvi fishery. High interest in lake ecosystem services and water quality. Partner in some PRP's projects.
Pyhäjärvi Lake Association	1995-	• Association for local inhabitants. Was very active in 1970's and 80's, during "water war" against Turku city drinking water project. Low activity level nowadays, mainly collecting funds for PRP.
Southwest Finland Regional Water Protection Association	1995-	• Association for industry and other water users. Owns company, which is in charge of mandatory monitoring of water quality. Educational purposes, partner in some PRP's projects.

375. The basic funding of PRP (total EUR 160 000 – 150 000/year) comes from the PPF, but additional resources are needed for the five actions undertaken. Thus several projects, co-funded by PPF, different EU programmes, foundations and government, that supplement and support the basic work and funding. The mean annual budget for 1995-2012 was about EUR 370 000, the budget time line is presented in Figure 8.2. Variations in the annual budget is mainly due to the EU programme funding periods (1995-2000, 2000-2006, 2007-2013); the phases between the programmes are the years with a lower annual budget due to lack of project funding.

Figure 8.2. Pyhäjärvi restoration programme budget time line



376. The content of the PRP, the most important partners and their roles in PRP are summarised below.

External load reduction: Management of the drainage area, collective actions in farming

377. Since 1995, nearly all farmers in the lake catchment area have committed to the European Community's and Finnish national agri-environmental programme to implement basic water protection measures. The PRP supports the implementation of this programme with education, information, courses, seminars, and planning services. In addition, as the need of load reduction is urgent in Pyhäjärvi catchment, different types of experimental buffer zones, sedimentation ponds, wetlands and wastewater treatment units have been promoted, funded and implemented by the PRP with local farmers and authorities. This work has often been done through local projects co-funded by PPF and EU funds. Many of the methods developed – such as filter ditches, sand filters, buffer zones and wetlands – were innovative and experimental in the 1990s. They have also been tested for their long-term ability to remove phosphorus from runoff (Kirkkala, 2001; Kirkkala et al., 2012).

378. The need for new load reduction solutions has increased as nutrient load reduction has becomes more challenging in the 2000s due to climate change. The recent climatic variation has already affected the timing of the annual external nutrient load. In the south-western part of Finland, the usual winter mean air temperature was -2.0°C and the catchment was normally covered with snow. However, there have been several mild winters in the 2000s with winter mean temperatures above zero, a lack of snow, and high

winter rainfall (Ventelä et al., 2011). If most of the nutrient loading occurs outside the growing season, the traditional biological measures such as wetlands and buffer strips will perform sub-optimally in reducing the load. New methods for flood and nutrient load peak controls have been developed and new kinds of filtering systems are currently being developed and tested in agricultural ditches and drainage waters.

379. PRP supports development work related to the EC's agri-environmental programme for the next programme period. Information on new methods and their ability to reduce external load has been forwarded to national planning groups and decision makers. PRP has been active in promoting waste water treatment in the rural catchment. There were several development projects co-funded by PPF in 1990s, efficient rural area treatment units were tested in Pyhäjärvi catchment and the results were utilised in the preparation of national legislation.

380. The most important partners in external load reduction work are as follows.

- *Local farmers*: Implement load reduction measures in agriculture, offer land for experimental purposes.
- *The Central Union of Agricultural Producers and Forest Owners (MTK)*: Experts in agriculture, connection to national and EU agricultural policy.
- *Agricultural administration at the municipality, county and national levels*: Control of EC's agri-environmental regulations and national legislation.
- *MTT Agrifood Research Finland*: innovative methods, agricultural research, partner in projects.
- *The Finnish Forestry Centre*: expertise in external load reduction in forestry, monitoring of loads, partner in projects.
- *South West Finland Centre for Economic Development, Transport and the Environment – Water Department*: Authority in lake monitoring, water level regulation and legislation, important funding organisation (EU programmes) and connection to national and EU water policy.
- *Finnish Environment Institute*: Catchment models, partner in projects.

Biomanipulation: management of the lake

381. Pyhäjärvi water quality is strongly connected to fish communities and fishery on the lake. For decades, this lake has been the object of intensive biomanipulation in winter by commercial fishermen, whose annual harvest rate approaches the total production of vendace (Coregonus albula), the main planktivore in Pyhäjärvi (Sarvala et al., 1998a). PRP has also subsidised the harvest of commercially unwanted fish since 1995. In 2002-06, the European Union provided additional project funding for PRP for this type of fishing, which was especially intensive in 2002-04 and seems to have resulted in water quality improvement (Ventelä et al., 2007). Total annual catch for biomanipulation can be as high as 600 000 kg.

382. Biomanipulation work is done in co-operation with the following actors.[45]

- Local fishermen: implementation of biomanipulation, PRP and Pyhäjärvi Fishing Area (with different co-funding) are paid from subsidies.
- Pyhäjärvi Fishing Area: water area owners, legal actor and local administrator in Pyhäjärvi fishery. Partner in some PRP's projects.

45. More detailed analysis of the ecological and economic implications of this long term biomanipulation is currently in progress and will be available in 2013 (Ventelä et al., unpublished manuscript)

- Local municipalities: have lake as a drinking water source and an important recreational site. Are owners of water and shore line areas.
- Fishery department of South West Finland Centre for Economic Development, Transport and the Environment: authority in fishery and legislation, connection to national EU fishery policy. Bio-manipulation funding.
- Ministry of Agriculture: Financial support for bio-manipulation in 2010-12.

Education

383. Pyhäjärvi and water protection-related educational material has been produced and distributed locally, nationally and internationally. Seminars, field trips and courses for school children, professionals, and local people are organised annually.

384. Education work is done in co-operation with:

- local schools and preliminary schools: co-organising special lake days, field trips.
- local lake and nature associations: co-organising seminars, field trips, courses.
- South West Finland Centre for Economic Development, Transport and the Environment: co-organising seminars, field trips and courses, education material.

Information services

385. Information on Pyhäjärvi, water quality and actions of PRP are given on their website (www.pyhajarvensuojelu.net), in local newspapers, radio, and seminars. PRP has its own annual information paper distributed to all houses in the lake catchment area. Scientific results are published in international scientific journals. The most important partners in information services are local newspapers and radio.

Research and monitoring

386. Pyhäjärvi ecosystem research began in the 1980s and long term data is currently highly valued by researchers in Finland and abroad. As such, Pyhäjärvi is an important area of scientific research and there are many on-going projects. The most important partners in research and monitoring are:

- Universities: research, project partners, publications.
- Environmental administration: basic monitoring, models.
- Game and Fisheries Research Institute: fishery monitoring.
- Finnish Environmental Institute: models, monitoring, project partner

8.3. Variables affecting collective action in Pyhäjärvi

Knowledge

387. Collective action in Pyhäjärvi has been based from the beginning on scientific knowledge and understanding of on-going processes and changes. The warning signs of high external loads were first observed by scientists working on Pyhäjärvi ecosystem studies at the University of Turku and by regional authorities. It was crucial that both scientists and authorities made known these important eutrophication results, explained their meaning to local inhabitants and decision makers, and that they participated in the action planning and implementation over the long term.

388. There is a high knowledge level and demand for action by the advisory group, member delegates and partners. However, as the perspective increases, the knowledge level often decreases despite education and information distribution provided by the PRP. The amount of information is so large today that in order for the public to receive and understand the lake or catchment related information, a personal connection to the eutrophication problem is needed. There are many examples where people have lived for decades close to the lake without paying attention to eutrophication or restoration work – or news and information dealing with them – until they personally see some unwanted symptoms like algae along the shore line owned by them. They may "wake up" and be very aggressive in accusing that "nobody is doing anything for the problem" until they receive sufficient information of on-going work and efforts to resolve the problem. Many of these people are willing to implement voluntary actions to improve water quality.

Group characteristics

389. Several methods have been used to activate local people in all professions and age groups. Village field tours have been organised with local people so that they have the possibility to show PRP personnel the aquatic environments their villages and offer their own development ideas. Local residents are then invited to prepare their own written ideas which are included in the final published plans. Water protection issues are also included in the plans and result in new and innovative ideas for phosphorus removal and collective actions. Ten village plans have been prepared and cover more than 80% of the drainage area. A multitude of water protection measures have been implemented in the drainage area based on such plans. At present, most of the planned measures have been implemented by village associations, PRP, the local environmental administration, or other actors. Local village associations have even applied and received their own separate project funding for implementation of the measures contained in the plans.

390. Communication and education must recognise the heterogeneity of the participating groups as much as possible. For example, the information given to farmers must be at once practical and professional. People working in this kind of co-operation project must be socially skilled and flexible in facing the target groups.

Institutional arrangements

391. PRP work is based on voluntary and positive actions. Control, legislation, regulations, enforcement and sanctions are the duties of administrations. This is important and sometimes difficult for the public to recognise. PRP is often seen as "responsible" for the water quality of the lake.

392. Monitoring has been traditionally done by environmental administration, but there have been reduction recently. PRP projects have partly tried to cover critical long term monitoring like fish catches, zooplankton and phytoplankton as well as some monitoring points in the catchment. As the monitoring gives critically important information on the state of ecosystem and on the effects of artificial stressors, it would be very important to maintain national monitoring programmes.

393. To manage complicated activities with diverse stakeholders, the PRP establishes effective governance structures. Members can contribute to PRP work by joining specific working teams, such as the agricultural or fisheries team.

394. The institutional environment has been relatively stable. Finland became a member of the European Union in 1995, which coincided with the beginning of the PRP. Local actions have been in harmony with EU rules and legislation and EU programmes have offered useful and needed funding possibilities. The funding rules of EU and national agri-environmental programmes can be at times too strict for local actions (for example the rule for wetland catchment size), but this is often solved by using

local funding for sites that do not fill the requirements of national or EU funding. Overall, the hierarchy between the institutions (local, national, EU) has been clear and there have been few institutional conflicts.

External environment

395. The current economic crisis has affected the PRP's basic funding as one of the major funders, the local paper factory, decided to resign from the PRP for financial reasons. Further resignations will probably occur in the near future and it will be necessary to find new funding members. The funding share of local municipalities is very important in PRP basic funding and as such the economic development of local municipalities is critical for PRP.

396. The willingness of farmers to implement external load reduction measures is also closely linked to the economic situation. EU rules and legislation have an important role and rules that are too strict may affect the motivation of farmers. In the Pyhäjärvi area, many farmers have contracts with food companies, which play an important role in imposing environmental rules on their contract farmers.

397. Local fishermen are now facing serious challenges as climate change modifies both the fishing environment (lack of ice, Ventelä et al., 2011) and fish stocks (Jeppesen et al., 2012). As biomanipulation is closely linked with local professional fishery, new strategies may be needed. There is currently an on-going project concerning these issues at Pyhäjärvi Institute (Ventelä et al. 2012; Ruokonen et al. 2012).

Motivation and results

398. The motivation and willingness of the PRP participants to continue their voluntary work are directly connected to results and effectiveness of conducted actions and measures. In spite of all the challenges, eutrophication of Pyhäjärvi has currently ceased and water quality has remained good over the last ten years. This is because the signs of eutrophication were observed at an early stage and restoration actions began before the situation became unmanageable.

8.4. Policy measures for collective action

399. This collective action supports both the EC's agri-environmental programme and water management work based on the Water Framework Directive (WFD). The implementation of legislation for rural area waste waters is also supported.

400. Pyhäjärvi collective actions are very cost efficient as local funding and projects have multiplied. A variety of national and international projects have improved water quality. PRP has been able to maintain and utilise the labour input of large groups of other professionals (advisory group, member delegate and other partners) outside Pyhäjärvi Institute to work towards a common goal. As a result of PRP's work, local people, decision makers and PRP members have been satisfied with the water quality during the last ten years.

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9. THE FRENCH CASE STUDY: THE VITTEL CASE[46]

401. French agriculture is well-known for its high productivity and the quality of its products. Nevertheless, when improperly managed, farm activities affect negatively water quality, which is frequently considered a top environmental concern. Polluted run-off from farms is a major source of water quality pollution, affecting both surface waters and even groundwater. Many public and private initiatives aim to improve water quality for drinking, recreational and other uses while maintaining a competitive agriculture.

9.1. Brief description of the case

402. Nestlé Waters, the world leader in bottled water includes several famous brands such as Vittel, Contrex and Perrier. This bottler uses a small number of specific and geographically delineated springs. At the end of the 1980s, the production unit of Vittel at the foot of the Vosges Mountains noticed an increasing risk of nitrate contamination and pesticide contamination that could lead to the deterioration in the quality of its mineral water. High concentrations of nitrate in drinking water can cause methemoglobinemia (blue baby syndrome), a potentially fatal disease for babies. Moreover, French standards on mineral waters are strict, defining mineral water as free from any contamination and do not authorise water treatment.

403. The main cause was identified as a non-point source pollution from intensive farming practiced in the fields surrounding the Vittel springs. The farmers concerned were mainly milk and cereal producers operating on the strategic 3 500 ha of the catchment area. The total turnover of farms located in this strategic area was estimated at less than 2% of the Vittel turnover (Chia and Raulet, 1994). Vittel considered and attempted several strategies to address this issue and finally contracted with the farmers (Table 9.1). In reality, only two alternatives, quasi-integration and contracting, were implemented. Interestingly, Vittel pursued several alternatives simultaneously, allowing it to learn through the process, delay the definitive alternative choice, and reinforce its ability to re-organise practices (Barbier and Chia, 2001; Déprés et al., 2008). Only two farmers from the targeted perimeter are not under contract with Vittel (Poirot, 2009). "An indicator of success has been the request from young farmers who have taken over family farms to enter into 30-year contracts" (Perrot-Maître, 2010). At present, all farmers who have contracted with Vittel have signed 30-year contracts. Indeed, collective action was needed to reduce possible pollution and secure the "goose that lays the golden eggs." This collective action was based on drastic changes in farming practices from a sufficient number of farmers with farmland located in the targeted perimeter (and not elsewhere).

46. This case study was prepared by Gilles Grolleau, from Montpellier SupAgro, LAMETA.

Table 9.1. Alternatives considered by Vittel to protect its water source

Alternative	Feasibility
1. Vittel does nothing	Too risky, can force Vittel to close down the business unit
2. Vittel forces farmers to change their practices by taking legal action	Farmers' liability is unproved and risk of publicising the Vittel problem with counterproductive effects on its reputation
3. Vittel relocates its activity by choosing new and non-contaminated springs	Loss of the Vittel label tied to its specific location and associated premium price
4. Vittel buys all the lands around the site ("quasi-integration")	Regulatory barriers and strong opposition if too much agricultural lands is sold to non-farmers (45% of the catchment area acquired[47])
5. Vittel achieves a contractual arrangement with farmers	Remaining alternative but need to make interests of farmers coinciding with those of Vittel

9.2. Collective action and provided public goods

404. Improvement of water quality is the most important public good provided by the arrangement between the Vittel Company and farmers. Declines in nitrate concentration have been observed from 8 to 4.6 mg/l in bottled water (Barneoud, 2009). The adoption of environmentally friendly practices by farmers also provided public goods which were not expected initially, namely substantial changes of the landscape (INRA, 2006) and an increase in biodiversity (Cazenave, 2010).[48] The area has been described in various outlets as a "green island" (Barneoud, 2009). The major actors involved were: (1) Vittel and its created subsidiary company, Agrivair; (2) the farmers located in the catchment area; (3) a public research consortium that included researchers from various disciplines; and (4) various local and national actors such as professional farmer organisations?[49] SAFER, and the Rhin-Meuse Water Agency.

405. The main activities undertaken correspond to the requirements included in the contract with Vittel. The contract requires a shared new farming system which is currently adopted by 26 farms. The overall area protected covers 92% of the targeted perimeter. First, these requirements correspond to drastic changes in farming practices and habits such as suppressing corn, chemical fertilisers and adopting extensive farming (Perrot-Maître, 2006). Some "sensitive" operations (e.g. applying compost in farmers' fields) introduced by the arrangement between Vittel and farmers are achieved by Agrivair on individual farms and not by farmers themselves. Agrivair also provides substantial technical assistance, including farm plans and introduction to new social and professional networks (Perrot Maître, 2006). The major role played by Agrivair ensures consistency across farms. These changes were so profound that a farmer under contract with Vittel described them as a "brain washing" (Poirot, 2009) while another, who refused to contract with Vittel considered them as "a return to the past, 30 years ago" (Barnéoud, 2009).

406. Several conditions were necessary to generate collective action. The most tangible ones were an adapted multidimensional incentive package that allowed the income of farmers to be maintained over time and to finance technological changes. Moreover, Vittel demonstrated a long-term involvement in the partnership and a willingness to take into account farmers' concerns. Thanks to the intervention of a

47. Several operations attributed to Vittel, e.g. purchasing lands are in fact formally achieved by Agrivair.

48. The Vittel experiment also produced knowledge, has public good properties, and has been redeployed in other locations by private and public operators.

49. Despite the desire of the research team to work with professional farmer organisations since the beginning, notably the Chamber of Agriculture and farmers' unions, the relationships became quickly contentious because these entities had a vested interest in maintaining the intensive production systems (Chia and Raulet, 1994; Dollet, 1998; Perrot-Maître, 2006).

research team, the process was participatory and collaborative, leading to greater acceptance by farmers. The locally-based intermediary institution, Agrivair, led by Philippe Pierre who was sympathetic to the farmers' cause, played a significant role in creating the conditions for the changes proposed by Vittel acceptable to farmers, e.g. the introduction of new social and professional networks. Agrivair's geographic proximity facilitated a permanent dialogue with farmers (Perrot-Maître, 2010).

9.3. Factors for successful collective action

Resource system characteristics

407. While the desired outcome by Vittel was clear, the means to achieve it needed to be defined. At the beginning, neither Vittel nor the farmers had sufficient knowledge to determine *what must be modified and how to do it.* To fill these knowledge gaps, in 1989 Vittel contracted a multidisciplinary research team from the French National Agronomic Institute (INRA) to launch a research action called *Agriculture-Environnement-Vittel* (AGREV). The objective was three-fold: understand the relationship between farming practices and the nitrate rate in the aquifer; identify and test the practices necessary to reduce and maintain the nitrate rate at the desired level; and identify incentives necessary for farmers to change their practices (Perrot-Maître, 2006).

408. Indeed, the relationship between farming practices and nitrate rate reduction is complex and non-linear. Results are observable at an aggregate level and only at middle or long-term horizons and cannot be linked to individual practices. In order to reach a nitrate rate below 4.5 g/l in groundwater, scientific expertise showed that the nitrate rate has to be lower than 10 mg/l in the root zone. A number of practices were identified to fulfil this objective and prevent pesticide contamination. For instance, eliminating corn crop was necessary because the nitrate rate can reach 200 mg/l in the root zone. Yet several factors challenged the emergence of a contractual arrangement between Vittel and farmers, namely valuation disputes over rights exchanged, bilateral monopoly[50] conditions, and third-party effects. For example, Vittel wanted to index the compensations on the opportunity cost of farmers while farmers wanted to be compensated on the basis of Vittel's rent from the rearrangement. Third-party effects related to how some parties who were outside the arrangement (e.g. farmers' unions, family members employed by Vittel) influenced positively or negatively the overall process. Despite these impediments, Vittel and farmers bargained successfully by keeping transaction and production costs sufficiently low and reducing them through innovative devices (Déprés et al., 2008) such as Agrivair's enforcement of the use of several scientific procedures (e.g. porous cups) developed by the scientific team and adapted to Agrivair's activities (Chia and Raulet, 1994). Nevertheless, the whole bargaining process lasted ten years.

409. Rather than the "ready-to-use" solutions first considered by Vittel,[51] the multidisciplinary research team, in co-operation with the farmers, progressively elaborated technical and economically

50. Bilateral monopoly is a situation where there are a monopoly (a single seller; in this case. farmers) and a monopsony (a single buyer; in this case, Vittel) in the same market. Each farmer located in the strategic area also had a kind of monopoly power to contract with Vittel, because lands they hold are not substitutable with other similar lands. The surface share per farm in the catchment area varied from 1 to 62% (INRA, 1996), but it has been argued that each farmer because of the geographical configuration, can to some extent, on his own, influence the nitrate rate and contaminate the groundwater (Déprés et al., 2008). Therefore, each farmer can obviously hold up the entire contracting process. Interestingly, some farmers typically held out by delaying their participation or by changing some key variables (e.g. corn surface, threats of some farmers to put deliberately contaminants into rock faults) that play a strong role in determining the amount of compensation.

51. In 1988, Vittel attempted to impose "ready to use" solutions elaborated by the French Committee for the Reduction of Water Pollution by Nitrates (CORPEN) by transforming all fields of the catchment area into grasslands. This solution could not be legally imposed on farmers, who perceived it as poorly adapted to

feasible solutions compatible with farmers' strategies (Déprés et al., 2008). This process contributed to increasing farmers' acceptance because most clauses of the contracts were not imposed "top-down" (Gafsi, 1999; INRA, 1997, 2006). In other words, farmers participated in designing the "rules of the game", which is likely to generate "procedural utility": farmers obtained utility not only from actual outcomes, but also from the conditions which led to these outcomes (Benz et al., 2004).

Group characteristics

410. Vittel had little knowledge of the farmers' realities and reasoning (Barbier, 1997). The intervention of the research team allowed understanding not only of the relationship between farmers' practices and nitrate rate, but also farmers' behaviours and strategies. Interestingly, rather than focusing on agronomic issues, the multidisciplinary team addressed first other crucial dimensions such as understanding the history, geography and sociology of the area and its people. The understanding of farmers' situations, trajectories and objectives was crucial. Although, the number of farmers in the targeted perimeter was limited (N<40[52]), a typology of farms revealed that farms were somewhat heterogeneous with respect to their size, their production process, economic situation and performance, and farmers' age and plans, notably regarding succession (Table 9.2). Vittel decided to focus on groups C and D since they were likely to continue farming and exhibited a good capacity for change. For group A, the major concern was how to close down the farm in best possible conditions (Chia and Raulet, 1994). The programme contributed to the retirement of the marginal farmers (groups A and B) who sold their lands to Agrivair (Perrot-Maître, 2006). A major and common concern among targeted farmers was debt and land issues. Indeed, all targeted farmers were heavily in debt as a result of purchasing equipment for the intensive farming promoted by the CAP[53] and land acquisition. Indeed, inheritance laws force the sibling taking the farm to purchase the land from the other siblings or parents. To purchase these lands, the new farmer frequently contracts long-term bank loans that heavily constrain his/her plans (Perrot Maître, 2006). In sum, most farmers were caught in a debt trap leading them to adopt more intensive farming with harmful consequences on water quality (Poirot, 2009).

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their production system and, further, that they fully complied with the laws and regulations applicable to their activities, notably the standard of 50 mg of nitrates per liter for drinking water. So, even if the CORPEN solution was able to address the problem faced by Vittel (i.e. 15 mg of nitrates per liter for mineral water for infant feeding, natural mineral water originally "pure and unharmed by any pollution hazards"), Vittel could force farmers to adopt it. Moreover, the research team questioned the solution suggested by CORPEN and offered an alternative, which was more compatible with farmers' perspectives (Barbier, 2008).

52. The number of contracting farmers has evolved over time because of retirement, succession, operations on lands, and so forth.

53. At that time, under the Common Agricultural Policy (CAP), farmers were receiving substantial subsidies proportional to their production, which were likely to encourage intensive farming.

Table 9.2. Overview of farms' characteristics in 1988

Farm category	A	B	C	D
Number of farms	4	8	12	13
Surface	19 ha (average)	< 50 ha	< 135 ha	> 135 ha
Turnover	< EUR 30 090	about EUR 83 847	about EUR 152 450	> EUR 167 693
Production system	Breeding	Milk	Milk + Meat	Milk + Meat + Cereals
Input	Hay	Hay + corn	Hay + corn	Hay + corn
Productivity level	+	+	++	+++
Likelihood of having a successor	No	Uncertain	Yes	Yes
Farmer's age	> 50 years	-	about 41 years	< 40 years

Institutional arrangement

411. Given the lack of reciprocal knowledge and trust between the two parties, the research team played a mediating role to ensure mutual comprehension between the *a priori* divergent and asymmetric interests of the two parties, i.e. an important industrial company willing to improve its water quality and farmers aware of public concerns but fearing changes in their production systems. The perception of the research team by farmers was better than the perception of the Vittel Company, which was perceived as an industrial giant willing to impose its rules and end farming in the catchment area (Chia and Raulet, 1994; Barbier and Chia, 2001). During the process of applied research, an extension specialist was recruited by the research team to ensure constant communication between farmers, Vittel and researchers (Gafsi, 1999). This specialist acquired specific competencies skills and became the director of Agrivair at the end of his collaboration with the research team (Deffontaines and Brossier, 2000; Chia and Raulet, 1994). These core competencies (e.g. precise knowledge of local farms, proxies used by the research teams) were redeployed to the Agrivair structure at a relatively low cost.

412. The new farming system proposed to farmers was capital, labour and land intensive. Farmers lacked all of these. Moreover, the changes desired by Vittel also implied a loss of status in the farming community (Chia and Raulet, 1994), which at the time, was using notably productivity, yields and farm size as symbols of status. It has been shown that such considerations can impede the adoption of profitable and environmentally friendly innovations (Salhi et al., forthcoming). In close collaboration with farmers, Vittel designed an incentive package (Déprés et al., 2008; Perrot Maître, 2006, 2010) that took into account several dimensions, such as debt issues, land management, income level, and status considerations. Vittel also showed farmers how intertwined their interests were intertwined.[54] Because of the complex nature of the relationship between farming practices and nitrate rate, payments were based on compliance rather than service provision (Perrot-Maître, 2010). Interestingly, even if some rules were shared, terms of contracts were adapted to each farmer's situation (Tables 9.3 and 9.4).

54. Interestingly, Vittel and farmers considered the creation of a "Vittel eco-label" to market agricultural products from this area, but the plan was abandoned because of the risk of negative spillovers on Vittel in case of problems with the foodstuff (Déprés et al., 2008).

Table 9.3. Main obligations of farmers

• Eliminate corn crop (nitrate rate can reach 200 mg/l in the root zone)
• Ban pesticides
• Compost all animal waste
• Nitrogen fertilisation by composted manure (an additional nitrogen contribution <30 units per ha is tolerated)
• Limit one livestock unit per ha of grazing area and balance livestock feed
• Ensure farm buildings are up to Agrivair standards for optimal waste management

Table 9.4. The multidimensional incentive package

• Long-term security through 30-year contracts (Originally, some contracts were 18-year contracts)
• Abolition of debt due to land acquisition[1]
• Land acquired by Vittel left in usufruct up to 30 years and linked dairy quotas
• Subsidy of about 200 EUR/ha/year over the first five years to ensure a guaranteed income
• Equipment investment, building modernization of about EUR 150 000 per farm (haymaking, barn drying, etc.)
• Free labour to achieve compost and apply it to fields
• Free technical assistance including individual farm plans and new social and professional networks

1. The exact arrangement and amount are negotiated for each farm. In most cases, if farmers have contracted long-term loans to purchase lands, Vittel took ownership of the lands from the creditors and provided farmers with long-term use rights (Perrot-Maître, 2010).

413. In order to convince reluctant farmers to agree, the purchased lands and tied dairy quotas constituted a bargaining "weapon", as additional lands were necessary to maintain income with a more extensive system. The increase in farm size and quotas also provided status benefits. Thus the fields owned by Vittel that were made available to farmers constituted both a compensation and an enforcement mechanism in the sense that if the contract was broken, these were lost. In addition, the contractual obligations of farmers apply to the whole farm, and not only to fields located in the catchment area, which increases the compensation paid but significantly reduces the monitoring costs. Indeed, it is difficult and costly to monitor whether nitrates or pesticides are purchased (e.g. by checking accounting documents) and applied over a part of the farm and not on another part located in the targeted area (Barbier and Chia, 2001). To ensure its obligations and prove its sustainable implication, Vittel also created an agricultural advisory firm, Agrivair whose mission was to advise, accompany, monitor and enforce contracts with farmers (Gafsi, 1999). It also performed other crucial tasks, e.g. composting, as a further means to ensure results and reduce monitoring costs. New technologies were introduced by this firm, such as geographic information systems to manage manure spreading.[55] Several clauses of the contracts relate to the prevention of fraud, such as free access to accounting documents and visual inspection of farms, thus lowering enforcement costs. By provoking and financing changes, Vittel expects to "lock" farmers onto a given trajectory that would make it difficult to switch back to previous polluting practices. It is hoped that farmers will acquire specific knowledge and skills concerning environmentally friendly farming and price premiums for environmentally differentiated products, such as organic products (Déprés et al., 2008).

414. The main reasons to explain the refusal to commit by a few farmers are (1) their strong political commitment, notably to farmers unions, to champion their vision of a modern and productive agriculture; (2) the loss of freedom and autonomy over decisions which are considered as incompatible with the farmer

55. Agrivair has extended its activities to non-agricultural actors such as golf courses, thermal parks or individuals.

lifestyle; and (3) their financial situation (very high sunk costs invested in intensive farming and high debt ratio) making the obligations of the contract unobtainable (Barneoud, 2009; Déprés et al., 2008).

415. It is difficult to provide accurate estimates of the overall costs and benefits of the contractual arrangement between Vittel and farmers because most data are not available in the public domain and available data are frequently partial. Déprés et al. (2008) stress that Vittel incurred at least three kinds of costs in getting the mechanism to work: 1) the design costs including the contract with the research team and other costs for identifying the transactors – e.g. land users, successors, owners – defining the accurate area to buy or put under contract, the rights to contract, and the terms of contracts with farmers; (2) the implementation costs including buying fields and investments in individual farms under contract, the costs associated with creating and running Agrivair, and economic compensation negotiated with farmers for changes in farming methods; and (3) the enforcement costs. Indicative data on the costs incurred by Vittel are provided in Table 9.5, but must be considered with caution. Despite its costs, the evidence suggests that the arrangement was profitable for both parties, although the allocation of the benefits between Vittel and farmers remains a contentious issue (Déprés et al., 2008).

Table 9.5. Costs incurred by Vittel for the contractual arrangement for the first seven years

Costs incurred by Vittel for the contractual arrangement for the first seven years Land acquisition	EUR 9.14 million
Investments in farm equipment	EUR 3.81 million
Other expenditures, mainly financial compensations	EUR 11.3 millions
Total costs for Vittel	EUR 24.25 million
Cost of protecting the resource per m^3 of bottled water	EUR 1.52

Source: www.observatoire-environnement.org/OBSERVATOIRE, from Déprés et al., 2008).

External environment

416. On the one hand, there were complaints that the Vittel action was disruptive to the local agricultural economy and its cultural norms, leading to stronger opposition from farmer unions. By purchasing lands in the catchment area, Vittel caused an increase in land prices which became twice the usual price. Tensions and jealousy between farmers located within the critical area and those located outside it, and consequently excluded from negotiations, were sometimes very high. The concerns in the farming community –especially on farmers unions and other agricultural organisations (e.g. Chamber of Agriculture) – about the impact of changes in farming were also significant because the dominant, industrial agriculture model would be substituted with a new and more stringent production process, threatening their lifestyle (Dollet, 1998). Moreover, some farmer representatives were concerned by the possible use of the Vittel approach to shape the forthcoming Common Agricultural Policy (Dollet, 1998).

417. On the other hand, because Vittel was an important employer (about 1 500 employees at that time) and the water's reputation was an important basis of other activities such as tourism and thermalism. Therefore, the efforts required by Vittel from farmers were perceived by some parties as legitimate and necessary. For example, the fact that each farmer has a member of his family working at Vittel put them under social pressure to find an arrangement which did not threaten these jobs. "There was also strong political support (at the local and national levels) to make the experience successful and to a certain extent, regardless of the overall costs" (Barbier, 2004 quoted in Déprés et al., 2008)

9.4. Policy measures for collective action

418. Despite a transaction that was between private parties, public authorities played a significant role in the process. The governmental implication was strong at different levels and for several reasons. First, salaries of the research team, who are public servants, were paid by public funds. These salaries have been estimated at 20% of the overall research cost over four years (Perrot-Maître, 2006); the remaining costs were mainly funded by Vittel. The research team was interested in having a "real laboratory" in the field to test and apply an interdisciplinary approach. Second, the Vittel area benefited from a land consolidation operation (OGAF), facilitating the reorganisation of the lands within defined boundaries thanks to public funds at the national level (Déprés et al., 2008; Perrot-Maître, 2006). Some expenses related to building modernisation were paid by the Rhin Meuse Water Agency (Perrot-Maître, 2006). Third, civil servants were interested in designing a methodology that could be applied to other areas experiencing similar problems (INRA, 1997).

419. By participating indirectly in the Vittel arrangement, public authorities kept some intellectual rights on the approach which has served as a model in several other environmental-related transactions on tap water quality in several French cities. Nevertheless, several issues can limit the potential for transferability (Perrot-Maître and Davis, 2001; Déprés et al., 2008). For instance, a geographical scale implying a greater number of farmers or more heterogeneous activities, or the need to get results quickly and the private sector profitability can restrict the applicability of the Vittel model. Small and homogenous groups can ease collective action. However, these conditions may also hold for tap water where citizens assign a higher value to water quality than farmers (Grolleau and McCann, 2012). Interestingly, similar approaches have been redeployed by private (e.g. Contrexéville, Perrier) and public actors at various locations (e.g. Auxerre, Pontivier) with some adaptation.

9.5. Conclusion

420. This case study necessarily condenses events and gives them more coherence and order than what the day-to-day reality was (e.g. Barbier, 2008; Chia and Raulet, 1994). According to the director of Agrivair, even if the financial ability to finance research and technological changes was important, it was not the primary reasons for success. Indeed, the attention devoted to understanding farmers, to establishing an on-going dialogue with them and to take into account their perspectives were key to the success (Perrot-Maître, 2006). The research team helped to build trust and to design solutions with local farmers that made the interests of Vittel and farmers coincide (Chia and Raulet, 1994). The long-term commitment of Vittel, tangible in the multidimensional incentive package and the creation of an intermediary institution, proved how their fates were intertwined. Vittel did not focus only on technological-economic issues (agronomic solutions and economic incentives), but also on other dimensions related to life choices, status considerations, and the future plans of farmers (e.g. debt issues, land issues, new support networks). In sum, we believe that this contribution makes a strong case on how private business can help protect environmental services.

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10. THE GERMAN CASE STUDIES[56]

421. Addressing key environmental challenges such as water quality improvement, biodiversity preservation, and climate change is an important issue in Germany. Among various examples of collective action related to agriculture and environment, this study analyses three case studies: landcare associations, co-operation in drinking water protection and wetland restoration in the Eider valley.

10.1. Landcare associations[57]

Brief description of the case "landcare associations"

422. Landcare Associations (LCAs) are regional non-profit associations founded by local and regional politicians, farmers and nature conservation associations. They work together with land managers and collaborate closely with administrations and further stakeholders, and strive to harmonise conservation interests as well as interests of rural communities in terms, for example, of farming or tourism. Their main goals are: i) to create an area-wide network of natural and semi-natural habitats in all German cultural landscapes; ii) to give impulses for a sustainable regional development and environmentally friendly land use, each suited to the single regions and their strengths; and iii) to help to provide a reliable additional income for land managers through nature conservation and support them in marketing products typical to the region.

423. LCAs are mentioned in the German Nature Conservation Act as the preferred organisations to implement landcare measures. LCAs can be considered as a service provider for i) local communities and the district, ii) private land owners and local nature conservation organisations, and iii) partly the federal states.

424. The first LCA was founded in 1985 in Bavaria, in southeast Germany. To date, there are around 155 regional LCAs, generally at the district level (NUTS 3),[58] with more than 3 000 municipalities, 1 000 organisations and 20 000 farmers being members. Most LCAs exist in Bavaria (55 LCAs, or about 35% of the total), less in northwest Germany. The national umbrella organisation is the German Association for Landcare (*Deutscher Verband für Landschaftspflege*, DVL).

56. This case study was prepared by Heike Nitsch from Helmholtz Centre for Environmental Research and Bernhard Osterburg from Institute of Rural Studies, Johann Heinrich von Thünen-Institut (TI).

57. This case study is based on the information from web-sites of the German Association for Landcare (www.lpv.de/), of the Bavarian Landcare Associations (bayern.lpv.de/), of the DVL Kelheim (www.voef.de/Verband.aspx), of the DVL Mittelfranken (www.lpv-mfr.de/) and of the project "Altmühltaler Lamm" (www.altmuehltaler-lamm.de/) and personal information from Lieselotte Unseld and Jürgen Metzner (German Association for Landcare).

58. There are LCAs across districts as well. In case single districts are very large (as, for example, in Mecklenburg-West Pomerania), there are more than one LCA in one district.

Provided public goods through collective action

425. Over the centuries diverse cultivated landscapes have developed in connection with agricultural use, such as mountain meadows, extensive pastures on poor soils or traditional orchards, and a considerable part of species and habitats in Germany is linked to a certain form of – mostly extensive – management. The main public goods provided through collective action via the LCAs are the conservation of diverse landscapes, biotopes, and biodiversity in cultivated landscapes. Measures are also partly linked to water protection (e.g. in Bavaria LCAs are since 2012 explicitly involved in the implementation of the European Union Water Framework Directive) or climate protection (conservation of fens or bogs; rewetting of organic soils).

Main actors and their roles

426. Each LCA consists of members, a steering committee, a manager and a panel of external experts (Table 10.1). Members of an LCA may be individuals, organisations, administrations, municipalities and private companies. The steering committee consists of an equal share of representatives of local politicians, land managers (mainly farmers, and also forest managers, or their associations) and nature conservation organisations. An expert panel is appointed by the steering committee. Depending on the size of the district, at least one permanent manager (or co-ordinator) is employed.

Table 10.1. The role of different participants in LCAs

Participants	Persons and role
Members of LCA	Individuals, organisations, administrations, municipalities or private companies: • Election of steering committee; decisions on general issues; adaptation of stated rules; height of membership fees; etc.
Steering Committee	Equal share of local politicians, land managers and environmental organisations: • Listing measures and decisions on human resources; appointment of members of the advisory panel.
Expert panel	Appointed by the steering committee; representatives of the lower administrations for nature conservation, agriculture, water and forestry, the regional tourism association and further experts (e.g. with special local knowledge, from machinery rings, different stakeholder associations or others if considered necessary): • Providing and sharing expertise.
Managers/ Co-ordinators	Depending on the size of the district, at least one permanent manager (or co-ordinator) is employed. They usually have a university degree (e.g. biology, ecology, agriculture, forestry, geography, resource conservation) and may be assisted by volunteers and or further freelance employees: • Mapping areas; concretising actual measures to be taken; calculating costs; applying for subsidies; organising and supervising implementation; monitoring results; co-ordinating with local communities, authorities, conservation groups and land managers.
Land managers	• Main actors in implementing measures; representatives in LCAs.
Governments	Ministries in charge of the environment and agriculture of federal states: • Main actors in design and financing of management measures such as agri-environmental measures or conservation and upgrading of the rural heritage; partly financing personnel and overheads. Experts from lower authorities (NUTS 3): • Providing their expertise in advisory panel.

427. Based on concepts developed by conservation experts, activities of LCAs include planting of hedges, re-naturation of formerly regulated streams, maintaining species-rich grassland on poor soils by mowing or extensive grazing often with traditional robust breeds, as well as advice to land managers on environmental education. Recently, assistance has been given with respect to marketing of high-quality products linked to landcare (e.g. lamb meet, apple juice from traditional orchards). At any one time, an LCA can co-ordinate up to 100 single measures.

428. The LCAs help to co-ordinate different interests, obtain funds, and organise measures. The actual conservation work is often carried out by local farmers, who receive payments for undertaking such activities as mowing or grazing, or other activities that require heavy machinery such as tractors or diggers. For the extended creation of new biotopes, a local landscape contractor can be involved. The final decision to participate lies with the land owners and/or land managers. If no farmers are available, LCAs may act as "active farmers" and create "landscape conservation farms" in order to be eligible for CAP's Pillar 1 direct payments. Generally, the involvement of farmers is sought as is the integration of nature conservation into agricultural farm land management. However, if the specific nature of the conservation activity is minimally connected to farming, the land is usually publicly owned or may be purchased by an LCA.

429. LCAs rely on various financial funds. Financing of personnel and overhead differs depending on the federal states and may be based predominantly on institutional funding by the federal state, on funds of municipalities or districts via membership fees or a mix of funds including CAP measures for the conservation and upgrading of the rural heritage. Funds for carrying out land management are provided by membership fees and by EU-funded measures. National Ministries may support model projects for nature conservation in larger areas (*Großschutzgebiete*). Additional funds may be acquired from various federal nature conservation trusts, private donations, penalties for environmental offences, compensation e.g. for construction activities, or lottery money. In many cases, the LCAs have to provide co-funding. The national umbrella organisation DVL is co-financed by the German Government.

Box 10.1. Implementation of Natura 2000 on semi-natural dry grassland in the *Altmühl* Valley (an example)

The valley of the *Altmühl* river in Bavaria is one of the most important corridors of semi-natural grassland in the South German Jura. It stretches to over 5 400 ha over 43 areas protected under the European Union's Habitats Directive. The agricultural use of these areas is highly significant for the conservation and interconnectedness of the habitats. The *Altmühl* Valley and its side valleys are farmed by more than 50 sheep-farmers with about 300 to 800 ewes per farm. Grazing by sheep maintains these valuable grasslands; transhumance contributes to spreading seeds and thus connecting populations of grassland species.

In order to maintain this extensive grazing system, the LCA *Mittelfranken*, LCA *Kelheim* (the first LCA founded in Bavaria) and *Naturpark Altmühltal* (Nature Park *Altmühl* Valley) jointly manage and co-ordinate related landcare measures. Many interest groups — huntsmen, foresters, nature conservation groups, cultural tradition groups and social institutions — are also involved in various landcare, environmental education and tourism projects. CAP subsidies to farmers and other land managers are crucial for this collective action. Co-financing is provided by four districts and 20 municipalities.

The LCA *Kelheim* is responsible for the communication, outreach and organisation of events, and co-ordinates the *Altmühltaler Lamm* project, in which sheep farmers, butchers and innkeepers work together with the nature conservation administration and the advisory service of the agricultural administration. The marketing of labelled regional lamb ("*Altmühltaler Lamm":* lamb from the *Altmühl* Valley) is not only of economic importance for the sheep farming businesses, but also serves as a figurehead for the whole region. Events such as sheep festivals and other environmental awareness actions take place regularly. The common goal of these events is to raise awareness of the Natura 2000 targets and their relation to the landscape and regional economic cycles.

Factors for successful collective action

Local knowledge and scientific expertise

430. An LCA is composed of many members and is supported by an expert panel. The steering committee, which takes general decisions on measures, is generally limited to no more than 15 people, equally consisting of representatives of local and regional politicians, farmers and nature conservation organisations. Thus, LCAs include both local knowledge and scientific expertise from a variety of backgrounds.

431. LCAs often collaborate closely with other LCAs to exchange expertise and experiences on good practice or to co-ordinate the management of a larger area. The national DVL communicates knowledge and experiences of different regional LCAs, works together with relevant ministries, represents the interests of LCAs at the European scale, and assists with building the foundations of new LCAs.

Permanent contact person

432. As the success of an LCA is closely linked to the commitment of the co-ordinator as a permanent contact person, the DVL considers it important to create an attractive employment opportunity for management (100% employment, qualified person). This co-ordinator is the central actor for networking, not only with land managers and other concerned stakeholders, but also with administrations.

Trust and balancing of interests

433. An important factor for the principles of an LCA is trust among the various participating groups and the respect of different interests, as well as involving people with local knowledge, reputation and connections. This exchange and understanding of interests result in measures that are broadly supported due to common decision-making. Participation is voluntary. However, even a sceptical farmer might be convinced to participate if farmers are represented in the steering committee or he/she is confronted with positive examples in the neighbourhood.

Communication, outreach and environmental education

434. Communication, outreach and environmental education are part of an LCA's work and play an important role in increasing the awareness of land owners and managers of landscape and nature protection and of existing funding. For farmers, help with applications for funding and the organisation of measures can be important in overcoming inhibitions to participate.

Institutional arrangement

Decentralised approach

435. Each LCA usually concentrates on one district or natural region. Thus, the LCA can take account of the specific regional conditions and plan measures accordingly (e.g. location of measures, concrete management options, finding individual solutions).

436. The individual projects organised by an LCA can be of different sizes. However, an added value of LCAs is the co-ordination of measures at the landscape level, a crucial aspect, for example, for habitat connection (Box 10.2). Co-operation between different actors is also facilitated (e.g. farmers carrying out management for nature conservation on publicly-owned land). The LCA *Kelheim* works with about 100 farmers.

Monitoring and sanctions

437. In the case where funding for management is received through CAP measures of Pillar 2, minimum control and monitoring requirements as well as sanctions in case of non-compliance are set by EU rules and carried out by responsible administrations. LCAs can advise on implementation, help with planning, and monitor correct implementation, which lowers the risk of non-compliance and sanctions.

External support

438. With the exception of the co-ordinator, all other members of the LCA, the steering committee and the expert panel provide their time and expertise without salary. Efforts for landscape management are financially remunerated.

439. Financial support for land management, land purchase, personnel and overhead stems from a variety of sources. Mixed funding, i.e. not being completely dependent on the municipalities or the federal state, provides a certain independence for LCAs. However, regular land management (such as mowing or grazing) is often strongly supported by measures of the CAP's Pillar 2 and thus relies on the continuation of these programmes.

Policy measures for collective action

440. EU subsidies are the most important policy measures contributing to landcare. Contrary to direct payments of Pillar 1, payments granted through CAP's Pillar 2 and LIFE+[59] must be co-financed by EU member states; in case of nature conservation measures in Germany, co-financing is provided by the federal states, which also formulate the relevant directives stating eligible measures, management requirements and level of payments.

441. Investment measures for nature conservation and upgrading of the rural heritage (according to Art. 57 of Regulation (EC) No 1698/2005) include planning costs. LCAs generally co-finance at least 30% of total costs. Agri-environmental measures (according to Art. 39 of Regulation (EC) No 1698/2005) remunerate all management costs but do not include planning costs. Further funding of Pillar 2 can be acquired through LEADER (according to Art. 61 of Regulation (EC) No 1698/2005). Box 10.2 shows an example of policies in the *Altmühl* Valley case.

59. The European Union's Financial Instrument for the Environment provides funding for projects in the area of the environment and nature conservation. A focus lies on the contribution to the implementation of the Natura 2000 network.

Box 10.2. Relevant EU subsidies for landcare activities in the *Altmühl* Valley (an example)

The maintenance of semi-natural grassland in the region strongly relies on the following EU subsidies:

- Applying **investment measures for nature conservation**: since 2009 about 110 ha of grazing grounds were restored by removing shrub, and an additional 190 ha received follow-up care after previous shrub removal. These measures have enabled new habitats to develop and for the system and quality of Natura 2000 habitats to be maintained or improved. Investment measures are also important to improve the infrastructure (i.e. troughs) of grazing systems and to restore connecting pathways between grazing grounds. Recipients may be municipalities, LCAs and other nature conservation organisations, or land owners and administrations of nature parks.
- On almost the entire area of the Natura 2000-network in the *Altmühl* Valley, **agri-environmental measures** are developed with sheep farmers. Extensive sheep grazing in Natura 2000 areas receives a subsidy of EUR 270/ha. Additional payments can be granted, e.g. in cases of difficult grazing conditions (necessity to cross roads; distance to farm or between pastures > 5 km). In addition to farmers, potential recipients may be LCAs or other nature conservation organisations.
- **Pillar 1 direct payments** comprise a significant part of sheep farmers' income, demonstrating the importance of integrating extensive grazing systems in Pillar 1 of the CAP. However, problems regarding the eligibility of areas have arisen in cases where there is shrub encroachment.

10.2. Co-operation in drinking water protection

Brief description of the case "Co-operation in drinking water protection"

442. The "co-operation model" in designated areas for drinking water protection of the state of Lower Saxony comprises the establishment of working groups of farmers, representatives of water suppliers and technical advisers. Co-operation helps bring farmers and water suppliers together and solve problems related to maintaining or recovering a high drinking water quality. Important activities are technical advice to farmers, voluntary contracts for water protection at farm level, model and pilot projects, field trials, and land purchase.

443. The "co-operation model" was established in 1992, based on the 8th amendment of the Water Law of Lower Saxony (NWG, Niedersächsisches Wassergesetz). Since this year, the NWG determines that before establishing restrictions and related compensation payments, participants of existing co-operations between water suppliers and farmers have to be consulted (NLWKN, 2011a). This sets a preference on co-operative, voluntary solutions in the conflicts between water suppliers and farmers. This is based on the Federal Water Ressources Law (Wasserhaushaltsgesetz, WHG), which in article 19 states that agricultural practices may be restricted to protect water from pollution in designated water protection zones. The WHG also requires authorities to compensate farmers for costs incurred and income foregone of additional restrictions going beyond the legal baseline of "good farming practice" (Heinz, 2003).

444. Since the 1992 amendment of the NWG, a water charge ("water cent") is paid by water consumers in Lower Saxony. It is partly used for compensation payments and to finance co-operation activities in designated areas that protect drinking water. In 2007, the NWG was once again amended. Prior to that year, the government of Lower Saxony played a more active role in the implementation of co-operative projects. At present, water suppliers must organise co-operations and apply for support from the "water cent" (NLWKN, 2011a). The allocation of funds is organised in accordance to priorities based on water pollution data. Areas with high water pollution receive more funds per hectare of agricultural area (NLWKN, 2011b). Further, the existence of co-operation between farmers (and in some cases forest

managers) and water suppliers, and their agreement with an advisory concept developed for the respective designated area are preconditions of support from the "water cent".

445. Funding is based on a standard contract between water suppliers and the government of Lower Saxony that defines the management concept for the groundwater catchment, target indicators and monitoring the performance of activities and water quality. These contracts include guaranteed funding for a five-year period. The co-operation establishes a protection concept for the respective designated area, develops and implements appropriate measures of water protection and performs monitoring and evaluation of farming, nutrient management, and water quality. Regular meetings of the participants are used to inform about conditions as well as results of field trials and monitoring and evaluation, to discuss progress made and further steps. A key co-operation activity is water-related special technical advice to farmers by professional advisers (NLWKN, 2011a).

446. Through such co-operation, voluntary agreements for water protection at the farm level are organised. Agreements include, for example, the growing of catch crops in autumn, change of crop rotation, extensive grassland management, reduction of nitrogen fertiliser inputs per hectare, or emission-reduced equipment for spreading of liquid manure. In 2009, co-operations were established in 370 drinking watersheds of Lower Saxony and measures were implemented on about 230 000 ha of agricultural land. In addition, EU-co-funded agri-environmental schemes cover about 40 000 ha. Thus, most of the agricultural utilised area within the designated areas for drinking water protection is covered by the agreements or by schemes for water protection. The agricultural area within the designated areas is 303 778 ha, equivalent to 11.7% of total agricultural land in Lower Saxony. Thus, a very high level of voluntary uptake could be reached, supported by the high acceptance of farmers and their willingness to support environmental actions (NLWKN, 2011a).

447. Land purchase is another activity supported with the "water cent", which serves to solve land use conflicts in sensitive areas. The land is converted to extensive grassland or forest for at least 25 years. Between 1994 and 2009, 1 700 ha of land were purchased. Since 1995, purchases have significantly decreased and, in 2009, 6 ha were purchased. Pilot projects to improve water quality monitoring or to better understand diffuse pollution are also supported, as are field trials and the calculation of compensation payments for voluntary agreements (NLWKN, 2011a).

Reducing negative externalities through collective action

448. The objective is to maintain and improve the quality of drinking water and to reduce diffuse pollution of groundwater, especially that caused by nitrate leaching and pesticides. Preventive actions are also taken to avoid the deterioration of water quality.

449. Between 1998 and 2008, farm gate nitrogen balances of farms in the co-operations decreased from 94 kg N/hectare of agricultural utilised land to 66 kg N/hectare, and mineral fertiliser input decreased from 138 to 110 kg/hectare. Voluntary agreements for water-friendly management plus agri-environmental schemes contributed to curb potential N pollution by about 12 kg/hectare in 2009, or 3 600 to 4 000 metric tonnes of nitrogen per year. The share of wells used for the extraction of drinking water with decreasing nitrate concentration increased from 41% in 2000 to 54% of all wells in 2009 (NLWKN, 2011a).

Main actors and their roles

450. In Lower Saxony, about 10 900 farmers have land within designated drinking water protection areas. Many participate actively in co-operation groups and most implement voluntary water protection measures. On average, there are about 65 farmers per designated area. The areas differ in terms of size and number of farmers involved. Smaller areas are often organised as a single co-operation (NLWKN, 2011a).

451. Representatives of water suppliers and contracted technical advisers also participate, and advisers organise many other activities. Co-operation is supported by the farmers union, the Chamber of Agriculture, regional administration, and the Lower Saxony Water Management, Coastal Defence and Nature Conservation Agency (NLWKN).

452. NLWKN organises the implementation process at the state level and performs monitoring and evaluation. Monitoring comprises data on the designated areas, such as natural conditions, farm structures and land use, nutrient balances and water quality, and budgets for voluntary management agreements and technical advice. The Ministry of Environment, Energy and Climate Protection of Lower Saxony is the public authority steering and controlling the legal and financial framework of the co-operations. Table 10.2 summarises the roles of participants.

Table 10.2. Role of different participants in the co-operations for in drinking water protection

Participants	Persons and role
Farmers	Farmer's representatives in the co-operations of the different designated areas for drinking water protection are seeking to find practicable and co-operative solutions of water protection, preferably voluntary and including compensation payments. Farmers implement measures for water protection on their land and undertake field trials.
Water suppliers	Water supply companies are the counterpart of the farmers, they stipulate protection and improvement of drinking water quality.
Specialised technical advisers	Technical advisers from consultancies or the Chamber of Agriculture approach single farmers or groups to improve knowledge and understanding of the environmental problems of farming, and to promote water protection measures. They organise the conceptual process, perform monitoring and evaluation and moderate meetings and discussions.
Chamber of Agriculture	The Chamber of Agriculture is responsible for providing technical advice in about half of the designated areas. The Chamber edits and updates background information on measures and compensation payments, materials for technical advice, performs field trials, and works on publicity.
Public water authority (NLWKN)	The Lower Saxony Water Management, Coastal Defence and Nature Conservation Agency (NLWKN) organises the establishment and the funding of co-operations, and performs monitoring and evaluation activities and workshops at the level of Lower Saxony.
Ministry of Environment	The Ministry of Environment, Energy and Climate Protection of Lower Saxony is responsible for the legal framework of co-operations and the funding through the "water cent", and is supervising the organisation of the co-operations.

Factors for successful collective action

Economic incentives

453. The establishment of co-operations based on agreements and equal rights of farmers and water suppliers is a pre-condition to receive funding derived from the "water cent. Thus, both water suppliers and farmers have a strong incentive to agree on a co-operative organisation. The co-operations support the development and improvement of a common understanding of problems and to search for solutions in a co-operative way.

Voluntary financial approaches

454. For water suppliers facing problems with water quality, the alternative to the co-operative approach would be to support more restrictive management requirements within their catchments. However, in this case they would have to pay compensations in accordance with the water law, but without support from the "water cent". Alternatively, they could opt for the technical purification of groundwater which in most cases is more expensive compared to the funding of the co-operation model. Command and control approaches in the area of diffuse pollution are of limited effectiveness and have a low acceptance by farmers. This applies even if compensation payments are offered.

Permanent local contact person and co-ordinator

455. Important elements of success are the presence of a person who acts at once as a specialised technical adviser, a permanent local contact person, and co-ordinator of the various activities. This person also helps farmers to complete applications for funding, and informs on environmental aspects and potential water protection measures appropriate for the respective farm. The dialogue between farmers and adviser, and regular meetings with water suppliers and other farmers create trust. In cases where there is conflict, balancing the various interests becomes easier. Farmers are compensated for additional costs of improved management measures, thus the polluter-pays-principle is not applied, but rather the "beneficiary-pays-principle", as the water consumers pay for the "water cent" and thus for the co-operation model.

Policy measures for collective action

456. As described, the co-operation model was developed on the basis of the German legal framework for water protection within designated areas which allows for restrictions of agricultural land use beyond the "normal" legal baseline but requires compensation payments. Thus, water authorities, water suppliers and farmers must agree on appropriate measures and compensation payments, which can be either enforced through area-specific, statutory requirements or implemented on a voluntary basis. Implementation in Lower Saxony is a more centralised approach as compared to several other German states (Laender), with a strong role of the government. There is also a clear preference for co-operative approaches, which are a precondition for funding of water protection activities through the "water cent".

457. In 2009, about EUR 6 million was spent for technical advice and other organisational activities (e.g. data collection, field trials). On average, this is about EUR 20 per hectare of agricultural land within the designated areas. For voluntary agreements and EU-co-funded agri-environmental measures, about EUR 12.3 million were spent, equal to about EUR 40 per hectare (NLWKN, 2011a). Although the general approach is centralised, co-operations have a certain degree of freedom. They decide how to develop their plans and which voluntary measures are promoted. While activities for water protection are diverse, the monitoring and evaluation organised at the state level provides for an exchange of experiences.

Conclusion of the case

458. Compared to agri-environmental action in the "normal" landscape, uptake of voluntary measures for water protection and of agri-environmental schemes is high. Monitoring and evaluation activities are well organised, have a long-term perspective, and improvement of groundwater quality is slowly evolving. The high uptake of voluntary measures is a major advantage of the co-operative approach. The activities performed and supported by the co-operation model have contributed to a decrease of diffuse water pollution. This success is dependent on collective action of the farmers within the designated areas for drinking water protection. However, intensification of land use due to higher prices for agricultural commodities has increased pressure on water quality in the last years. For example, grassland conversion

into arable land has released high loads of nitrogen stemming from soil organic matter which is decomposing after conversion. Pollution also increased due to a boom of biogas production based on the cultivation of silage maize, supported by German renewable energy policies. These external developments affecting the designated areas for drinking water protection cannot be controlled through the voluntary approach of the co-operation model.

10.3. Wetland restoration in the Eider valley

Brief description of the case "wetland restoration"

459. Restoration of wetlands such as peat bogs and fens in the German Federal States of Schleswig-Holstein is an objective of environmental policy. Such areas cover about 190 000 ha in this state, with about 50% in agricultural use (Landesregierung, 2011). Extensification of agricultural land use, deconstruction of drainage systems and rewetting of land all require agreements with land owners and users. Therefore, restoration of bogs and fens is based on co-operative institutional organisations. This study describes the case of the project "Eider valley pasture landscape", the rewetting of a groundwater-influenced fen complex and flooding area of the river Eider. The project area in the Eider catchment is situated between Flintbeck and Bordesholm, about 10 km south of Kiel, the capital of Schleswig-Holstein. The size of the project area is about 400 ha (Jensen et al., 2001; Leiner and Weihrauch, 2011).

460. During the 1980's, the nature conservation authority started to purchase land areas in the fen and marsh area of the Eider valley in order to reverse the amelioration occurred in the beginning of the 20th century. However, until the late 1990's land purchase could not be completed so that no rewetting was possible due to claims of other land owners and users with parcels within the project area (Leiner and Weihrauch, 2011). Before the project started, a land consolidation has been performed to reorganise land ownership. In 1999, a co-operative project with a 20 years perspective was started. The project also includes land owners and farmers as partners and promotes extensive grazing on restored lowlands. The grazing land is managed in a co-operative way by several farmers. Through a balanced and co-operative approach, the project succeeded to reconcile the interests of nature conservation, land owners and local governments, and to reach high local acceptance (Jensen et al., 2001).

461. The project is part of the fen restoration programme. Maintenance of the Eider River by water authorities has been minimised, and drainage of parcels has been ceased. The pasture management takes place on 11 parcels of up to 40 ha, a comparatively large size for this region. Grazing animals are heifers of dairy herds (Holstein-Frisian) as well as special breeds of cattle (Heckrinder, Galloway) and horses (Konik), using the pastures at a low stocking density. For the "Heck cattle", a breeders association has been established (Landesamt für Landwirtschaft, 2010). The animals are shaping the landscape through selective grazing, and even in winter there is no additional feeding as the area provides for sufficient forage. During winter, the cattle and horses are feeding on plant species which would otherwise encroach on more area. The large parcels comprise both wet fens and dry mineral soils so that the animals have access to a large range of vegetation.

Provided public goods through collective action

462. In accordance with the Programme for the Protection of Peat Bogs and Fens (Moorschutzprogramm) of Schleswig-Holstein, peat bogs and fens shall be restored. Environmental objectives are mitigation of green house gas (GHG) emissions from peat decomposition, protection of biodiversity of wet grasslands, and improvement of water quality through improvement of filter and storage capacity, denitrification and a stop of nitrate emissions from peat decomposition (Landesregierung, 2011). In the Eider valley project, the reduction of nitrogen and phosphate pollution of the Eider River and the restoration of the natural dynamics of the river and accompanying natural vegetation such as reeds and

alder bogs are key objectives (Stiftung Naturschutz Schleswig-Holstein, without year). The alder is an autochthonous tree species (*Alnus glutinosa*) growing in wet and even flooded areas. However, the wetland and fen restoration has multiple other outputs, such as GHG mitigation through peat conservation, protection of biodiversity and flood control. Due to its value for biodiversity, the area is part of the EU network of nature reserves Natura 2000. The reduction of surface water pollution also curbs the chemical load of marine ecosystems. The recreational use of the area for the regional capital Kiel needs to be mentioned as the project area has the landscape is diverse and attractive. There is a public foot and bicycle path of 22 km length, established to improve the recreational value, and information boards are installed to inform about the environmental and historical values of the region (Landesamt für Landwirtschaft, 2010). The Eider River can be explored by canoe. The recreational value and public awareness also improve the image of the partners involved in this project.

Main actors and their roles

463. A key actor in the project is the Water and Land Association (Wasser und Boden Verband, WBV) as the executing organisation and intermediary of the co-operation effort which undertakes negotiations with land owners and farmers. The WBV purchases land parcels, or offers long-term land management and extensification contracts for 20 years, allowing for rewetting and to develop large parcels for collective grazing. About 70% of privately-owned land were purchased, 15% obtained extensification contracts, and for 15% of the area set-aside contracts were signed (Myrzik, 2002).

464. Land owners and users form part of the project by allowing their land or farm area to become part of collective large grazing areas, with wetlands to be restored. Land owners are, for example, the municipalities, forest authorities, the Foundation for Nature Conservation, and private owners. Several farmers are organised in a pasture association for collective, extensive pasture management with special breeds. The administrations for agriculture, water and nature conservation are involved in the steering group responsible for project planning and management.

465. The University of Kiel is accompanying the project with research projects. From 1999 to 2004, a research project financed by the German Federal Ministry for Education and Research explored the ecological impacts of large-scale grazing, and analysed the institutional arrangements and public cost of the project (Holsten, 2003; Noell et al., 2003, Irmler et al. 2010). The University of Kiel with the Centre for Ecology is involved in monitoring and evaluation, and is advising the project's technical steering group. Table 10.3 summarises the roles of participants in the Eider valley wetland restoration.

466. The main activity of this restoration project is the organisation of large pasture areas for extensive grazing (on about 270 hectares in 2011), allowing for "passive" rewetting (no maintenance and repair of the drainage system) and the establishment of a more structured, semi-natural landscape. Farmers have the right to use the land as extensive pasture. Land is purchased by the WBV or leased on long-term contracts, limiting the reversal of wetland restoration after the contracts end. Parcels of 130 hectares purchased over a longer period of time by the Foundation for Nature Conservation are part of the project area. The WBV has purchased another 135 hectares. Land purchased outside the project area has been used for a land consolidation process exchanging parcels to form an undivided, continuous area, which is a precondition for larger changes in the water regime.

Table 10.3. The role of different participants in the Eider valley wetland restoration

Institutions and individuals involved in the project	Role
Water and Land Association	Promoting and managing the planning and implementation process, negotiation in order to enlarge the project area under contracts or for purchasing land.
Farmers and land owners	Negotiation of contracts to reduce land use intensity in the project area, collective management of large extensive grazing areas.
University of Kiel	Accompanying the project with research, monitoring and evaluation, publication of project results.
Foundation for Nature Conservation	Purchase of land, transfer of land to the Water and Land Association.
Governments	The Environmental Agency of Kiel (Staatliches Umweltamt) developed the project together with the WBV and the Environmental Agency of Schleswig-Holstein (Landesumweltamt), with the aim to reduce N and P pollution of the Eider.
Other special authorities (for nature conservation, water, agriculture)	Promoting the planning process or enable additional support of agri-environmental activities, using funding for rural development.
Technical steering committee	Definition of land and grazing management requirements.

467. There is a mixed funding of the project activities, based on land purchased by the Foundation for Nature Conservation Schleswig-Holstein, with funds of the Land Schleswig-Holstein. Funds of the Land are stemming from a "water cent" paid by water consumers, from an EU co-funded scheme of the European Agricultural Guidance and Guarantee Fund for investments in nature conservation and from the fen restoration programme of Schleswig-Holstein. Further, compensation payments are used to transfer land owned by municipalities to the project. According to German nature conservation legislation, infrastructure and construction projects must offer compensation for ecological damages, thus generating funds for conservation projects. The return from land rented to farmers who use the pastures is reinvested in the project. In the long term, on the basis of land rents the project shall be self-sustaining. Further, farmers receive substantial support through EU direct area payments for most of the pasture land.

Factors for successful collective action

Co-operative approaches

468. The original intention in the 1990s was to purchase land through the Foundation for Nature Conservation and public authorities. Although 130 hectares could be acquired, purchased parcels remained partly privately owned, of which certain sections continued to be used intensively. As such, no rewetting was possible as owners were opposed to such measures. The co-operative approach launched in 1999 changed this situation. The project integrated public authorities at the Land and the local levels, local specialised authorities, non-profit organisations such as the WBV and the Foundation for Nature Conservation, as well as land owners and farmers. This created the basis for a more transparent and participative process which increased acceptance and local involvement.

Local intermediary

469. For the Foundation for Nature Conservation, acting at the Land level, regional co-operation is the best way to perform local nature conservation projects. The project provides for a permanent process and involves local persons. With the WBV as the project executing organisation and project partner, confidence in the project has increased as land owners and farmers have already co-operated with the WBV. This change of roles has created mutual trust, and engaging local partners has decreased the

transaction costs of negotiations and eased the communication process. A key factor was that negotiations were led by the chairperson of the WBV who is a farmer in the region (Myrzik, 2002).

470. WBV as an intermediary and the co-operative approach enabled progress in changing the land use within the project area. Farmers were offered rights to use the extensive pastures with grazing livestock, or to get land outside the project area in exchange. Not all land has been purchased, it has been also leased with long-term contracts (over 20 years). Allowing access to land use rights, alternative approaches of leasing instead of purchase, and land resources in hands of the project for land exchange were elements to improve the project performance in terms of access to land (Myrzik, 2002).

Economic incentives

471. Fen areas are sinking due to peat decomposition, thus such areas are of decreasing value for agricultural use. This is another motive for farmers to agree on extensification and fen restoration. On the other hand, farmers are keen to keep access to that land for grazing, for receiving support payments of the EU Common Agricultural policy, and to "dilute" high livestock stocking densities on other farm land. At the beginning of the project, the creation of a unified, large grazing area had been planned. The farmers were opposed to that; they feared, for example, that animal health would be more difficult to manage in larger herds with animals from different farms. Thus, the animals of different herds are kept separately on the pasture land. In order to better take into consideration the requirements of farmers, several parcels of 10 to 40 ha have been established. 50 % of the land is collectively managed by the pasture association with special cattle breeds and horses. The pastures are equipped with fencing and gates to manage the herds and separate of animals. These investments were undertaken by the project (Myrzik, 2002).

Open process

472. An important element of the project's success is that the whole process of land acquisition, management and restoration was open when it was given over to the project. Thus, all parties could influence and identify themselves with the progress achieved (Jensen et al., 2001). The Eider valley pasture landscape project offered a new approach in the late 1990s that has attracted public and scientific interest. Together with the increased recreational values, the improvement of pathways and visitor information, these aspects have contributed to a constructive and co-operative project performance.

Policy measures for collective action

473. The project has been promoted by public entities from the beginning through the planning process, setting a long-term agenda for the further development of the Eider catchment. Policy support concentrated first on funding land purchase through the Foundation for Nature Conservation. Investments in land have also been supported from EU funds for rural development. Public lands have been transferred to the Foundation and compensation payments stemming from infrastructure and building projects have been invested in land purchase. This stock of land is the financial basis of the project, which will be self-sustaining in the long run.

474. An important basis for this – due to land purchase – comparatively expensive project was public support due reflected in the multifunctional outputs of the project. Water and nature conservation authorities have a stake as well as local municipalities. For nature conservation authorities at the Land level, the participatory approach has been in important step toward new land management approaches with stronger involvement of local land managers. The same applies to the Foundation for Nature Conservation, which is an important land owner in Schleswig-Holstein. In 2005 the foundation owned about 23 000 ha of land within designated areas of the EU network of Natura 2000 nature reserves (Dierking et al., 2004).

475. The project helped to gather positive experience with semi-open grazing landscapes, on management based on collective action, and the impact on biodiversity. There is a general trend towards intensification of productive agricultural land in addition to extensification and abandonment of farming, especially in the case of wet grasslands. This opposing trend poses the problem of how to maintain and further develop open landscapes that are valuable for biodiversity in Schleswig-Holstein, and to do so in an economically efficient way. The Directive 92/43/EEC on the conservation of natural habitats and wild fauna and flora requires that EU member states and regions maintain valuable habitats. With the concept of semi-open grazing landscapes, Schleswig-Holstein has contributed to the development of this measure which helps to maintain semi-natural landscapes open which have been shaped by historical farming systems (Dierking et al., 2004). The concept makes use of grazing animals which generate more spatial diversity, especially when grazing occurs year-round, and relies on co-operation with local farmers. Grazing is also a comparatively cheap way to manage and develop such grasslands that are so valuable to biodiversity.

Conclusion of the case

476. With 305 designated Natura 2000 areas, the approach of land purchase as the main instrument for enabling wetland restoration and management through extensive grazing is limited due to budget restrictions and increased land use competition. Therefore, local alliances for nature conservation and land management are increasingly supported to promote collective effort for biodiversity. Such entities are similar to the Landcare associations in other parts of Germany and are composed of representatives from nature conservation, agriculture, tourism and municipalities. The associations need a sufficient financial basis, own capital or support from foundations, and professional management. They support local planning and implementation processes for Natura 2000 areas and create a co-operative basis for communication and integration of regional interests (Dierking et al., 2004).

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11. THE ITALIAN CASE STUDIES[60]

477. The Italian case study includes three different collective actions which have been promoted in three different regions (Aosta Valley, Tuscany and Campania) with the objective of increasing the provision of agri-environmental goods and services associated with farming.

478. These initiatives are very different, since different territories and farming systems are involved (Table 11.1), but also the types of collective action are differentiated in terms of institutional organisation, approach to delivery, and in terms of environmental/social objectives to be achieved.

Table 11.1. The Italian case studies

	Custody of the territory in Tuscany	Community garden in Campania	Mountain pastures in Aosta Valley
Type of collective action	Collective action led by the local agency in charge of the project (*co-ordination*)	Grass root collective action (coordinated by local NGO) (*cooperation*)	Broad scale collective action supported by the regional government (*coordination*)
Location	Media Valle del Serchio (Pistoia and Lucca Provinces, Tuscany) Mountain and marginal area	Pontecagnano (Salerno province, Campania) Urban area	Alta Val d'Ayas (Aosta Valley) Mountain area
Objectives	Farmers' stewardship, landscape management, hydro-geological management, reducing farm abandonment	Degraded site recovery, public green area management, cultivating community Gardens.	Landscape maintenance, biodiversity conservation
Government role	Local initiative, funded by a local agency and by the regional RDP (Rural Development Programme)	Non-involvement	Supported and financed by the regional RDP as well as by regional financial resources

479. The first case study, the "Custody of the Territory", is a local project in the mountainous area of Lucca and Pistoia provinces of Tuscany. It is implemented by a local government agency which has an agreement with the local farmers for the co-production of environmental services to increase resilience to flooding and to improve the landscape and hydro-geological management of the territory.

480. The second case study focuses on a community garden in the Campania region, a collaborative greenspace which was converted from a degraded site into an eco-archaeological park where urban gardens, environmental benefits and social relations are cultivated.

481. The third case study describes the collective management of mountain meadows and pastures in Alta Val d'Ayas (Aosta Valley region), where regional support ensures the co-ordinated action of several stakeholders and provides the high value public goods associated to the sustainable management of these areas.

60. This case study was prepared by Francesco Vanni, Stefano Trione, Patrizia Borsotto and Monica Caggiano from the Istituto Nazionale di Economia Agraria.

11.1. Custody of the territory in Tuscany

Brief outline of the case study

482. The Custody of the Territory case study refers to a local project in the Reclamation District No. 4 "Serchio Valley", a mountain area of the Tuscany region of over 115 000 hectares in the drainage basin of the Serchio River. It is comprised of 35 municipalities in the Lucca and Pistoia provinces.

483. The main reclamation activities are managed by a local agency, the mountain community "Media Valle del Serchio", which is in charge of ensuring the hydro-geological management of the territory. Due to difficulties in managing over 115 000 ha of mountain areas and about 1 500 km of streams and torrents, this local agency has an agreement with local farmers to increase resilience to flooding by improving landscape and hydro-geological management by way of Payments for Environmental Services (PES).

484. The PES to local farmers is articulated through two types of activities:

- *Monitoring activities*: periodical on site controls of torrents and streams, with reports and pictures;
- *First maintenance intervention*: execution of simple maintenance works such as removal of trees, woods and debris from riverbeds and dikes to avoid overflowing, together with the management of riparian vegetation.

485. The PES includes a fixed payment (EUR 6 000 per year during the initial phase and EUR 4 000 per year during the following years) for the monitoring activities, and a variable payment for the first maintenance intervention, based on the extent of the work to be done.

486. During the initial phase of the project (2007/2008), the initiative received great interest from farmers: there were 63 expressions of interest that resulted in the activation of 20 contracts with "farmers custodians". In this phase, activities were mainly related to monitoring (report writing and photographs) as it was necessary to develop a data-base of the main environmental needs and services to be carried out by farmers (Rovai, 2013).

487. During the second phase (2009/2010), some organisational aspects of the project were modified, and the budget for the monitoring activities was decreased since it had been carried out extensively during the first phase.

488. During the third phase (2010/2011), PES were paid to 25 farmers and 4 co-operatives. In 2011, the local agency was able to monitor 500 km streams, corresponding to 40% of the territory.

489. During the second phase of the project, the local agency decided to standardise procedures for the monitoring activities (reports and photographs provided by farmers) with the objective to collect all information into a single database. An information system, IDRAMAP, based on Google Maps was created as was a website (www.bonificavalleserchio.it/manutenzioni/index.php). This website was also developed with the objective of expanding monitoring activities to local inhabitants.

490. Local farmers and citizens, by accessing IDRAMAP, can signal the need for intervention on a specific location simply by clicking on the map. When clicking on the corresponding point on the map, IDRAMAP opens a menu that allows the user to select the type of environmental problem detected and the alarm is automatically sent to the local agency.

Public goods provided by collective action

491. This project was created in order to provide and protect a large set of environmental goods and services closely linked to agricultural activities, such as landscape, soil protection, resilience to flooding, but also non-environmental public goods, such as social capital, institutional capital and new knowledge. The broad objectives may be summarised as follow (Rovai, 2013):

- To improve the environmental management of the areas through the involvement and empowerment of local communities;
- To favour a pro-active role for farmers in managing the territory in order to maximise their role in delivering environmental services;
- To increase the resilience to flooding by favouring the involvement of farmers in preventive activities (monitoring, surveillance, early intervention works).

492. These objectives were pursued by "re-building" the technical knowledge of farmers related to the environmental management of activities.

493. The project aimed to recover such knowledge through interactions and exchanges between different actors (institutions, technicians and farmers) in order to increase the effectiveness of the environmental services provided. Instead of implementing a traditional hierarchical approach of learning transmission (from managers to technicians to workers), the involvement of farmers led to a constructive exchange and to learning processes that have involved representatives of local institutions, technicians and local farmers (Vanni et al., 2012).

494. The project made use of the local knowledge of farmers, but also pushed farmers to increase their knowledge of the territory and, above all, allowed to transfer the new knowledge generated to the public administration, with the integration of new data and new information considered as strategic in planning activities related to flood prevention.

495. Another aspect related to the knowledge generation is the contribution of local farmers to the local and regional cartography, since in many cases they have registered the canals and streams with names, location and status of maintenance.

496. This initiative shows that a collective approach for the provision of the environmental goods (resilience to flooding, hydro-geological management of the territory, landscape) has the potential of increasing the provision of immaterial benefits and goods, such as new knowledge, social capital, institutional capital and capacity building.

Factors affecting collective action

497. The main factors that influence collective action may be grouped as follows: (1) resource system characteristics, (2) group characteristics, (3) institutional arrangement and (4) external environment. Based on this classification, the table summarises the key successful factors in Custody of the Territory project (Table 11.2).

Table 11.2. Factors affecting collective action in Custody of the Territory

Resource system characteristics	Group characteristics
Lack of hydro-geological management due to the abandonment of mountain areas Extreme weather events High risk of flooding, especially in urbanised areas of the plains	Social capital: trust and mutuality Involvement of marginal and isolated farmers Participatory events: involvement of local community Interdependences between local agency and farmers
Institutional arrangements	**External environment**
Simple rules Different rural stakeholders involved Information/early warning system: IDRAMAP Co-production of knowledge: joint inspections	Payments for Environmental Services settled by Mountain Community National and regional legislation on multifunctional agriculture Rural Development Programme

498. With regard to (1) *resource system characteristics*, hydro-geological management of the territory is increasingly recognised as a main environmental priority. A result of the numerous extreme weather events that have increased in the last years, there is a perception amongst local citizens and politicians that the area needs a stronger resilience to flooding. Local farmers are increasingly aware that a lack of management of rivers and riverbanks could have important negative effects (such as flooding and bad landscape) for their business.

499. With regard to the (2) *group characteristics*, local stakeholders were increasingly aware that they were not able to implement individual solution to this problem, and in order to reduce flooding risk a collective and joint action was necessary. Moreover, through this collective action, also more immaterial joint outputs were produced, such as an increasing sense of community amongst the farmers of the same areas, an acknowledgment (even though not everywhere at the same level) by the local community of the important social and common functions carried out by the farmers. The information system also aimed at building social networks that could enhance the formal and informal exchanges amongst local institutions, advisors and farmers, with the main objective of increasing the efficiency of the environmental services provided (Vanni et al., 2012).

500. Regarding the (3) *institutional arrangements*, this initiative shows the importance of negotiation amongst the different local stakeholders and, above all, of joint learning processes and knowledge generation. Indeed, the payments and the support received by farmers are not only an economic incentive to deliver environmental services, but are structured as an incentive to actively participate in the environmental management of the territory by increasing the relations and interdependences amongst farmers, local institutions, advisory system and local communities.

501. Another important strength of the project is its simplicity both in terms of measure design and in terms of their implementation. Indeed, the management of this collective action is based on a daily relationship between the co-ordinator of the project, the technicians and the farmers. This strong collaboration has favoured the development of trust and willingness to co-operate and this has facilitated the implementation of a very simple agreement without excessive regulation or bureaucratic tape.

502. This simplicity was stressed in contrast to the (4) *external environment*, especially the RDP measures, which were described as "cumbersome and rigid," since these measures usually required a deep knowledge of the administrative procedures that in many cases discourages their adoption by farmers. The agreement also shows how a direct relationship between a local authority and farmers may facilitate the adhesion to the collective action by increasing its effectiveness.

Government policy

503. The main authority involved in the project is the mountain community "Media Valle del Serchio", the local agency which defined the contracts, co-ordinated the project, and maintains the information system.

504. At the same time, it is possible to identify the involvement of various institutions and organisations that, to a various extent, have provided the institutional, technical and policy support to the project. These include Pistoia and Lucca provincial authorities, other local agencies, municipalities, and local farmers' organisations.

505. The project was developed thanks to the national and regional legislative framework on multifunctional agriculture developed during the last decade. A very important step is the 2001 national Legislative Decree N. 228 which redefined the role of farmers through an acknowledgment of the environmental services that they may provide in rural areas. This decree (art. 15) allows "local institutions to draw up agreements with farmers in order to facilitate ecosystem services, the preservation of forest and agricultural landscape, the hydro-geological management of the land."

506. Nevertheless, the representative of the local agency argued that there are several important issues that are not yet sufficiently stipulated by the existing legislation and supported by public policies. For example, according to the local stakeholders, the regional RDP should include specific support for monitoring activities, since to date the project managers have failed to find a set of RDP measures which could finance the project in its entirety.

507. This project shows that the effective implementation of local strategies depends on the development of coherent supporting policies, but that co-ordination mechanisms are needed amongst the different institutions involved for an effective provision of environmental services at territorial scale. In some cases, inflexible policy tools and institutional arrangements based on administrative borders hindered a more effective approach to the broad range of environmental services to be provided at the landscape level. Nevertheless, the project should be able to develop its full potential in terms of territorial expansion by increasing the range of environmental services provided.

508. The most critical element of the project lies in the difficulty to expand it and ensure that it becomes the dominant approach for delivering environmental services in the district. This project could nevertheless increase its scope and broaden its action by obtaining specific funding aimed at increasing its effectiveness.

11.2. Community garden in Campania

Brief outline of the case study

509. Since 2001, a local group of *Legambiente* (the most widespread environmental Italian NGO) in Pontecagnano near Salerno (southern Italy) has been co-ordinating a project called Eco-archaeological Park which includes community gardens.

510. The park is situated in an important archaeological area, the ancient city of Picentia, an Etrusco-Campanian and Roman settlement, and occupies about 22 hectares, with a smaller part of the site (about 500 m^2) has been excavated and opened to visitors as an archaeological site.

511. The local group of Legambiente manages six hectares, creating a public green space and community gardens that have been a great success among citizens. The total area managed by Legambiente is divided in two parts: an open public space to which there is free public access and a fenced area

containing community garden plots. The public open space is an open and recreational space equipped with a children's playground which includes a wood stove, an orchard, an environmental education centre, a *library for children* and young adults specialised in environmental issues, etc. Numerous events have been organised, such as festivals, book presentations, scientific conferences, organic farming course, and environmental education programmes.

512. The community garden includes garden plots. There are 54 individual plots (100 m^2 each) assigned to pensioners, a big plot (1 000 m^2) assigned to an association that has adopted a biodynamic and community-supported agricultural project, a therapeutic garden dedicated to horticultural therapy, a pedagogical garden for children, and a garden cultivated by people suffering from rheumatism. The number of candidate gardeners exceeds available plots and there is a long waiting list. Despite the availability of land, water scarcity prevents the number of garden plots from being increased.

513. The community garden offers a wide range of activities that includes fresh vegetable production, educational and art programmes, and space for the community to meet informally and formally. The gardens are the heart of the Eco-archaeological park, mobilising the volunteer resources needed to sustain its existence. Since the volunteers of the NGO ensure the maintenance of the park, the gardeners are obliged to join the NGO to obtain a plot. All gardeners must sign a community garden agreement and pay an annual fee of EUR 90.

514. This project involves a rich and varied range of stakeholders with different social and cultural backgrounds. The majority of gardeners have had no experience in gardening. When the project started, there were only ten people with real know-how and who have since become referents for the whole group (about 80 people).

515. Despite this heterogeneity, the group members are linked by their common gardening passion. This allows them to develop a strong, shared identity, and to create a real community network which has enabled them to share ideas, resources, skills, information and support. This social capital has enhanced motivation and improved the capacity for collective action.

516. This community building process was further strengthened by collective training and leisure opportunities and by the role of the NGO in facilitating events, mediating conflicts and ensuring that communication happens smoothly and regularly.

517. Before the eco-archaeological park project, the area was closed to the public and was a waste dump, despite the high cost of its maintenance. The local group of Legambiente restored the area, guaranteeing its maintenance and, at least in one part of the park, ensured free access to citizens. The added value of this experience also comes from the fact that the park is located in a peri-urban area where urban sprawl is rapidly increasing and it is the only green public area of Pontecagnano.

518. Elsewhere, the park is devoted to community gardens and, even though the local NGOs must regulate the access of gardeners to this area, public events and the education programmes accessible to all citizens are strictly related to the community gardens area. This mixed solution resulted in a cost-effective strategy to manage a public area by offering an array of vital services that were no longer provided by the local government.

Public goods provided by collective action

519. The community gardens of Pontecagnano may be considered as a collective action providing at once club goods and pure public goods, and their production is tightly interlinked. There are some goods that are excludable to non-club members (the gardeners), and some positive externalities of the community garden that are non-rival and non-excludable goods.

520. Together with the provision of farming opportunities for local members, this project also results in a broad range of positive physical, social and psychological well-being outcomes for the gardeners. It helps to mitigate the increasing disconnection of urban residents from nature. These benefits include providing opportunities for individuals to relax, undertake physical activity, enjoy of nature/open spaces, socialize and mix with neighbours, sharing across culturally different backgrounds. The contact with green spaces improves psychological health and mental wellbeing. The gardens also afford opportunities to learn about horticulture, to share favourite recipes, resources and expertise, to know about sustainable environmental practices, such as composting and recycling. Participants experience the satisfaction of seeing plants grow and of being able to provide for their own needs. The gardens are also an important source of low-cost fresh organic produce for a healthy diet. For many gardeners who had experienced isolation, the community garden has become a very important focus of their lives contributing to their well-being, as well as for the people with special mental health problems who use the gardens for green therapy.

521. Finally, for the gardeners, being part of the community is an advantage in itself, a sort of symbolic public good that may be considered a very important driver of collective actions.

522. The community garden not only contributes significantly to the quality of life of the gardeners, it also provides different ecological, social and cultural advantages for the whole population. From an environmental perspective, even though this project is on a small scale, it contributes to the landscape's beauty and to the enhancement of the ecosystem services in various ways.

- It plays a role in climate regulation through the absorption of greenhouse gases.
- It closes the nutrient cycle by recycling organic waste and through the use of compost to improve nutrients and soil structure.
- It improves air quality in an urban polluted context.
- It reduces the travel distance from producer to consumer, leading to such environmental benefits as the reduction of fuel and packaging.
- It increases the biodiversity within the city limits, since the community garden encourages pollination and is a refuge for wildlife such as soil organisms, wild plants, insects, birds, etc. (the gardeners also preserve the production of local varieties of fruits and vegetables, thus enhancing agricultural diversity).
- It promotes organic farming and environmentally respectful practices.
- It prevents land consumption and soil erosion.
- It preserves and improves tacit knowledge and skills as part of the so-called "social ecological memory for ecosystem management" (Barthel et al., 2010).

523. The community gardens also improve the aesthetics of the city and the green spaces by providing recreational opportunities. Indeed, the project became a means to create and strengthen social links between citizens and community gardens, with the result of improving social integration, as well as preserving and transmitting knowledge and traditions among different generations and cultures (Caggiano, 2010). An interesting experience was the programme *Nonnet*, digital urban gardens, promoted by Legambiente Campania and a local foundation in which students were taught about local varieties of fruits and vegetables and organic agriculture practices by pensioners, and the students taught basic computer skills to the pensioners.

524. Thus, the community gardens may be effective laboratories to experiment and transfer to citizens respectful environment and biodiversity conservation practices. They play an important role in community development as well as raising the quality of life of inhabitants and their civic sense.

Factors affecting collective action

525. The community garden is an instructive example of resource system characteristics combined with individual self-interest to create conditions favourable to collective action.

526. The success of the project is highly dependent on the availability of a set of simple and clear rules that (even if not from the beginning) increasingly become a shared community heritage. The organic standards adoption is an instructive example of this.

527. There is also an effective system of continuing mutual restraint among the gardeners and the development of a shared sense of responsibility. In addition, one person is responsible for every ten gardens to verify their proper maintenance, cleaning paths, and so on. Finally, a failure to comply with the garden rules may result in the loss of gardening advantages, including loss of the assigned plot.

528. Community-building is another key factor for the success of the community garden since it allows developing relationships, trust and social capital amongst local stakeholders. In this process, the external acknowledgement (beyond the local community) plays an important role by encouraging awareness: the mass media emphasise the valuable role of the community garden in urban sustainability, appreciating its function as public open space with positive environmental value. This project was also the subject of a documentary film called "The Days of the blackbird."[61] The events organised in the Eco-archaeological Park were also important for both recognising the gardeners' hard work and their accomplishments and increasing public awareness of the community gardens.

Table 11.3. Factors affecting collective action in community garden in Campania

Resource system characteristics	Group characteristics
Complex resource system, including natural, cultural and archaeological assets Lack of public (green) space and meeting points Growing urbanisation Loss of local identity	Heterogeneous group Strong sense of community High levels of social capital
Institutional arrangements	**External environment**
Rules governing the use of collective goods are simple and clear, shared as community heritage, with an effective system of self-control and sanctions Joint provision of club goods and pure public goods production	Lack of local authority support (financial and non-financial) External acknowledgement (mass media and documentary films)

529. The role of the local NGO is another critical factor affecting collective action in different ways: motivating the gardeners, promoting the project and its sustainable vision, actively advocating the community garden with solid presence, facilitating communication among members, serving as mediator in conflicts or negotiations as needed, sharing expertise, resources and experience, improving the gardeners environmental education. In addition, the local NGO, as part of a national NGO network, has played a strategic role in spreading the experience beyond local boundaries.

61. *I giorni della merla*, Italy, 2009, Color – 52', Directed by: Andrea D'ambrosio, Carla Del Mese, Production: Associazione Leonia, Provincia di Salerno, Legambiente Campania.

Government policy

530. The project is community-based and almost entirely self-funded, receiving little public support. In this case, the lack of public support had a positive side since it stimulated this spontaneous community-based initiative which allowed for the exploring of innovative practices and institutional arrangements.

531. Nevertheless, the gardeners emphasise the lack of support from local governmental institutions, not just in financial terms but also in terms of equipment, infrastructures and so on, and feel that the local institutions do not fully appreciate the value of the project. According to the local stakeholders, the public institutions should show a greater interest in promoting the community gardens that not only encourage food security and provide ecological services, but also represent social and economic investments as they improve the quality of city life by ensuring the enjoyment of green spaces preserved from negligence and social degradation. In addition, the municipality has the opportunity to save money in terms of cleaning and maintenance.

532. Despite the disinterest of local institutions, the regional government has demonstrated its appreciation of the project. Considering the experience of Pontecagnano an example of good practice that should be more widely disseminated, the Campania Region in the 2009 allocated EUR 1.8 million to support experimental community gardens projects. A total of 22 projects were selected and co-financed by the European Social Fund (ESF) with the main aim of promoting social inclusion through the development of such initiatives.

11.3. Mountain pastures in Aosta Valley

Brief outline of the case study

533. This case study is related to the collective management of mountain pastures in *Alta Val d'Ayas* (Aosta Valley region). It is interesting to examine the management of mountain meadows and pastures, and the livestock movements among farms in this valley since they involve specific rules, norms and specific organisational patterns that ensure the provision of high valued public goods.

534. Furthermore, dairy cattle is very important for the whole regional economy of Aosta Valley because it allows the production of precious cheeses such as Fontina PDO (Protected Designation of Origin), which in *Alta Val d'Ayas* is also an organic production.

535. Livestock in Aosta Valley is mainly feed with local forage and hay, especially in the higher pastures, known as *alpeggi*, which may be defined as "all the cattle shed and mountain areas (pastures and meadows) used primarily for grazing and which ensures pasture feeding for dairy cattle for an average period of 100 days in summer".

536. In *Alta Val d'Ayas,* meadows and pastures cover about 3 840 hectares, of which 3 134 hectares are alpine pastures (Administrative Data Base). About 40 farmers manage *alpeggi* and there are about 108 sheds at different altitude. About 2 980 cattle and about 300 sheep and goats are moved to alpine pastures in summer. There are about 1 000 cattle and more than 80 goats and sheep that are transferred from one farm to another.

537. The co-operative "Fromagerie Haut Val d'Ayas" (located in Brusson) collects and processes the milk produced by about 50 local farms (about 2 100 000 litres every year) and sells Fontina PDO cheese (18 000 rounds) according to organic regulations.

Public goods provided by collective action

538. By ensuring the proper management of *alpeggi*, farmers provide a set of public goods that are highly valued by the whole community. Indeed, there is an important relationship between local livestock breeds and the environment since alpine cattle breeding is a long established exploitation system with positive effects in terms of soil and biodiversity preservation.

539. The agronomical exploitation of grasslands preserves soil functionality and contributes to preventing hydro-geological instability. In fact, the appropriate maintenance of rivulets (short sluices called "*rù*" in Aosta Valley) and grazing at a higher altitude allow snow settling and minimises avalanches risks.

540. Vegetal biodiversity is preserved as mowing and grazing influence the richness of permanent grasslands and meadows with different functions: hay production and pasture variously combined during the year (Bassignana et al., 2009; Bassignana et al., 2011; Curtaz and Talichet, 2011). Animal biodiversity is preserved as wild fauna (chamois, rock goats and deer) receive nourishment from alpine pastures in spring during the thaw period and in autumn.

541. In addition, grazing alpine areas plays a fundamental role in maintaining both the landscape and the culture of the mountains. A sustainable use of these pastures also contributes to attracting tourists during summer and to maintaining ski runs during winter.

Factors affecting collective action

542. The collective management of pastures is related to the movement of cattle between farms in order to keep the traditional and extensive livestock system, representing the historical and socio-economical background of breeding in Aosta Valley.

543. The sustainable management of mountain meadows and pastures relies on a complex network of local actors, involving local breeders, the owners of the *alpeggi* (also municipalities), buyers of the cow milk (and the local Fontina PDO cheese making), and the regional government. The presence of the co-operative Fromagerie Haute Val d'Ayas is very important because it collects and makes milk into cheese (including organic cheese), thus increasing the value of local dairy production.

544. The main factors that influence collective action can grouped as follows: (1) resource system characteristics, (2) group characteristics, (3) institutional arrangement, and (4) external environment (Table 11.4).

Table 11.4. Factors affecting collective action in mountain pastures in Alta Val d'Ayas

Resource system characteristics	Group characteristics
Great availability of permanent grasslands and alpine pastures Extensive agriculture and dairy cattle breeding Need to transfer cattle among farms	Complex network of various local actors (local breeders, owner of *alpeggi,* milk buyers, etc.) Land owners (private owners and Municipalities) let breeders use their pastures
Institutional arrangements	**External environment**
Lease location of pastures Specific agreements and payments for cattle moved from a farm to another "Hay-Manure Agreement"	Regional Rural Development Programme (measures for pastures and meadows and for organic farming) Support from regional government

545. With regard to (1) *resource system characteristics*, the typically extensive agriculture and dairy cattle breeding are based on the extensive availability of permanent grasslands and alpine pastures. On the contrary, meadows in the valley floor are not sufficiently wide and do not give enough forage to breed cows year-round, so in late springtime and summer cows are transferred to alpine pastures and farms placed in the valley floor in summer can easily and efficiently feed their livestock.

546. With regard to the (2) *group characteristics*, the sustainable management of mountain meadows and pastures relies on a complex network of local actors, involving local breeders, the owners of the *alpeggi* (also municipalities), cow's milk buyers (and *in loco* Fontina PDO cheese making) and the regional government.

547. Generally, farms located in the valley give the livestock to those farmers exploiting the *alpeggi* during summer, and who in turn use the milk produced during this period to make PDO Fontina cheese *in loco* or sell it to local milk buyers. Traditionally, the period of *alpeggio* is from 15 June to 29 September.[62] There are no official contracts between the farmers located in the valleys and those exploiting the *alpeggi*, only an oral agreement, but which is a traditional arrangement rooted in the regional culture. The agreement is articulated in a dualremuneration system.

- With regard to the dairy cows, the farmers located in the *alpeggi* "rent" the heads of livestock by the owners located in the valleys. Traditionally, the price is calculated as the difference in the value of the milk produced by the cows and the value of 4 kg of milk per day.[63]

- Regarding the non-productive livestock (such as calves, bullocks, heifers), the farmers located in the valleys pay those located in the *alpeggi* to look after this livestock. In this case, the amount to be paid is established directly by the farmers.

548. Finally, another type of agreement is involved in the use of *alpeggi* which normally are not directly owned by the farmers that use it for their livestock, but may be privately- or publicly-owned (usually by the municipalities). The farmers located in the *alpeggi* rent these areas directly in the case of privately-owned *alpeggi* or participate in the public auctions organised by municipalities in the case of publicly-owned *alpeggi* (in both cases farmers have the possibility to rent these areas for a period of four to five years).

549. As for (3) *institutional arrangements*, since land property in the Aosta Valley is split into lots of parcels, dairy farms must often lease several plots of land to graze their cattle. The rental of grasslands is also incentivised through specific agreements, e.g. the "Hay-Manure Agreement" sets that dairy farms swap manure for grass and hay produced by farms without livestock.

550. The (4) *external environment* is also very important in favouring collective action. In fact, Aosta Valley regional government supports the management of meadows and pastures in the *alpeggi* through specific funding, several measures and local laws. The regional support is complemented and integrated with EU funding, in particular by measures of the Regional Rural Development Programme related to alpine farming, forage growing and organic agriculture. The goal of public support is not only to support the production of Fontina PDO cheese but also to ensure the supply of a certain number of important environmental services associated with the sustainable management of pastures and meadows such as biodiversity conservation, soil functionality and preservation of landscape.

62. This period may vary according to the weather conditions and on average covers a period of 90-120 days.

63. According to the regional tradition the value is calculated on the quantity of milk produced by the cows the day of Saint Peter, the 29th of June; this value is multiplied by the number of days of the *alpeggio*.

Government policy

551. The regional government has traditionally enacted many laws in order to ensure the appropriate management of grasslands, and has traditionally supported and funded the *alpeggi*.

552. The collective action described above is in place thanks to financial incentives and to the local laws of the Aosta Valley regional government, which were integrated and complemented with EU funding with the objective of ensuring the appropriate management of meadows and pastures by farmers.[64]

553. Environmental services and public goods are mainly supported throughout the Rural Development Programme of Aosta Valley region mainly through the measures of the 2nd Axis of the RDP, the goal of which is the protection of the environment, landscape and biodiversity, water quality improvement, greenhouse gas reduction, and so on. These interventions are implemented with co-financing by the European Union. Farm investments and investments in infrastructure, such as those directed towards accessibility of *alpeggi*, are funded by regional laws without EU co-financing.

554. Additional (and smaller) interventions – but no less important – are funded by the Aosta Valley regional government in order to promote alpine landscape and to increase the sales of local dairy products (i.e. the yearly event called *Alpages ouverts* that brings many tourists to *alpeggi*).

555. Finally, it is useful to point out that it is absolutely necessary to maintain support to farms that follow exploitation systems according to the approach described above for the future of both rural development policy and regional agricultural policy.

11.4. Final remarks

556. The three case studies differ to a large extent in terms of the type of collective action involved. In the first case study (Custody of the Territory), the local action was mainly developed and co-ordinated by a local public agency (*co-ordination*), whilst in the second case study (community garden) the collective action was directly led by a local community (*co-operation*), and in the third case study (mountain pastures) co-ordination is ensured by the regional government, which provides a diffused system of support for the collective management of pastures and meadows at a regional level (even though the analysis focused on *Val d'Ayas* area).

557. Major differences are also related to the different socio-economic contexts of the three initiatives, as well as to the different governance levels involved and the agri-environmental issues addressed.

558. Nevertheless, it is possible to recognise several common points amongst the three case studies.

559. First, the case studies show that collective action, by involving a broad set of stakeholders and enhancing local knowledge, can develop an efficient strategy for public goods provision in different institutional and social contexts, although institutional arrangements are based on shared responsibility and co-management amongst private and public actors.

560. Secondly, the Italian initiatives show that a fruitful interaction amongst farmers, local authorities, private sectors, advisors and local communities is important for the effective implementation of the

64. The main interventions currently in force are the following: a) RDP 2007-2013 of Aosta Valley region: measure 214.2 "Alpine farming"; b) RDP measure 214.1 "Forage growing"; c) RDP measure 214.5 "Organic agriculture"; d) RDP measure 211 "Aid to farmers in Less Favoured Areas"; e) regional Law N° 32/2007 heading III Art. 51 "Conservation of traditional rural buildings and traditional landscapes".

measures on the ground by making the delivery of policy measures more effective. Indeed, the engagement of several local stakeholders in both the design and implementation of the schemes can help to increase the transfer and the sharing of knowledge across different individuals and groups, operating as "communities of practice" (Wenger, 1998). This may result in the longevity of the strategies proposed.

561. From this perspective, the Italian case studies highlight the role of local public bodies and institutions as key promoters and co-ordinators of specific projects related to agri-environmental public goods provision and the need of a stronger devolution of power and responsibilities.

562. Finally, these initiatives call for more attention to the implementation of multi-goal policy instruments through the integration of policy tools based on compensation with incentives focused on information, communication, skills and learning. Indeed, while a generation of new knowledge, as well as of social and institutional capital are among the most important positive outcomes of collective action, such dimensions are often forgotten when planning the delivery of agri-environmental public goods in rural areas. Collective action may result in a long-term shifting in farmer thinking and actions, since the institutional and social dynamics observed allow farmers and citizens to learn about and implement environmental management techniques that may be accumulated in institutional and social capital.

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12. THE JAPANESE CASE STUDIES[65]

563. Preserving the multifunctional characteristics of agriculture (i.e. non-commodity outputs) and securing food supply are the main policy objectives of the agricultural sector in Japan (MAFF, 1999). Many of the non-commodity outputs associated with agricultural production have some degree of public goods characteristics such as controlling floods through paddy fields, providing agricultural landscape, and preserving biodiversity in agricultural production systems.

564. The average farm size in Japan remains small (approximately 1 ha), with the exception of Hokkaido (the northern island of Japan) where the average farm size exceeds 10 ha, so to encourage collective action key usually key to achieve sustainable provision of agricultural goods. Similarly, the reduction of negative externalities can be implemented more efficiently and effectively in a collective manner compared to farmers changing their farming practices individually. In this context, Japan is a country where various types of cases associated with collective action in agri-environmental practices can be observed. As indicated by Shobayashi et al. (2011) there are several examples in which collective action have been integrated into Japanese agri-environmental policies.

12.1. The cases

565. This study analyses three policies: (1) the preservation of biodiversity associated with agriculture; (2) recycling water drained from agriculture; and (3) measures to conserve and improve land, water, and the environment.

Policy for preserving biodiversity associated with agriculture

Brief outline of the case

566. The current form of this biodiversity policy was initiated by the Shiga Prefectural Government[66] in 2006 and received the best policy award from the National Governors' Association in 2009. This award is given to the policy issued by a prefectural government that is considered to be the most innovative.[67]

567. This policy makes agri-environmental payments to farmers whose cultivated lands are along a drainage canal and who must act collectively to raise its water level (Figure 12.1). More specifically, the prefectural government pays farmers to raise the level of water in drainage canals so that a special type of fish residing only in Lake Biwa[68] can swim from the lake to paddy fields in order to reproduce. Without

65. This case study was prepared by Mikitaro Shobayashi of the Department of Intercultural Communication, Gakushuin Women's College, Japan.

66. There are 47 prefectural governments under the National Government. There are around 50 to 100 city governments in each prefecture.

67. In 2009, more than 2 000 policies were reviewed.

68. Lake Biwa, 4 million years old, is the largest lake in Japan.

this policy, the fish would stay in the lake and juvenile fish would be eaten by alien species, such as black bass.

Figure 12.1. Illustration of how water levels can be raised

Source: Takeda et al. (2012).

Public goods provided by collective action

568. Biodiversity is preserved by this policy and justifies the payments made to the farmers. For the prefectural government, the benefits associated with preserving biodiversity have pure public good characteristics with non-excludability and non-rivalry in consumption. For farmers, raising the water level in drainage canals negatively affects their rice productivity, which requires compensation. The amount of payment, JPY 33 000 per ha, is based on the additional cost associated with farmers' raising the water level.[69] The effect of the policy was impressive. Since this policy was implemented in 2006, the area participating has increased from around 1 ha in 2005 to 40 ha in 2006, and to more than 100 ha in 2011.

Collective action

569. Collective action needs to be organised because the agreement of all farmers whose farmlands are located along the drainage canal is required. If even a single farmer does not increase the water level of the drainage canal, this project cannot be implemented.

570. Although the prefectural government does not require collective action as part of the contract, all contracts currently executed are with groups of farmers. This is because any single farm in Shiga prefecture is unlikely to cultivate all the paddy plots along a drainage canal for the several hundred meters that are required for a project. Currently, 32 groups cover a total of 117 ha;[70] the average size is 4 ha per group. Considering that the standard size of each plot is 100 m×30 m (0.3 ha), there is an average of 13 plots in each project area. If each plot is operated by a different farmer, then 13 farmers need to act collectively.

69. JPY 33 000 is equivalent to around 5% of the average production cost for paddy farmers in Japan.

70. Personal communication with Shiga Prefectural Government.

Factors affecting collective action

Cost and benefit of collective action and social capital

571. Collective action under this policy is voluntary primarily because of the physical conditions involved. In theory, a group of farmers along the same drainage canal would decide whether they want to join the project by comparing the costs and benefits (JPY 33 000 per ha). The costs they face would include additional costs that the individual farmers would have to bear and the transaction costs associated with organising themselves. The former would depend on the physical conditions of their farmlands; if their farms are located in steep areas, raising the water level of their drainage canal could cost more than those in flat areas.

572. Transaction costs would reflect the socio-economic circumstances. For example, if the farmers along the drainage canal are growing different types of rice, co-ordination might be more difficult because they could have different cropping calendars. When some farmers would like to drain their land, others may want to keep their land flooded, thus making it difficult to agree on the level of water of the drainage canal. Although no quantitative data are available, it is likely that strong social capital could reduce this type of transaction cost. The fact that the share of part-time farmers in the total number of farms in Shiga prefecture is one of the highest in Japan (more than 90%) implies that many farmers still reside in their original villages, reflecting that social capital remains strong, making it easier for farmers to act collectively.

Local government

573. Although collective action is voluntary in this case, the prefectural government has also played an important role to organise collective action. First, it has a policy tradition of helping farmers to organise themselves. For example, numerous agricultural extension services are provided to establish community-based farms. At present, there are over 400 such farms in Shiga (MAFF, 2011), accounting for more than 10% of total farms in Japan, which is far greater than the prefecture's share of farmland (around 1%). Second, the prefectural government has provided assistance to help each region form groups by securing substantial amounts of human resources to implement this policy. In each regional office of the prefectural government, several staff members are assigned to assist farmers with this project.

574. In addition to providing direct assistance for organising farmers, the prefectural government also leads the initiative to establish eco-labelling specifically designed for this policy (Figure 12.2). The hope was this would help maintain a higher price for the rice cultivated in the project areas as compared to the standard price. This may have provided farmers with an additional incentive to organise. As Shobayashi et al. (2011) indicate, eco-labelling requires a degree of collective action because a certain quantity of products needs to be produced in order to make labelling effective.

Figure 12.2. Eco-labelling

Source: Shiga Prefectural Government (2010a).

Policy to recycle water drained from agriculture

Brief outline of the case

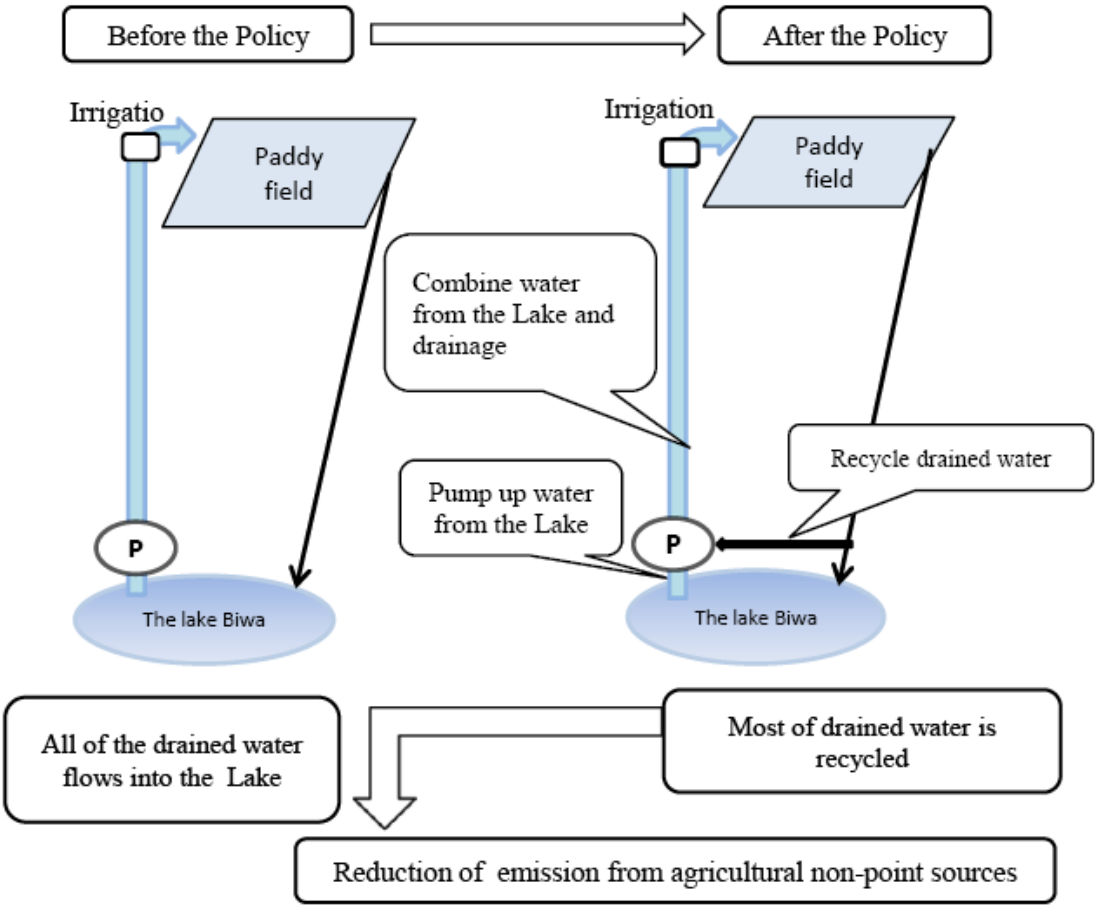
575. This policy was introduced by the Shiga Prefectural Government in 2004. The objective is to reduce the drainage flow from agriculture into Lake Biwa by encouraging several irrigation districts[71] to re-use the water drained from paddy fields (Figure 12.3).

576. This policy draws on the efforts begun in the 1970s by the prefectural government to reduce the flow of chemicals into the lake. The initial target was to reduce emissions from point sources, such as sewage facilities and manufacturers, by a series of aggressive regulations. Consequently, the share of these point sources of the total emissions into the lake gradually decreased; this then required policy measures to tackle non-point sources, especially agriculture. In 2003, a law was passed by the prefectural parliament to make agri-environmental payments to farmers who reduce their chemical inputs by 50%.

577. In 2005, this policy was designed to supplement the effects of the agri-environmental policy for individual farmers. The basic idea was that, in addition to reducing the use of chemical inputs in each field, recycling drained water containing chemical inputs could also substantially contribute to reducing overall emissions going into the lake. It was also envisioned that recycling the drained water for irrigation would require the consent of all farmers using the same irrigation canal and that this would require a built-in mechanism to encourage collective action.

71. Irrigation districts are the organisations regulated under the Land Improvement Law and which operate and maintain irrigation facilities. Institutional arrangements that are required for them are also detailed in the Law. For example, at least two thirds of the member farmers in a district need to agree if a major decision is to be taken by the district. There are around 5 000 land improvement districts including irrigation districts in Japan, and around 117 in Shiga Prefecture (Shiga Prefecture Government, 2011). Policy issues associated with irrigation district in Japan are presented in Shobayashi et al., 2010.

Figure 12.3. A schematic illustration of how the project alters the irrigation cycle



Source: Shiga Prefectural Government (2010b).

578. There were two options to promote recycling: regulate the use of recycled water by farmers or make payments to those who agree to recycle. The choice would depend on the consistency of the overall policy (e.g. Shobayashi et al., 2012). For example, regulating the use of recycled water could potentially contradict policies that make payments to farmers who reduce the use of chemical inputs by 50%. However, consistency with the agricultural support policy in general needed to be considered. Consequently, it was decided that the prefectural government would pay irrigation districts an amount equal to 50% of the additional costs associated with the district recycling drained water for irrigation. These additional costs include those related to pumping the drained water upstream and cleaning pipes.

Negative externalities reduced by collective action

579. In this case, payments are made to irrigation districts that reduce the negative externalities associated with agricultural production.

Collective action

580. An individual farmer cannot join the project because payment contracts are made only between the prefectural government and irrigation districts. Hence, collective action is automatically built-in. Because the facilities required for recycling drained water are the property of an irrigation district and are operated and maintained by that district, contracts with irrigation districts, rather than individual farmers or groups of farmers, could be justified. An irrigation district uses a formal decision-making procedure when deciding whether to obtain a contract. Although no quantified data are available, these procedures are likely to contribute to reducing the transaction costs associated to obtaining consent from member farmers to use the drained water.

581. At present, the prefectural government has contracted with seven irrigation districts, covering around 3 600 ha of catchment area (Table 12.1), and the number of member farmers exceeds 16 700. The outcome of the policy has been impressive, with the amount of recycled water being eight times greater than before the introduction of this policy.

Table 12.1. List of irrigation districts (2011)

District Name	Catchment area of drainage canal (ha)	Irrigated area serviced by the recycling facilities (ha)	The environmental outcomes		Number of member farmers
			Quantity of water Q ($1\,000\ m^3$)	Suspended Solid (SS) reduction S (kg)	
Aisei	388.0	1 377.0	596	51 257	2 498
Amanogawaengan	174.0	661.0	1 442	14 718	816
Nagahamananbu	108.3	674.1	722	10 850	1 483
Ishidagawa	42.3	298.0	172	1 765	432
Kamogawaryuiki	404.3	749.5	2 530	29 584	1 217
Shinasashi	24.0	393.0	967	6 735	792
Echigawa	2 489.0	581.0			9 479
Total	3 629.9	4 733.6	6 429	114 909	16 717

Source: Shiga Prefectural Government (2010b).

Factors affecting collective action

Local government

582. As mentioned above, the prefectural government intentionally designed this policy as a collective contract. It identified all districts that owned and operated recycling facilities, and targeted the policy towards these as it was near impossible to sign contracts with individual farmers or informal groups of farmers. It was also believed that transaction costs would be smaller in the case of collective contracts.

Transaction costs

583. The main question concerning these collective contracts is how each irrigation district can reduce the transaction costs associated with obtaining consent from its member farmers to use recycled water for irrigation. The water rights issued to each irrigation district are sufficient to supply the necessary amount of irrigation water. The use of recycled water therefore is not attractive to member farmers. Furthermore, the payments made by the prefectural government to the irrigation districts did not include any of the costs that the member farmers might have had to bear. Thus, obtaining consent from member farmers was seen as a challenge to implementing the policy.

Institutional approach

584. As indicated by the outcome, the policy should be ranked as "successful," which implies that the institutional approach taken was successful. All the irrigation districts which joined the project obtained consent from their member farmers through a regular decision-making process. The Land Improvement Law, enacted in 1947, requires all districts to have general conferences with all members or their representatives at least once a year. These general conferences aim to make major decisions, such as those involving the water charges and the operation and maintenance plans for the next fiscal year. The irrigation districts under this project used these general conferences as venues to obtain consent from their members.

Measures to conserve and improve land, water and the environment

Brief outline of the case

585. This policy was initiated by the Ministry of Agriculture, Forestry and Fisheries (MAFF) as part of the agricultural policy reform carried out in 2007. This reform focused on two aspects: 1) increasing the productivity of farms, mainly by concentrating land resources with large-scale farmers; and 2) preserving rural hamlets that might be affected by the structural adjustment. These two aspects were translated into two policy objectives and "measures to conserve and improve land, water, and the environment" (MCILWE) was the core policy tool under the second objective.

586. The MCILWE was then divided into two types of payment. The first was used to preserve irrigation and drainage facilities at the distribution level[72] and the second was used to preserve the agricultural environment by encouraging farmers to reduce their use of chemical inputs by 50%. The first type pays "local action groups" under contracts with local municipalities in return for the maintenance work of drainage and irrigation canals. This payment was based on the average costs associated with maintaining these facilities. The average cost was estimated to be JPY 66 000 per hectare yearly, and one-third of the cost was determined to be shared by farmers, while the rest would be borne by the MAFF and the relevant prefectural and city governments. The second type of payment was more or less similar to the policy established by Shiga prefecture in 2004, which pays farmers the amount of any additional costs associated with their reduction in the use of chemical inputs by 50%. A major difference is that this payment requires each region to implement the first type of payment.

587. An example of a specific local action group, from the Shirao area in Shiga prefecture, is examined.

Common pool resources maintained by collective action

588. This section focuses on the first type of payment, the main objective of which is to preserve facilities related to agricultural production, such as drainage and irrigation canals. It is not easy to have a clear idea of this policy objective or of the types of non-commodity outputs that are being provided through a description of these. From a theoretical point of view, irrigation water should be categorised as private goods. Therefore, the payments to maintain irrigation facilities are just one part of agricultural support policies. However, drainage facilities have the characteristics of common pool resources, which are rival and non-excludable in consumption; i.e. these facilities can become congested if there are too many users, and it is technically difficult to exclude non-farm drainage from drainage canals. Therefore, this report establishes a working definition that specifies that this policy is related to the provision of common pool resources.

72. The major irrigation and drainage facilities are operated by irrigation districts.

Collective action

589. This section first provides basic figures at the macro-level based on the statistical data collected by the MAFF (2012). Around 20 000 local action groups carried out activities designated in the MCILWE in 2011, which covered 1.4 million ha of farmland or 35% of total farmland in the agricultural promotion areas in Japan. In Shiga, 791 local action groups were active in the same year, covering 33 000 ha or 67% of total farmland in agricultural promotion areas in the prefecture, one of the highest among the prefectures.

590. Regarding geographical size, 68% of the local action groups are formed according to rural hamlets and 18% cover more than two rural hamlets. A rural hamlet is the most fundamental unit in rural areas in Japan, with an average of 100 households and 30 ha of farmland. Although they are not legally established organisations, they have a certain degree of autonomy and, in some cases, act as supplemental bodies to city governments. The fact that the vast majority of local action groups are, in practice, equivalent to rural hamlets strongly implies that the MCILWE contributes mainly to preserving or strengthening the collective action that is already in place. In fact, a study conducted by the MAFF (2010) showed that the officials of local governments involved in this policy feel that the reasons for the success of the policy lie in the existing institutions in rural hamlets, such as community-based farming bodies.

591. The case study area of Shirao area[73] is located in Oumi-Hachiman city in Shiga prefecture. This city has 93 rural hamlets, among which 53 hamlets are conducting community-based farming. Shirao area is one of these rural hamlets. The local action group was established in 2008, based on several existing organisations, including community-based farming organisations, women's associations, parents' associations, relevant irrigation districts, and 38 individual farmers. There are 55 ha of farmland in this area.

592. The local action group has been performing work to properly maintain irrigation and drainage facilities. The other organisations, especially the rural-based farming organisations, as well as the NPOs outside of the village have been collaborating with the local action group. For example, the city government decided to designate the area as a landscape preservation area regulated under the Landscape Preservation Law. Following this decision in 2008, the city government, local residents, community-based farming organisations, and NPOs started working together to preserve the historically valuable landscape. The prefectural government also assisted by introducing the above-mentioned fish nursery project and the eco-labelling initiative (Case 1), which gives the landscape and resource preservation activities greater value.

Factors affecting collective action

Social network

593. Although the contract with the local municipality is a collective contract, collective action in this area is based on an institutional setting that has lasted for a long time. A closely linked social network was obviously the basis for the local action group. The irrigation and drainage facilities at the distribution level, as in most paddy fields in Japan, have been maintained by each rural hamlet, which has also contributed to the creation of a local action group with the same geographical size.

73. The information on this area was obtained through the personal communication with the prefectural government.

Government support

594. The issue here is whether the policy has been effective in preserving or amending the collective action so that it matches the current environment surrounding the village. In this context, there are a few points that need attention from policy makers. First, a careful balance between government support and voluntarily organised collective action should be sought. Before the introduction of the MCILWE, maintenance activities were performed by residents in each hamlet, including both farmers and non-farmers. The MCILWE intended to support these activities in a situation where a decline in the population was making it difficult for residents to carry out these activities. Consequently, the MCILWE contributed to the proper maintenance of these facilities, as shown in various studies (e.g. MAFF, 2010). On the other hand, payments for activities that are already being carried out voluntarily could have a negative impact on collective action. For example, if payments are used to remunerate residents for these activities, there is a risk that some of them might not participate. This implies that any support policy for collective action should be designed to achieve the policy objective without hampering the collective action already in place.

595. Another point is whether the central government is in the best position to design policies associated with encouraging collective action. Each area or hamlet has its own social and historical background which should be reflected in policies. Local governments are better supplied with information and experience. When support policies are designed by the central government there should be institutional mechanisms by which local governments can be fully involved in their design. Decentralising policy-making through financial grants from the central to local governments could be an option (see, for example, OECD, 2003).

12.2 Comparative analysis

596. A horizontal comparison of the cases discussed in this case study is made to obtain preliminary policy implications (Table 12.2).

597. From the viewpoint of policy-making, one factor that dominates the size of a collective action group is the degree of the economy of scale related to the supply of the goods or services in question. However, as the size increases there is also an increase in the transaction costs associated with organising suppliers. How these factors should be balanced is an empirical question. The case of preserving a special type of fish through collective action is a question in the policy design. A fixed-rate payment would automatically involve groups for which the transaction cost is smaller than the fixed rate. Similarly, a fixed rate under the MCILWE seems to have implicitly favoured hamlet-based local action groups because the transaction costs would be smaller than in other cases. On the other hand, the case of drainage recycling clearly defined the size of collective action groups by having contracts only with relevant irrigation districts.

598. Another policy-oriented factor that needs attention is the role of government, both central and local. Table 12.2 indicates that the role of local governments needs to be strengthened, a result that has strong policy implications. This issue may also have to be examined in the context of wider discussions on decentralisation.

Table 12.2. Summary of the cases: Comparative analysis

	Policy for preserving biodiversity associated with agriculture	Policy to recycle drained water from agriculture	Measures to conserve and improve land, water, and the environment
Collective action	Farmers jointly increase the water level of their drainage canal to allow a special type of fish to swim up to paddy fields.	Farmers jointly recycle drained water for the use of irrigation.	Residents of rural hamlets maintain irrigation and drainage facilities, which are common pool resources
Collective actors	Farmers	Farmers and irrigation districts	Farmers, non-farmers, farming organisations, and NPOs
Organising bodies for collective action	Informal group of farmers	Irrigation districts	Local action groups to be established under policy regulation, most of which in practice are based on traditional rural hamlets
The number of organising bodies	32 groups	7 irrigation districts	There are around 20 000 local action groups in Japan, of which 792 are in Shiga
Average size	4 ha	670 ha and 1 300 member farmers	53 ha (excluding Hokkaido) with 58 farmers, and 12 non-farmers
Justifications for collective action	No other options	Individual contracts would entail huge transaction costs. Making use of the formal decision making process could reduce the transaction cost associated with contracts.	Collective action that has prevailed in each rural community is the basis.
Government agri-environmental policy	Agri-environmental payment	Agri-environmental payment	Voluntary management of irrigation and drainage facilities.
Justification for the agri-environmental policies	Preserving biodiversity is a typical type of pure public goods	The environmental benefits associated with reducing chemical inputs are pure public goods. Payments should be justified in the context of overall agricultural support policy.	The payment by the MAFF could be interpreted as a part of the support policy for the maintenance of irrigation and drainage facilities[a].
How collective action is encouraged	Physical conditions associated with farming and drainage canals automatically require collective action.	Collective contracts between prefectural government and irrigation districts.	Collective contracts with local action groups by the MAFF
Role of central government in promoting collective action	None	None	Policy design and financing 33% of the costs
Role of local governments in promoting collective action	Policy design and provision of the payment. Technical and extension services for collective action.	Policy and institutional designs as well as the provision of payment	Not involved in the policy design, and sharing 33% of the cost (16.5% by prefectural governments and 16.5% by city governments)
Factors affecting collective action	Physical conditions would affect the level of transaction costs for organising farmers. Long history of the prefectural government in promoting collective action for farming activities has been a factor in the success of the policy.	Strategic intention of the prefectural government that collective action should be promoted by making use of the existing institutional setting was clear. This arrangement could contribute to reducing the transaction cost.	Informal and historical network has been the main reason for establishing local action groups according to rural hamlets in many cases.
Factors affecting farmers' decisions as to whether they would join collective action	Because the policy totally depends on voluntary action, social trust among farmers is likely to be the main factor. In particular, they would see whether the benefits associated with their joining a project (e.g. payment from Government and social pressure) are greater than the cost associated with their coordinating with neighbouring farmers.	Farmers could express their concerns through the formal process within their irrigation district.	Historical and social background of each village is likely to be a key in the decision made by each resident. In many cases, there may be no choice but to join because of social norms in their villages.

a. This payment has been notified to WTO as a green box measure.

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13. THE NETHERLANDS CASE STUDY: WATER, LAND AND DIJKEN ASSOCIATION[74]

599. The first farmer associations on farmland conservation in the Netherlands were created in the early 1990s. Many had a broad environmental focus and were called "environmental co-operatives." The initial idea was to develop an overall contract with the government on environmental issues, including on biodiversity, landscape and heritage. Although this seemed initially difficult, the number of co-operatives increased during the late 1990s. They focused on farmland conservation, particularly on grassland bird protection. Since the Dutch government has been promoting a collective approach under the agri-environmental scheme as of 2000, the number of co-opeatives has increased. Particularly in the lowland grassland areas in the western and northern parts of the Netherlands, collective action covers huge regional areas. Today, there are some 150 regional groups, involving over 10 000 farmers and covering more than half of the Dutch countryside. They focus on conservation issues, such as birds of grassland and arable land, and landscape features. They involve not only farmers, but also citizens and have a broad rural development approach, including rural tourism and farm education. As their professionalism has increased, many have been certified under the new Dutch agri-environmental scheme.

13.1. Brief outline of the case

600. This case study examines a regional farming co-operative, the Water, Land & Dijken (WLD) association in Laag Holland (Lower Holland). The WLD, governments and other non-governmental parties work co-operatively to protect grassland birds.

Case study area: Laag Holland

601. Laag Holland (Lower Holland) is a unique, typical Dutch open landscape located north of Amsterdam between the coast of the North Sea and the dykes of the Ijsselmeer (a former inland sea). The area has characteristic variations of wet and moist peat meadow areas, and lower lying polders. The former are cultivated from peat marshes, which have existed for over ten centuries; the latter are former lakes drained by windmills in the 17th century and are presently situated three to four meters below sea level.

602. Livestock farming is the dominant land use. There are some 1 000 farms in Laag Holland, managing 32 000 ha of land, of which 22 000 ha is grassland. Compared to average Dutch farm figures (and the average foreign perception of Dutch agriculture), farming in Laag Holland is relatively low intensive; the average livestock density is between 1.0 and 1.5 livestock units per hectare and the use of artificial fertilisers is low, partly due to the high "natural" nutritional content of the peat soils.

603. In the peat grassland areas, the medieval cultivation patterns have changed little. Relatively small fields with a rather high water table are surrounded by a high percentage of open water and reed beds. Fifteen hundred hectares can be reached only by boat. As the vast majority of livestock grazes in open air, the small-scale parcelling and high water tables make farming labour-intensive. Owing to this, the farm economy is in decline, especially in times of low dairy revenues. The cost of milk production is estimated

74. This case study was prepared by Paul Terwan.

to be 15-25% above the national average. As a result, farm incomes are lagging, the pace of farm termination is relatively high, and the region has been "losing" dairy quotas since the quota system began in 1983.

604. In the lower laying polders, however, farming is much more diverse because of their more recent reclamation. Production circumstances are good and grassland alternates with arable and even horticultural land.

Public goods provided by collective action

605. Laag Holland is rich in public values: attractive landscape, many cultural heritage sites, and a rich biodiversity (including grassland birds, marshland birds and other waders, and rare vegetation including wet hay lands, heath lands and peat moors). Because of its attractive characteristics, the area is visited by thousands of national and international tourists yearly. The Dutch government has awarded the region with many spatial designations: National Landscape, two World Heritage Sites and Heritage sites of national importance, National Ecological Network, Less Favoured Area (LFA), Natura 2000 area, geese foraging area, National Buffer Zone, and Soil Protection Area.

606. The following public goods are delivered collectively by many stakeholders in this rich resource area:

- grassland birds;
- wintering geese and wigeons;
- ecological management of road verges and dykes;
- ecological dredging of ditches; and
- on-farm education for school children.

607. This case study focuses on grassland birds because their preservation is the main purpose of collective action in Laag Holland.

Grassland birds

608. Laag Holland, especially the peat grassland part of the area, is famous for its breeding birds. It is one of the Netherlands's most outstanding regions in terms of breeding densities. In 2006, 15 780 breeding pairs of waders (80 per 100 ha) were counted (Scharringa and Van 't Veer, 2008). Following an increase in the 1990s, there was a slight decrease the following decade. Density varies from 51 per 100 ha on regular farmland to 85 per 100 ha on land with an agri-environmental contract, and to 114 per 100 ha in nature reserves managed by farmers. The black-tailed godwit (Limosa limosa) is particularly important for preservation. In Laag Holland, 4 675 breeding pairs of this bird (23 per 100 ha) are registered, more than 10% of the Dutch population and about 5% of the entire European population.

609. In 2010, 9 236 nests were actively protected, of which 75% hatched. The majority of the protection takes place by means of agri-environmental contracts, while a minor part is done by unpaid (but co-ordinated) protection. The agri-environmental scheme for grassland birds involves 432 participants, 10 360 hectares and EUR 1.8 million. This is 24 ha and EUR 4 131 per participant. Easy accessible conservation measures ("light green" measures) cover 77% of the area and 39% of the budget and more drastic measures ("dark green" measures) cover 23% of the area and 61% of the budget.

13.2. Collective action

Main actor: Water, Land & Dijken Association

610. Grassland birds are the most important public good provided by regional farming co-operatives in the Netherlands. The case study focuses on the Water, Land & Dijken association (WLD), one of about 150 regional farming cooperatives in the Netherlands. Farmers (and often citizens) organise themselves on nature conservation at the regional level, sometimes in a broader context of rural development. The Dutch government has been encouraging these initiatives because they are important local "motors" to rural development and "self-regulation" of the agricultural sector.

611. The WLD was founded as a legal entity in 1997 to professionalise existing co-operation between farmers and conservationists. Its aim is to increase the value and importance of Laag Holland, including grassland bird preservation, to all its inhabitants. It has 650 members, of which 500 are farmers and 150 citizens. With support from 620 volunteers for conservational field work, it manages 55 000 ha of farmland, about 50% of the Laag Holland area. Because many of the large new polders are not eligible for LFA and agri-environmental support, the participation in these parts of the area is low. On the other hand, in the peat areas, the participation reaches up to 95% of the land. Because of various activities taken up by the association, it has become a regional focal point for rural development and a serious partner for policy consultation. Its activities include the following.

- Overall co-ordination of farmland conservation: drafting conservation plans and acquiring agri-environmental contracts for grassland birds, wintering geese and wigeons and management of botanical grassland and landscape features.
- Training and education: improvement of conservation skills and exchange of knowledge.
- Enhancing other ecosystem services such as: monitoring and protecting the barn swallow, and managing road verges.
- Developing and negotiating adequate arrangements with farmers in conservation areas purchased by conservation organisations (about 4 000 ha), where agri-environmental schemes are usually not operational.
- Promoting and enhancing other rural development themes: rural tourism, farm education for primary schools and for the broader public to reconnect farming and civil society, landscape-friendly building activities, and enhancing innovative entrepreneurship.
- Developing new financial arrangements for rural development, especially for farmland conservation, by organising private funding.

Mechanism of collective action

612. The WLD, the province of North Holland and other non-governmental parties, such as farmers, volunteers and conservation organisations, work collectively for preserving grassland birds in Laag Holland. Table 13.1 summarises the role of each.

Table 13.1. Role of stakeholders for grassland birds' preservation

<table>
<tr>
<th>WLD</th>
<th>Provincial government (province of North Holland)</th>
<th>Other non-governmental parties</th>
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Negotiating with farmers on the relation between farmers' interests and ecological needs
In its function of regional conservation coordinator: drafting a regional map with management "mosaics" (grassland use patterns) for grasslands birds
Recruiting farmers to participate in the scheme
Co-ordinating the protection work in the field: functioning as local floor managers and being contact points & advisors for farmers
Implementing a private protocol on "good farm conservation", which every participating farmer has to comply with
Co-ordinating the protection of nests with 650 volunteers
Making individual contracts with participating farmers for re-distributing money from the Dutch paying agency
Organising information and education on grassland bird protection in order to improve the professional skills of farmers as conservationists

</td>
<td>

Designating priority areas and conservation targets for grassland bird protection in a regional agri- environmental plan
Including rules for safeguarding the quality of grassland bird management in the same plan
Requiring the regional conservation coordinator to develop "mosaics" for guaranteeing effective protection
Commissioning the Dutch paying agency to only approve applications that are in accordance with the regional plan
Taking responsibility for the monitoring of conservation results

</td>
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Farmers: Applying for participation in the regional management plan at the Dutch paying agency. Signing an agreement with the WLD for capping and redistributing part of their payments. Implementation of bird protection measures (adjusted grassland use)
Volunteers: 650 volunteers assisting the farmers in tracing, marking, registering and protecting the nests
Regional umbrella organisations for farmland conservation: Looking after the interests of the affiliated local organisations and helping create beneficial circumstances for the marketing of public goods
Conservation organisations: Purchasing and re-leasing about 4 000 ha of grassland, many of which are not eligible under the agri-environmental scheme
Fauna management groups: local fauna managers (e.g. hunters) dealing with predators of grassland birds
"Grassland bird circles": local groups discussing best management practices for grassland use and predation control

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National government

Dutch paying agency[1]: Checking whether individual applications for agri-environmental contracts are in compliance with the regional management plan by the provincial government. Implementation of agri-environmental payments
Food and Consumer Product Safety Authority: Scheme enforcement by selective field inspections

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1. Governmental institution certified to implement payments that include the EU contributions.

613. The implementation of the scheme by the WLD takes place close to farms, thus substantially increasing the uptake. For example, the WLD makes individual contracts with participating farmers to selectively cut and re-distribute part of the payments they receive from the National Paying Agency. This "skimmed" budget is used 1) for result-oriented payments (according to the number of nests protected); and 2) for private conservations contracts, especially last-minute measures. For example, when a field is going to be mowed, but is still densely populated with birds, the WLD can agree with the farmer to postpone mowing.

614. The WLD also works closely with local governments. The Dutch government has shifted the responsibility for the agri-environmental schemes from the national to the provincial government. As part of this decentralisation and the revision of the agri-environmental programme, since 2011 regional co-ordinators and farmers' associations can receive a government certificate for their reliable role in the implementation of the agri-environmental scheme. The WLD received the certificate in 2011. The WLD

(by obliging farmers to comply with the regional management plan) together with the province (by its implementation rules) provide strong guidance on the quality and location of agri-environmental measures.

13.3. Factors affecting collective action

615. Historically, there is little tradition of co-operation in the Laag Holland area; farmers were transporting their products individually (often by boat) to markets and shops to nearby Amsterdam. In addition, farmers in the region have always been relatively autonomous and resistant to government interference. Despite these barriers, the association on farmland conservation is now among the most successful ones in the Netherlands. Table 13.2 summarises the key factors for this success according to four categories: 1) the characteristics of the resources (Laag Holland and grassland birds); 2) the nature of the groups that depend on these resources; 3) the particulars of institutional regimes through which resources are managed; and 4) the nature of the relationship between a group of external forces and authorities. Many of the factors as listed below apply mainly to the extensive peat grassland areas in Laag Holland and far less to the newer polders where bird densities, and WLD membership, are much lower.

Table 13.2. Factors affecting collective action (Dutch case)

Resource system characteristics	Group characteristics
• Severe resource problem • Long history of nature conservation in the area • Close location to big cities	• Farmers' autonomy • Local leadership
Institutional arrangement	**External environment**
• Pre-existence of a local environmental cooperative	• Economic fragility and need for collective marketing • Decentralisation

Resource system characteristics

- *Severe resource problem*: As the number of grassland birds has declined in spite of conservation efforts and the effects of agri-environmental measures were broadly criticised, the belief grew that the protection of species and populations that exceed farm boundaries need strong regional co-ordination. For other environmental topics, a regional (cross-farm) approach was considered to be effective (see, for example, Franks and McGloin, 2007). These two factors, the critical situation of the resource, and high expectation to a regional approach encourage stakeholders to act collectively.

- *Long history of nature conservation*: Since the 1930s, conservation organisations have been purchasing land to establish nature reserves. As the biodiversity values involved were directly linked to the use as grassland, the majority of the land was leased to local farmers. In other words, the farming community has long been aware of the public values of their region. Although a number of farmers have moved to regions with better production, the remaining farmers are proud of their region and are convinced that it is of special interest. Perceived this way, a co-operative approach to collective goods is a logical way to connect farming, nature conservation and the civil society (Renting and Van der Ploeg, 2001).

- *Close location to big cities*: Its location close to Amsterdam and other big cities has two effects:

  - Since the 1970s, there has been an increase in the number of "citizen" inhabitants who buy property as well as manage increasing tracts of land. The latter has not always been to the benefit of the regional values, however. Involving them in a regional approach and improving

awareness is a way to safeguard regional values and "ecological capital" (De Rooij et al., 2010).

- Many cities and towns have substantially expanded over the last decades. Collective action and emphasising regional values are perceived as ways to reduce further urban expansion.

Group characteristics

- *Farmer autonomy*: In their opinion, regional governance is best served by an organisation "of their own", which is close to farmers and carries out things "their way".

- *Local leadership*: Since the late 1970s, there has been a group of knowledgeable, motivated and respected young farmers who have developed ideas for the future and have tried to influence government policies.

Institutional arrangement

- *Existence of a local agri-environmental co-operative*: When the first agri-environmental plans for the regions were published in the early 1980s, farmers considered these to be insufficiently tailored to their specific circumstances and in response, collective action was taken. As a part of this action, an early and small-scale co-operation between farmers and conservationists, the *Samenwerkingsverband Waterland* (the Partnership Waterland), was established in 1981. For many years, this partnership has developed regional knowledge and co-ordinated the voluntary (unpaid) protection of grassland birds by reflecting local needs for the development of Dutch agri-environmental plans. This Partnership became the founding basis of the WLD.

External environment

- *Economic fragility and the need for collective marketing*: The regional agricultural production capacities are limited, as are the income perspectives from primary production. This has fuelled interest in broadening the economic basis of farming. As the agri-environmental scheme for the region covers only part of the public goods available, there is growing awareness that the marketing of rural goods is better done collectively. In this way, the association functions as a producer co-operation, a model with a long history in Dutch farming (although not in this region).

- *Decentralisation*: Increasing decentralisation of government policies for nature conservation and rural development has created room for types of regional self-organisation and self-regulation, where regional collectives fit in well. These can be considered as a new mode of rural government with new institutional arrangements (Wiskerke et al., 2003).

13.4. Cost-effectiveness of collective action

616. There is no hard evidence of the cost-effectiveness of collective versus individual delivery of public goods in the Netherlands. Generally speaking, however, collective action may bring better outcomes, although it may – under the current scheme design – create additional costs.

- *Benefits*: It is probable that collective action will provide better results in terms of bird population. Although scientific evidence is lacking, supporting arguments are:
  - as there is increasing proof that an individual and general approach to bird protection is hardly effective, a targeted regional approach with fine-tuned management mosaics (grassland use patterns) is expected to provide better results (Oerlemans et al., 2007);

- the regional approach and the existence of a conservation organisation by and close to farmers lead to a broader scheme uptake, and thus to a larger coverage of targeted protection;
- information and education efforts of the WLD bring a better understanding of the ecological needs and a more professional management;
- the efforts of many volunteers, only possible under the umbrella of regional co-ordinations, are of vital importance to the conservation results;
- the WLD employs five regional field co-ordinators who enable fine-tuning of the management during the breeding season; and
- although the WLD has no role in official field inspections (official inspections are done by Food and Consumer Product Safety Authority), the presence of the field co-ordinators provides a high level of compliance with the scheme's obligations.

- *Costs:* The current design of the Dutch agri-environmental schemes does not encourage a cost-effective implementation. First, the implementation cost of the Dutch agri-environmental scheme is 40% of the total scheme expenditure. Payments for regional co-operatives for their role as regional co-ordinators share 5% of the total expenditure, and the overhead costs for the Dutch paying agency are estimated at about 35% of the total budget. The remaining 60% is paid to farmers. However, it is expected that the governmental costs would rise by more than 5% if the regional co-ordination by co-operatives would be in governmental hands. Second, the complex character of the Dutch scheme and the unofficial position of the regional co-operatives (C.2.6.) result in relatively high costs. It is the general opinion that a less complex scheme design and an implementation shift to the region would enhance the cost-effectiveness of the Dutch agri-environmental scheme.

13.5 Government policy for collective action

617. In the 1990s the Dutch government perceived regional co-operatives as a potential contract partner for the delivery of public goods and services. As such, it provided occasional support to help them develop their organisational skills and to elaborate regional "bids" to the national and provincial governments.

618. From 2000 to 2009, regional co-operatives were assigned formal roles under the revised Dutch agri-environmental scheme.

- From 2000 to 2003, they could be applicants and final beneficiaries of the Dutch agri-environmental scheme. They could make different individual contracts with farmers as to the content and payment of the agri-environmental measures, as long as the targets of the scheme (in terms of numbers of birds or plants) were realised.
- In 2003, the European Commission no longer allowed the Netherlands to operate the scheme in this way. This was because: 1) the co-operatives were in practice functioning as regional paying agencies, but did not have the obliged certification for this task; and 2) the Commission urges that the payments be directly related to the measures taken and not to the results achieved.
- From 2003 to 2009, the co-operatives could still be contract partners with the government and conclude individual contracts with farmers, but only if the collective contract adds up exactly to the sum of all individual contracts as to the content of the agri-environmental measures. In addition, the Dutch paying agency no longer paid the co-operatives but directly paid participating farmers. To create more flexibility, some Dutch co-operatives shifted to the model of "private"

capping and redistribution of payments based on a private agreement between the association and its members.

- During these same ten years, the Dutch government paid co-operatives for the co-ordination and educational costs in accordance with the number of hectares under the collective approach. These payments were entirely funded nationally and separate from the operation of the agri-environmental scheme co-financed by the European Union (under which participating farmers were paid from the Dutch paying agency).

619. In 2010, with the revision of the Dutch agri-environmental scheme, the position of regional co-operatives as contract partners was also abandoned. As a result, co-operatives no longer have any official roles in the enforcement of the agri-environmental scheme. The first reason of this reform was the envisaged difficulty for co-operatives to enforce the obligations on Good Agricultural and Environmental Condition, which are compulsory for any payments involving the EU budget. The second reason was the administrative burden in case of contract changes made by one farmer, but influencing the entire collective contract. However, in many regions, farmer associations are assigned the role of regional co-ordinator for grassland birds. Many provinces enable them to elaborate the regional management plans and thus to provide guidance to the content and locations of on-farm protective measures. Under the new scheme, the Dutch government pays for this unofficial role and separately for a number of additional services (such as training) provided by regional co-operatives.

620. Since it was the general expectation that the revision in 2014 of the Common Agricultural Policy (CAP) will include a further shift from production support to support for public goods and services, and the Dutch government consideres regional collectives to be a useful means for their delivery, the Ministry of Agriculture initiated the so-called CAP pilot projects in four regions, including Laag Holland (2011-13). The intention is to further experiment with the collective delivery of services (in terms of effectiveness and costs), focusing on the degree of guidance that regional collectives can provide, and exploring the opportunities to develop useful "policy formats" for a collective approach under the future CAP.

621. The European Commission's proposals for the CAP 2014-2020, presented in October 2011, include a new formal position for collective action, mentioning "groups of farmers" as potential applicants and beneficiaries under the agri-environmental part of the proposals for rural development (EC, 2011). The proposals also mention broader possibilities for EU support for co-operative actions, including the organisational costs involved. The WLD is pleased with these possibilities and is now formulating ideas for:

- the practical implementation of these new possibilities;
- extending the role of regional co-operatives to first pillar CAP payments (direct payments), where 30% of the budget is reserved for environmental measures. Co-operatives could also play an important role in developing an effective "collective delivery"

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14. THE NEW ZEALAND CASE STUDIES

622. Agriculture is an important industry in New Zealand. It contributes about 5.5% to GDP and 7.2% to employment, while farm exports account for 53.4 % of the value of merchandise exports (OECD, 2011). Agricultural land use is 43% of land area and 57% of water use is for agriculture (OECD, 2011). Forty-nine per cent of greenhouse gas emissions are also from agriculture (OECD, 2004). Many innovative policies have been established for dealing with agri-environmental effects. The Ministry for Primary Industries of New Zealand (MPI) and local governments have promoted grass-root activities by farmers, growers and foresters to provide public goods and reduce negative externalities associated with agriculture. Among various collective actions in New Zealand, this study analyses three cases: Sustainable Farming Fund (SFF), East Coast Forestry Project (ECFP) and North Otago Irrigation Company (NOIC).

14.1. Sustainable Farming Fund

Brief outline of the case

623. The MPI launched the Sustainable Farming Fund (SFF) in 2000 to fund grass-root activities and help innovation, research and other environmental projects by farmers, growers and foresters. Until 2010, SFF had invested about NZD 100 million in 700 projects (MAF, 2010). In 2012, aquaculture projects became eligible for funding.

624. This case study picks up a specific example in SFF projects: Aorere Catchment Project. This project is led by the dairy farming community. They work for improving water quality in the Aorere Catchment to the benefit of the near shore environment and coastal water quality. SFF funds the farmers' group and helps address the complexities around sustainable water management.

Sustainable Farming Fund

625. SFF is a funding programme to support grass-root activities. All SFF projects are collaborative projects often initiated by farmers, growers or foresters with the support of a wider *community of interest* involving industry organisations, agribusiness, researchers or consultants. The purpose of the fund is to support rural communities to undertake applied research and extension projects that tackle a shared problem or address an opportunity (MAF, 2010).

626. SFF projects include projects such as sustainable land management, novel production systems and human capability development. SFF often funds initial work leading to larger ongoing programmes and provides support to facilitate various local or cross-industry activities. These activities are related to various public goods and externalities associated with agriculture such as biodiversity, water quality, sustainable forestry and pest management. However, projects that target fundamental or long-term research and that benefit an individual or a single business are not eligible for SFF funding (MPI, 2012).

627. The maximum investment SFF can provide to any one project is NZD 200 000 annually for three years (MAF, 2010). However, SFF cannot fully fund projects just by itself. It requires a minimum of 20% non-governmental contribution (MPI, 2012). SFF funds costs associated with specific, contracted project

work not for business as usual activities. Most projects leverage a significant amount of cash and in-kind support from the applicant group.

Aorere Catchment Project

628. The Aorere Catchment is located in the Western Golden Bay of the South Island. About 30 dairy farms operate throughout the catchment. Most of the catchment is hilly and covered in native bush. About 16% of the catchment's land use is pastoral farming, mainly dairying. The Aorere Catchment project was established because, in 2005, coastal water quality of Golden Bay became a problem. Mussel farming that had operated near the Aorere River mouth had almost become unviable due to restrictions on the number of harvesting days resulting from poor freshwater water quality entering the Bay. Dairy farming, in this high rainfall environment, was thought to be affecting the water quality which was having a detrimental impact on the mussel farms. Local dairy farmers began to proactively address the issue, with the help of the NZ Landcare Trust (MAF, 2010; OECD, 2012).

629. In 2006, local dairy farmers applied for SFF funding to run a three-year project in the catchment. By using SFF, first, the Aorere Catchment Group commissioned a scientific investigation to understand possible causes of water deterioration. They found that although the Aorere River does not have a nutrient contamination problem, coastal waters near the mouth of the river are very sensitive to faecal bacteria, which affects harvesting shellfish (NZ Landcare Trust, 2009). Next, based on the results of the scientific research, dairy farmers agreed to take action to improve water quality by trying to reduce the levels of bacteria reaching their waterways during fine weather and low rainfall events. Each farmer developed their own environmental plan, which shows what kind of measures they should take in what order, with the help of the NZ Landcare Trust, and support of the local council and changed their farming practices including: 1) eliminating stock access to waterways, 2) stopping effluent irrigation to saturated soils, 3) reducing effluent application rates, and 4) looking for runoff hotspots (NZ Landcare Trust, 2009).

630. The project used local science, farm-scale environmental plans and farmer leadership as the tools to improve water quality, and indeed, water quality in the Aorere Catchment improved greatly (MAF, 2010). In 2002, local shellfish harvest days were as low as 28%, but in 2006, they increased to about 50%, and after the three-year project, mussel farmers can now harvest shell fish 79% of the days per year[75] (NZ Landcare Trust, 2009). Although the first project finished in 2008, from 2009 the project extended the Aorere approach to the neighbouring Rai catchment (Table 14.1).

Table 14.1. AORERE Project

	2006-2008	2009-2011
SFF project name	A community approach to improving catchment wellbeing	Farmers as leaders in water quality action
SFF investment	NZD 218 000	NZD 259 000
Other cash contributors	NZ Landcare Trust	NZ Landcare Trust
	Tasman District Council[1].	Tasman District Council
		DairyNZ
Total project value	NZD 503 473	NZD 585 000

1. The Aorere Catchment is located in the Tasman region. The Tasman District Council is one of 16 regional councils of New Zealand.

75. There will always be some days that they cannot harvest – due to poor weather conditions and/or still improving water quality.

Source: MAF (2010).

Collective action

631. In order to improve water quality in the Aorere Catchment, dairy farmers worked collectively together with NGOs and government agencies. Their roles are summarised in Table 14.2. This collective action has financial support from the central government. However, although MPI funds the group, activities taken by the group are locally devised, with support from NGOs and external experts. This project illustrates how farmers can take initiatives if they are provided with information and ownership to act (MAF, 2010). This concept is reflected in a catch phrase of the project, "experts on tap, not on top".

Table 14.2. Roles of stakeholders (Aorere)

Farmer's roles	Non-Farmer's roles	Governmental roles
• Forming a farmer group to improve water quality. • Commissioning a scientific investigation for identifying possible causes of water deterioration. • Changing farming practices for water quality improvement by reducing the levels of bacteria reaching their waterways.	• *The NZ Landcare Trust* (NGO): assisting farmers in applying for SFF, facilitating the project and making financial contribution to the activity. • *External scientists:* undertaking scientific research and providing information for improving farming practices. • *Golden Bay Streamcare Group* (established by a NGO): voluntarily planting thousands of seedlings along stream banks.	• *MPI (SFF)*: providing three-years funding for the activity from 2006 to 2008, and expanding the programme from 2009 to 2011. • *Tasman District Council*: providing fencing materials to help farmers exclude stock from streams. Farmers build fences by using these materials by themselves.

632. In the Aorere Catchment Project case, the community of interest is improving water quality. Therefore, by collective action, negative externalities from dairy farming have been reduced. It also enhanced stream health and biodiversity (e.g. habitat for flora, fish, birds) in the catchment. In addition, the Aorere Catchment project has a characteristic of managing common pool resource, because the Aorere Catchment is not only shared by dairy farmers, but also by marine farmers and other local citizens. Although everyone can access the resource and can enjoy it in common including for dairying, mussel farming and recreation and wild shellfish gathering (non-excludable), it can be subtractable (rivalry). If one exploits the resource, the others suffer from the action. Co-ordinated management among stakeholders through collective action is necessary.

Factors affecting collective action

633. The factors affecting the outcome of collective action can be classified into four groups. Based on this classification, Table 14.3 summarises successful factors of the Aorere Catchment Project.

Table 14.3. Factors affecting collective action (Aorere)

1) Resource system characteristics	2) Group characteristics
• Sharing the recognition of keeping common pool resources • Knowledge of environmental resources	• Social capital and small group • Farmer-led initiative • Communication
3) Institutional arrangement	**4) External environment**
• Tailored individual planning	• Financial support • Intermediary/coordinator • Involving wider community

Resource system characteristics

- *Sharing the recognition of keeping common resources*: The Aorere Catchment is a common pool resource which is shared by dairy and marine farmers. Mussel farming had almost become unviable due to restrictions on the number of harvesting days resulting from poor freshwater water quality. This fact let all stakeholders notice that if one side over-exploits the resource, the other side suffers from the action. Collective action is essential to manage the shared natural resource. The recognition of maintaining common resource among stakeholders is a key factor for successful collective action.

- *Knowledge of environmental resources*: Having precise knowledge on local environmental resources is a first step to take action. The Aorere Catchment group asked external researchers to undertake scientific research. Good science can empower farmers (MAF, 2009). The group also shares this information with the local district council and local marine farmers, thus enabling smoother communication.

Group characteristics

- *Social capital and small group*: The significant point of this project is that nearly all 33 dairy farmers in the community supported the project. In addition, most farmers have been farming for a long time in the area. The small group size and historical relationships may help them to organise collective action. Moreover, the success has positive impacts on community capacity, pride and cohesion (MAF, 2009), which further develops social capital.

- *Farmer-led initiative*: The Aorere Catchment Project is a farmer-led initiative with full community support. Farmers, and their spouses, actively participate in the project and adopt suggestions and solutions in co-operation with other farmers and external experts. Some farmers took the role of spokesmen/women and pro-actively led initiatives. Strong leadership and bottom-up approaches make collective action successful.

- *Communication*: Communication is key to collective action. The Aorere Catchment group holds community meetings regularly to exchange and update information, engage in social events, issue newsletters, and utilise the media (MAF, 2009). Open communication with dairy and marine farmers, and other stakeholders helps all stakeholders to understand each other and to make collective action effective.

Institutional arrangement

- *Tailored individual planning*: Farmers developed a confidential individual farm planning system to address specific water quality issues with help from a local NGO and rural consultant because

each farm is different and needs specific treatments. Confidentiality is also important as it relates to working in a style of respectful engagement with landowners. The plan shows what kind of measures farmers should take and in what order. Flexible and locally-adjusted approaches are more effective to manage non-point pollution, as opposed to a one-size-fits-all approach.

External environment

- *Financial support*: This collective action is a bottom-up collective action: farmers take actions in response to criticism of water quality problems. However, SFF greatly helps farmers to organise as a group and implement solutions. Financial support from governments can promote grass root activities by farmer groups.

- *Intermediary/co-ordinator*: In this collective action, strong support from NZ Landcare Trust is a key to success. It actively participates in the discussion, co-ordinates meetings and helps farmers to develop plans. Even after the SFF project period, it continues to help farmer with their activities.

- *Involving the wider community*: Interacting with others can provide great opportunities for two-way learning. Liaising with and utilising outside agencies, such as local governments, NGOs and experts, can build collaborative networks and bring better solutions (NZ Landcare Trust, 2009).

Cost-effectiveness of collective action

634. Improving water quality of the Aorere Catchment cannot be done by a single farmer. Collective action among all dairy farmers is necessary. They can learn good management practices from other farmers and experts by sharing information and working together. Moreover, through this collective action, farmers can also reduce costs for changing farming practices, compared with individual actions for improving water quality. Therefore, although quantitative data is missing, collective action seems a cost-effective approach for managing local water quality issues.

635. According to a farmer in the Aorere Catchment Project, although farmers always farm with intentions to take care of the land, sometimes they don't know environmental effects associated with their traditional farming. Respectfully explained the need for change is accepted, action may take time and money.

14.2. East Coast Forestry Project

Brief outline of the case

636. The Gisborne region[76], located in the north eastern corner of the central North Island in New Zealand, has a severe erosion problem. 26% of Gisborne region's land is susceptible to severe erosion. This is much higher than the New Zealand national average, which is 8% (MAF, 2007).

637. Severe erosion causes long-term damage to agriculture and rural infrastructure. It also lowers water quality by increasing the amounts of sediment in rivers. In order to address the wide-scale erosion problem, the MPI launched the East Coast Forestry Project (ECFP) in 1992. The ECFP provides funding to landholders to prevent and control soil erosion (MAF, 2007).

76. There are 16 regions in New Zealand, and the Gisborne region is one of them.

East Coast Forestry Project

638. Hill country of the East Coast area was once covered by native forests and its underlying geology is dominated by allochthonous unstable rocks, such as mudstone and argillite which make the area susceptible to erosion. A significant area of native forests was cleared for pastoral farming in the nineteenth century following European settlement, which exacerbated the soil erosion problem, i.e. negative externalities associated with agriculture. The East Coast has the highest population of Māori people (the indigenous people of New Zealand), and they have significant tribal landholdings and a strong cultural association with the land. The soil erosion has had a negative effect on Māori and other local people in the area (Rhodes, 2002).

639. The ECFP aims to promote sustainable land management in the area by providing a grant for planting trees or encouraging natural reversion to native forests. This is a voluntary project for encouraging landowners to take initiatives for treating erosion – some of the plantations are expected to be commercially viable (MAF, 2007). It targets the worst 60 000 hectares of eroding land in the Gisborne region. Since the first planting in 1993, by 2010, the ECFP has provided grants to 356 grantees, which covers 35 552 hectares (MAF, 2011). This number shows that the voluntary funding programme could attract a lot of landowners to take initiatives to prevent soil erosion. However, in 2007, in order to take more proactive approaches to prevent this severe soil erosion and involve landowners who had not implemented treatments under the ECFP scheme, the Gisborne District Council (GDC), a local council in the region, introduced a regulation which requires landowners to treat severe erosion. The regulation came into force on 1 July 2011. Landowners can use funding from the ECFP to satisfy this requirement, i.e. the ECFP (voluntary funding programme) is complemented by the local land use rule (regulation).

640. The ECFP grant can be used for the following erosion treatments: forestry treatments (closely planted radiata pine, Douglas fir, poplar and other species, if appropriate), pole planting (wide-spaced poplar and willow poles and wands) and reversion to native forests. Grant rates for afforestation (forestry treatments) range from NZD 1 476 to NZD 2 280 per hectare depending on the distance to port. Grant rates for pole planting are 70% of actual and reasonable costs and those for reversion to native forests are NZD 1 512 per hectare (MAF, 2011). This grant does not cover all costs for the treatments. Landowners have to bear a part of the cost which ensures their continued interest in the project.

641. Landowners are helped by the GDC and the ECFP to choose effective and appropriate treatments for preventing soil erosion. For this purpose, understanding the type of erosion is a first step. Each erosion type requires a different approach. For example, severely eroding soils require closer tree planting such as radiata pine, not space planted trees such as poplars and willows. Through inspection of site conditions, it is necessary to identify various factors including soil moisture levels, wind and frost, and match the tree type to the land type. In addition, for effective treatments, it is important to treat contiguous areas, not just the actively eroding parts. A combination, rather than a single treatment option, is most effective for reducing soil erosion (MAF, 2008).

642. To apply for an ECFP grant, applicants must own or have an interest in land where the worst erosion is occurring or prone to occur (this type of land is called “target land”). This includes the applicant having a lease on the land or a forestry right that applies to the land. People who are going to purchase or gain an interest in the land can also apply for the ECFP. In addition to individuals, a trust or incorporation can also apply for a grant instead of people who own or have an interest in target land (MAF, 2007). Soil erosion sometimes occurs beyond individual lands and collaboration between landowners is necessary for providing effective treatments. If an application is accepted, landowners can start a project up to three years after the approval (MAF, 2007). Landowners receive part of their grants at the time of establishment, and the rest three to eight years later depending on treatments. Once landowners are in the programme,

fifty-year covenants are applied. The covenants bind current and future landowners to maintain the erosion control effectiveness on the treated area (MAF, 2007).

Collective action

643. Landowners, the GDC and the MPI work together to prevent soil erosion in the Gisborne region. Their collective action tries to reduce negative externalities. Although the ECFP does target groups of landowners, individual landowners also need to work with local and central governments for their common interest. In this sense, this is collective action in a broad sense. All erosion problem areas have been mapped at property scale by the GDC. The MPI and the GDC approach landowners together and develop plans to treat erosion, including technical advice. Landowners are free to obtain independent advice. Once the landowner is satisfied with the plan, s/he applies to MPI for funding. Therefore, in this collective action, governments take proactive approaches (implementing both funding programme and regulation) and prevent soil erosion together with landowners. Their roles are summarised in the Table 14.4.

Table 14.4. Roles of stakeholders (ECFP)

Landowners' roles	**Local government's roles** (Gisborne District Council)	**Central government's roles** (Ministry for Primary Industries)
• Recognising soil erosion problem and contacting GDC/MPI. • Applying to MPI for funding • Implementing treatments: forestry treatments, pole planting or reversion to native forests.	• Helping landowners develop soil erosion treatment plans and prepare applications. • Establishing rules for targeting eroding/erosion prone areas in the District Plan. • Requiring landowners to implement treatment of soil erosion.	• Designing the ECFP and providing grants to landowners. • Auditing the annual claims for payment to make sure that agreed work is completed to an acceptable standard and in accordance with the approved treatment plan.

644. The collective action by these groups is underpinned by the MPI. Without support from the MPI, or put another way, central government, it would not be possible to provide treatments on the necessary scale. This is mainly because the necessary resources are beyond the capacity of the GDC. However, the GDC has supported erosion control by establishing rules to target eroding and erosion prone areas in the Gisborne Regional Plan (MAF, 2011).

645. Through collective action, landowners can enjoy several benefits. The most important is funding to mitigate soil erosion which helps to mitigate landowner's cash flow issues. The ECFP's financial support also assists landowner compliance with the Gisborne Regional Plan requirement of having tree cover on targeted land. In addition, the ECFP provides benefits for central and local government through carbon sequestration, improved water quality, and biodiversity (MAF, 2011).

Factors affecting collective action

646. Factors affecting the success of collective action can be classified into four groups. Based on this classification, Table 14.5 summarises the successful factors of the ECFP.

Table 14.5. Factors affecting collective action (ECFP)

Resource system characteristics	Group characteristics
• Severe resource problem • Scientific knowledge	• Large group
Institutional arrangement	**External environment**
• Commercial activity (commercial forestry)	• Financial support from governments • Regulatory measures by a local government • Effective collaboration between central government and local government

Resource system characteristics

- *Severe resource problem*: Soil erosion in the Gisborne region is 26% of the area. It is very high compared with the New Zealand national average, which is 8%. This severe resource problem encourages all stakeholders to take strong collective action to prevent the problem.

- *Scientific knowledge*: Choosing effective and appropriate treatments for preventing soil erosion is very important. Each erosion type requires a different approach. The need for strong expertise, including scientific knowledge, data and mapping, requires collective action since it is beyond the capacity of each landowner.

Group characteristics

- *Large group*: To cover the large soil erosion area (60 000 hectares), the ECFP provides funds to more than 350 grantees with support from the local government. A large number of landowners work together on the same issue (soil erosion problems) in the same region (Gisborne region). To manage large group activities, strong governmental involvement is necessary.

Institutional arrangement

- *Commercial activity (commercial forestry)*: The ECFP takes a "private initiative" approach to motivate landowners to pursue economic activities so as to improve the environment. They can sell thinned-out timbers and some plantations are expected to be commercially viable. Indeed, this approach is of interest to landowners.

External environment

- *Financial support from governments*: Managing 60 000 hectares of eroding land is beyond the ability of individual landowners and a single district council. Financial support from the ECFP is essential for managing a large-scale problem.

- *Regulatory measures by a local government*: The ECFP (voluntary funding programme) is complemented by a local land use rule (regulation). The local government decided to take regulatory approach to cover broad eroding areas. Although the voluntary funding programme can attract many landowners and provide treatment, as the voluntary approach was not enough to encourage all landowners in the target areas to treat the problem. The stick (regulation) and carrot (funding) approach, was effective to deal with this more severe environmental problem.

- *Effective collaboration between central government and local government*: The GDC is responsible for the Regional Plan which requires effective tree cover and relies on cost-effective treatment options. The ECFP supports landowners in meeting this requirement by providing grants. A good working relationship and collaboration between the MPI's ECFP management and the GDC has been important to the success of this collective action (MAF, 2011).

Cost-effectiveness of collective action

647. The ECFP has resulted in 35 552 hectares being treated through afforestation, pole planting or reversion. Between 2007 and 2010, 718 hectares were treated per year on average. In 2010, approvals were made for a further 5 745 hectares of forest planting, 451 hectares of pole planting and 498 hectares of reversion in the next three years (MAF, 2011).

648. However, the ECFP has struggled to use available funding and deliver treatments. The ECFP receives NZD 4.5 million per year for project grants and administration. Administration is estimated to cost about NZD 400 000 per year, leaving NZD 4.1 million for grants. Nevertheless, from 2007 to 2009 total spending has been between NZD 1.7 and NZD 2.2 million per year. Much higher annual amounts have been allocated but not spent due to the high dropout rate from grant approval to implementation (MAF, 2011). Reasons for this high dropout rate may include a lack of landowner finance, complications with Māori land with multiple landowners, relative economics of farming in the short term and a lack of genuine interest in undertaking land use change (MAF, 2011). Thus, it is necessary for improving its cost-related aspects. Since the introduction of the regulation by the GDC in 2011, application of the ECFP is increasing and this funding-delivery problem is expected to be improved.

14.3. North Otago Irrigation Company (NOIC)

Brief outline of the case

649. Otago[77] is the second biggest region in New Zealand. It spans from east coast to west coast of the South Island. North Otago is a sub region on the east coast. The extensive dry tussock grassland hills and lowland down lands in North Otago area provide the important agricultural base. However, farmers had been struggling to access reliable water supply due to its dry environment and existing allocation pressure on the main rivers in the area. In order to have access to reliable water, farmers took initiatives and formed the North Otago Irrigation Company Ltd (NOIC), which started a scheme to deliver a large volume of water to farmers from a nearby reliable (over 90%) resource, the Waitaki River in 2006.

North Otago irrigation Company [78]

650. NOIC is a company owned by the users of the scheme, i.e. farmers, with a strong governance structure. The NOIC scheme pumps water from the Waitaki River up to a head pond. Then, the water is delivered to the farm gate via natural water courses and a piped network by using gravity and secondary pump stations to maintain water pressure.

651. Farmers can get a water right and have access to water if they have shares and have also completed a registered Water Supply Agreement with NOIC, which nests water use efficiency, nutrient and farm management. Farmers can get shares either by buying them from NOIC when additional shares are issued or by trading shares through the market which is conducted independent of NOIC. Typically,

77. There are 16 regions in New Zealand has. Otago region is one of them.

78. This section is based on the information available on the NOIC website, www.noic.co.nz/ (accessed 15 June 2012), and information provided by the New Zealand government.

shares are transferred as part of the transaction when properties change hands. Once farmers become shareholders, they have to pay charges for maintenance, operation and administration of the irrigation scheme. This funds the board and staff that run the scheme.

652. Farmers also need to improve environmental performance through the NOIC's Environmental Farm Plan System, in order to maintain access to water supplied by the NOIC scheme. For achieving environmentally sustainable irrigation development, NOIC promotes responsible and efficient use of water through education and technological innovation. Farmers are required to implement the best practices for achieving environmentally sustainable farming, and every year one third of farms are audited to ensure that they are implementing the best practices detailed in their farm plans. If a farm fails audit, farmers are required to review their performance and take another auditing. In addition to the Environmental Farm Plan audit process, NOIC also undertakes weekly unscheduled compliance checks throughout the irrigation season.

653. NOIC provides water to over 100 shareholders and covers approximately 14 000 hectares of farmland in North Otago. It also aims to expand its service to adjacent areas and cover another 10 000 hectares of farmland. For expanding the services, the Waitaki District Council[79], one of the district councils in the Otago region, made a partnership with NOIC in 2006 to pre-invest NZD 10 million.

Collective action

654. In order to have access to reliable water, farmers took initiatives to form NOIC and implement environmentally sustainable farming. NOIC provides its members with reliable water and promotes sustainable farming by providing technical services. Local regulators, Otago Regional Council (ORC) and Waitaki District Council provide support for this collective action. For example, the ORC works closely with NOIC to improve on-farm practice for preventing water run-off from farms and achieving sustainable development. Table 14.6 summarises the roles of stakeholders.

Table 14.6. Roles of stakeholders (Otago)

Farmer's roles	NOIC 's roles	Government roles
• Taking initiatives to form NOIC for accessing reliable water. • Having access to water from the NOIC scheme if they become shareholders of NOIC. • Implementing Environmental Farm Plan for achieving sustainable farming.	• Providing shareholders with reliable water. • Auditing farmers and confirming the implementation of Environmental Farm Plan. • Regularly reviewing environmental performance and reporting progress to ORC and other stakeholders. • Promoting responsible and efficient use of water for achieving environmentally sustainable irrigation development.	• *Otago Regional Council*: developing water run-off policies with NOIC and has been involved in negotiating drainage agreements between neighbours. • *Waitaki District Council*: a founding funder of NOIC scheme, having invested NZD 10 million in infrastructures. • *Whitestone Contracting Limited*: owned 100% by the Waitaki District Council, providing operations and maintenance services to NOIC.

79. Otago region has five districts. The Waitaki District lies in North Otago.

Club goods and public goods provided by collective action

655. The NOIC scheme provides reliable water and this service can be classified as club goods. First, this service is excludable. NOIC is a company owned by the users of the scheme. Farmers can get a right to have access to water if they have a share of NOIC and have also completed a registered Water Supply Agreement with NOIC. Shareholders have to pay 1) annual charges for maintenance, operation and administration of the irrigation scheme, 2) fixed charges for debt servicing associated with capital costs of the irrigation scheme and 3) the cost of power for water supplied by the NOIC scheme. Second, this service is non-rival. Once farmers join the scheme, they have access to reliable water according to the number of shares they have. Additions to the scheme are regulated and can be admitted only if they do not affect existing shareholders' water flows or pressures.

656. NOIC also provides significant benefits to the local community, and the wider Otago community, not only economically but also environmentally. NOIC scheme enhances in-stream flows and hence biodiversity values, and maintains cultural values, in particular respecting Māori values in relation to water and the natural environment. These additional values associated with irrigation system are public goods, i.e. non-excludable and non-rival goods.

Factors affecting collective action

657. The factors affecting the outcome of collective action can be classified into four groups. Based on this classification, Table 14.7 summarises successful factors of NOIC.

Table 14.7. Factors affecting collective action (North Otago Irrigation)

1) Resource system characteristics	**2) Group characteristics**
• Broad area • Strong need for the resource	• Club goods: one provider delivers services to many club members
3) Institutional arrangement	**4) External environment**
• Additional environmental requirements • Monitoring	• Financial support from governments • Close work with local governments

Resource system characteristics

- *Broad area*: The NOIC scheme covers more than 10 000 hectares and aims to expand its services. For investments in large infrastructures and undertaking a large operating system, NOIC collaborates with farmers and local governments. When the targeted area is large, collective action is usually necessary.

- *Strong demand for the resource*: In this dry environment, farmers had been investigating access to a reliable water supply for a long time, but concerns about the ability to fund such a scheme had prevented farmers from going further. Following a significant drought in 1999, strong demand for reliable water encouraged farmers and other stakeholders to co-operate and to take action.

Group characteristics

- *Club goods*: One provider, NOIC, delivers services to many club members, i.e. farmers. This club goods case (water supply) is different from public goods cases (landscape, biodiversity, etc) because services can be excludable and part of its operational costs and fixed costs are covered by fees from farmers. On the other hand, public goods are non-excludable, which makes it difficult to let beneficiaries pay for the costs of provision. Market mechanisms to provide goods work better in a club goods case than in a public goods case.

Institutional arrangement

- *Additional environmental requirements*: Farmers must comply with an Environmental Farm Plan to participate in the NOIC scheme. This requirement makes it possible for farmers to work on environmental issues including water quality on a larger scale, which cannot be done by a single farmer. This requirement promotes collective action and brings better environmental outcomes.

- *Monitoring*: In order to prevent farmers from free-riding, NOIC audits one-third of farmers every year and undertakes weekly unscheduled compliance checks. This strong monitoring system helps large-scale collective action work. Without monitoring, there is a risk of free-riding.

External environment

- *Financial support from governments*: Financial support is provided by the Waitaki District Council to expand the irrigation system. Although farmers also bear the costs of operation and maintenance, external financial contribution is significant for expanding the service of the NOIC scheme.

- *Close work with local governments*: NOIC works closely with local governments, the ORC to improve on-farm environmental practices, prevent water run-off from farms and achieve more sustainable development. Support, information and close co-ordination of local regulators and ORC is important to assist the NOIC scheme to meet community expectations.

Cost-effectiveness of collective action

658. This large-scale irrigation system brings large benefits to farmers and communities. Farmers can have access to reliable water supply, which was impossible without the NOIC scheme, and the scheme greatly improves their agricultural performance as well as improving environmental management. Some of them can expand their farms and reduce costs because of the economy of scale. Thus, the collective action by the NOIC scheme seems a cost-effective approach for providing water while also meeting environmental expectations.

659. In fact, according to the AgBusiness (2010), gross revenue from the scheme area has increased from NZD 21.14 million (without the irrigation scheme) to NZD 65.08 million (with the scheme), i.e. NZD **43.95 million** or about 300% increase. Farmer's cash expenditure has increased by **NZD 29.26 million or 310%. Indeed, f**armers have **spent about NZD 62.24 million** in land conversion and created 76 extra labour units. The NOIC scheme has **brought about large economic impacts in the local community.**

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15. THE SPANISH CASE STUDIES[80]

660. The two case studies chosen to analyse collective action in Spain concern associations that help provide public goods and reduce negative externalities. They examine and cover the following areas:

- Description of the public good(s) provided through collective action, including the major stakeholders involved.
- Identification of the factors necessary for successful collective action.
- Examination of the policies necessary to promote collective action.
- How cost effective is collective action as a means for providing public goods.

15.1 Community water management

661. All Spanish water resources are considered to be in the "public domain". This means that water is owned by the State, which authorises the use of water for different purposes. In the case of economic activities (e.g. irrigation), Spanish legislation establishes a concession system whereby the State assigns water rights to economic agents free of charge and over long periods of time. Most water concessions for irrigation purposes are collectively awarded to owners of irrigated land who have grouped together to form water users associations called "communities of irrigators" (*comunidad de regantes* or CR). These associations are in charge of running irrigation infrastructures and responsible for the management of the water resources granted.

662. There are currently 7 196 CRs in Spain which manage water resources at the local level according to their own water allocation rules (self-government). The CR of Bembézar Margen Derecha (right Bembézar river bank) is a typical example and is the first case study examined here.

Brief overview of the Community of Irrigators of Bembézar Margen Derecha

663. The CR of *Bembézar Margen Derecha* (BMD) is a typical irrigation district in the Guadalquivir river basin (Southern Spain). The irrigation infrastructure was begun after 1950 and finished by 1967; the owners of the irrigated land were collectively granted water rights (concession). The BMD has managed since the irrigation infrastructures and water resources, providing services to 1 296 users with a total land coverage of 11 814 hectares.

664. Due to the intensive land reclamation policy of the 20th century, the Guadalquivir river basin, like many others in Spain, has at present a "mature water economy" characterised by: i) high and growing demand; ii) strong competition between different users, both agricultural and non-agricultural; iii) rigid

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offer in the long term due to the high costs of new infrastructure works; and iv) the emergence of serious negative environmental externalities (reduced flow of rivers, pollution of water bodies, overexploitation of aquifers, etc.). The Guadalquivir Basin Authority has clearly indicated these factors as the major problems to be addressed in the new river basin management plan (CHG, 2011). Although irrigated agriculture is a key issue in the development of rural areas, it has also exerted major pressure on water resources:

- *Quantitative pressures*. Consumption of irrigation water accounts for 80% of total water consumption (3 3295 cubic hectometre (hm^3)/year) and is expected to increase. Moreover, water consumption by individuals and other economic sectors are also expected to increase their demand for water at a time when further water supply is increasingly difficult (and costly) to obtain. Thus the gap between water availability and demand will increase in the future.

- *Qualitative pressures*. Non-point source pollution from farming activities significantly affects water quality. Indeed, most irrigated areas in the Guadalquivir basin (such as the BDM district) have been designated as "vulnerable zones" (NVZ) following the EU Nitrates Directive (areas of land that drain and contribute to nitrogen pollution).

Common resources maintained and negative externalities reduced by collective action

665. Collective self-management of irrigation water resources in Spain has its origin in the Middle Ages. This tradition of collective irrigation water management was incorporated into Spanish law in the 19th century with CRs recognised as key institutions for water governance (Ostrom, 1990 and 1992).

666. As established by the Spanish Water Act, CRs are non-profit associations of irrigators recognised by basin authorities (*confederaciones hidrográficas*) as holders of collective irrigation water rights and which are required to use "rationally" the water resources granted. For this reason, associations are autonomous and elaborate their own rules to determine how irrigation infrastructures are managed and how irrigation water is distributed amongst farmers. CRs are in charge of the operation and maintenance of irrigation infrastructures, the implementation of water delivery arrangements, and controlling that water is used properly by all farmers in their district. These associations are also autonomous from an economic point of view as they have their own budgets to finance all services provided. The total amount of money required for this purpose is fully borne by irrigators via annual quotas based on different water pricing criteria.

667. This decentralised system has proved to be effective in achieving an adequate management of common pool resources (common irrigation infrastructures and water endowment) that allows for the maintenance of common irrigation facilities and the "rational" use of water endowments, as well as to minimise the negative environmental externalities on the quantity (water conservation) and quality (minimising run-offs and non-point source pollution) of water.

Collective action

Managing irrigation

668. Although the national government sets the basic rules on collective water management, CRs are autonomous in managing irrigation water at the local level. Each CR has its own democratic institutions. All irrigators are members of the Assembly, the institution where the main decisions (water allocation rules, annual budget, investments to be made, etc.) are taken. The President of the CR and the members of the Council are elected.

669. CRs are in charge of the overall maintenance of local common irrigation infrastructures, and water conveyance and distribution. However, it is the individual farmer who is responsible for applying water to crops using his own irrigation facilities. In order to implement this collective water management at irrigation district level, associations employ their own staff. In the particular case of BMD, ten people are employed by the CR: a general manager, seven operators in charge of maintenance and running infrastructures, and two administrative assistants. Staff members implement the decisions adopted by the Assembly and the Council (water allocation rules), and act as a water police to enforce water conservation ("rational" water use).

670. Collective action on behalf of the CRs also plays a relevant role in controlling conflict amongst farmers, especially during droughts or where resources are scarcer due to overexploited water bodies. For this purpose, the Assembly of every CR elects a Water Jury which is responsible for interpreting local rules and for sanctioning irrigators guilty of breaking these rules. As these juries are widely accepted and respected, sanctions are rarely appealed.

Modernising irrigation infrastructures

671. The irrigation infrastructures in BMD were built in the 1960s and based on an open distribution network that riddled the entire district with channels. The main channel supplied water to the BMD from two different reservoirs. These resources were distributed to farm gates through more than 90 km of secondary channels. Although the distribution network was adequately maintained, research estimated water losses in the conveyance system to be close to 30% (Rodríguez-Díaz et al., 2011 and 2012), which is normal for such a system. However, as irrigators received water at atmospheric pressure (open distribution network), the most common irrigation technique was surface irrigation (70% of the district). Taken into account the low efficiency of surface irrigation, another 30-40% of water used was estimated to be lost during operations. Thus, the overall efficiency of water use (efficiency in distribution×efficiency in application) was around 45% (0.70×0.65).

672. Such inefficiency was largely widespread among Spanish irrigation districts, although the problems associated with this only became visible in the last decade of the 20th century. As the amount of irrigated land increased (implementation of new land reclamation projects), more water was required and thereby becoming an increasingly scarce resource (higher opportunity cost of water lost). Furthermore, as irrigated farming is more intensive in the use of inputs than is rain-fed agriculture, the use of agrochemicals also increased at the basin level. This resulted in water run-offs into the Guadalquivir River leaching higher amounts of nitrate, with the result of a serious problem of non-point source pollution.

673. The National Irrigation Plan (*Plan Nacional de Regadíos* or PNR), approved in 2002, recognised the need to stop the development of large irrigated areas and shifted policy priorities to promoting the modernisation of existing irrigation systems so as to minimise negative environmental externalities (MAPA, 2001). For this purpose, the PNR has partially financed collective investments made by CRs to improve the efficiency of existing irrigation districts. In 2007, BMD modernised its irrigation infrastructures, investing EUR 53.8 million, 60% of which was subsidised by the Andalusian regional government. The remaining investment costs (40%) were paid by the irrigators through a 20-year term loan.

674. The renewed irrigation system has maintained the principal channel as the primary distribution infrastructure, but the secondary network is now based on pressurised pipes. This has reduced water losses considerably, which now account for only 10% of water used. Moreover, this new network has been designed to operate drip irrigation, which is the most common system used today, covering more than 80% of the district's surface. This technique uses water much more efficiently, with a loss of only 5% of water

applied to crops. These improvements have led to a significant improvement in the overall efficiency of water use, which is now around 85% (0.90×0.95), in the BMD district.

675. The effects of this modernisation have been twofold. First, from a private point of view, the irrigation system is more flexible and reliable for producers. Water is now available on a demand basis, in contrast with the limited irrigation season (from May to September) that existed before modernisation when water was delivered on rotational turns. This improvement has allowed farmers to migrate to more profitable crops, mainly citrus orchards. This change in crop-mix has raised the value of agricultural production by 7% and which is expected to increase further over the next five-six years, the period required for new citrus orchards to become fully productive.

676. Secondly, from a public perspective, this modernisation has allowed for the maintenance of irrigation facilities (obsolete infrastructures and the risk of collapse are now things of the past) and has minimised serious environmental pressures exerted by irrigation activities. The improvement in efficiency of water use (distribution and application) has led to a 40% reduction in irrigation water used, from an average of 8 000 m^3/ha·year to 4 700 m^3/ha·year. These savings have reduced demand for water, leaving more water available for other uses (other economic sectors or for environmental purposes). This modernisation has also improved the problem of non-point source pollution. The current infrastructures and irrigation techniques have reduced return flows from 55% to only 15% of the water used, minimising polluting discharges into water bodies.

Factors affecting collective action

677. There are many factors that explain why collective action of irrigation water management is successful in Spain. The following are common to most CRs in the country.

- *Economies of scale*. Irrigation projects typically exhibit increasing returns-to-scale giving rise to a natural monopoly (Spulber and Sabbaghi, 1998). This is because managing the conveyance and distribution of irrigation water is a complex task requiring high fixed costs (monitoring and control). In this sense, it is economically justified that irrigation districts are managed collectively.

- *Autonomy and democratic self-government*. Spain has a long tradition of disputes between irrigators (collective action) and political authorities regarding water management and control. The CR is the result of the successful experiences of collective self-government, which has minimised corruption, the costs of monitoring and control, and the influence of non-farming interests in irrigation management.

- *Compulsory membership*. As irrigation water rights are granted collectively by the State to all farmers operating within the irrigation district, these irrigators are compulsory members of CRs. This arrangement avoids any free-riding behaviour, all irrigators being required to observe the water allocation rules of the CR and pay the fees established to cover its budget.

- *Legal capacity*. The existing legal framework provides CRs with a legal personality, giving them the ability to be owners of their irrigation facilities and any other asset, employ the staff required to manage water, to operate bank accounts and borrow money, to deal with the public administration and other external groups, and to undertake any other activities.

- *Technology capacity*. The staff of CRs acts as a large and qualified water manager which can deal with the most advanced technology. This was proved by the modernisation of the BMD,

where only collective action allowed for the implementation of a modern pressurised irrigation network monitored by a remote control and telemetry system.

- *Transaction costs*. As CRs act as local managers of irrigation water, they are easier to contact and interact with than are public central agencies. This saves irrigators' time and money. Resolving conflicts through CRs also saves substantial time, material, money, and interpersonal transaction costs.

- *Social capital*. The long history of CRs in Spain has made these institutions socially accepted and trustworthy, being a key element for successful co-operation amongst farmers.

678. Dealing with the particular experience of the BMD in relation to the modernisation of the irrigation system, other reasons explaining famers' involvement in collective action are as follows.

- *Obsolete irrigation facilities*. The 40-year old irrigation infrastructure required large expenditures on repairs and maintenance, and involved a high level of conflicts due to rotational turns. Modernisation was not an option, but rather a necessity given the risk of facilities collapsing.

- *Profitability enhancement*. Before modernisation, growing the most profitable crops (citrus with drip irrigation) required large private investment in wells, pools and pumping infrastructures that only wealthy farmers could afford. The new irrigation technology based on a pressurised network on demand made such production available to all farmers.

- *Improvement of irrigators' welfare*. Modernisation was not only decided because of the expected increase in profitability, but also because new irrigation facilities would make irrigation planning and execution much easier as compared to the old system, which required working through the night and on weekends (depending on the rotational turns) and required more intense human labour (land preparation for surface irrigation).

Government policy for collective action

679. Public agencies (basin authorities) in Spain retain operational and maintenance responsibilities at higher levels of the system, controlling and monitoring water use in the whole basin, administering the registery of water rights, managing reservoirs and other multipurpose facilities, and designing water plans. Nevertheless, Spanish law recognises CRs as self-governing associations for irrigation water management, providing a support policy and legal environment that facilitate their role as agents in charge of enforcing local rules, monitoring and controlling water use at the irrigation district level, and sanctioning illicit behaviour. This institutional arrangement entails several advantages for public administration, a more efficient management of irrigation water being the main one.

680. CRs have also shown their use as collective institutions to face more recent problems regarding quantitative and qualitative pressure on water resources. This has been possible for the administration by making win-win proposals in order to modernise obsolete irrigation facilities, as established in the PNR. This plan is based on the idea that by renewing old irrigation infrastructures, both farmers and society as a whole can benefit. Irrigators will be able to improve their income and welfare, while society will receive more and better quality water for other uses. Thus, the PNR has given priority to the modernisation of existing irrigation systems (improvement of efficient water use), proposing for this purpose the financial involvement of both parties. Bearing in mind the limited affordability for irrigators (potential increases in farmers' profitability), a general framework was established which supports around 50% of investment through public subsidies. This public funding has been a key element for collective action to perform major works on irrigation facilities.

681. Considering the success of this policy over the last decade, the top priority for Spanish water policy is to modernise the remaining obsolete irrigation systems through collective action as provided by CRs. This is the objective of the new National Strategy for Sustainable Irrigation Modernisation, Horizon 2015 (MARM, 2010), which is a continuation of the PNR.

Cost-effectiveness of collective action

682. Cost-Effectiveness Analysis (CEA) is the preferred method to select policy measures (e.g. modernisation) to attain the good ecological status of water bodies as prescribed by the EU Water Framework Directive (WFD). This is why there are precise and updated data available regarding the different alternative measures to be potentially included in the Program of Measures (PoM) of the new river basin management plan (CHG, 2011; Berbel et al., 2011). In this sense, for each measure available, a cost-effectiveness index has been calculated, expressed as the equivalent annual cost (i.e. the annualised investment, plus maintenance and operating costs). Using these cost-effectiveness indices, alternative measures were ranked from lowest to highest. A combination of measures, starting from the one with the lowest score, were selected

683. The results as implemented by the Guadalquivir Basin Authority (CHG, 2011) show that modernisation of irrigation projects has a relatively high cost-effectiveness ratio (it costs EUR 0.66 to save 1 m^3), ranking sixth among all measures analysed. There are other cheaper and effective methods to improve management of water resources, however modernisation is the sole means by which to save the water required at basin level in an effective way. This is the reason for the modernisation of 365 588 irrigated hectares, which is expected to result in 259.5 hm^3/year of water saved.

684. PoM in the Guadalquivir basin also considered measures to tackle the problem of diffuse pollution by farming activities. However, CEA has not been implemented to select these measures and, as a result, no reliable data are available for our purposes. It is worth mentioning, however, that the Basin Authority expects non-point source pollution to be solved by 2015 because of the modernisation (lower return flows) and implementation of the code of good agricultural practice related to water and nitrogen fertilisers, suggesting the usefulness of collective action to minimise this externality.

15.2. Good practices to avoid animal diseases

685. The increasing number of public health and food safety alerts worldwide related to animal production (epizooty and zoonose outbreaks) has led to stricter requirements regarding farm animal sanitary conditions (including traceability implementation). This has posed a challenge to Spanish livestock breeders and collective action as undertaken through Animal Health Associations (*Agrupaciones de Defensa Sanitaria Ganadera* or ADGS) have played a key role to help breeders cope with the new sanitary and bureaucratic requirements.

686. ADSGs are voluntary associations of livestock breeders established to implement a common animal health programme aimed at improving sanitary and animal welfare standards on all farms. The ADSG of Pedroches county is one of 1 500 associations that exist today in Spain, and which is considered as a case study for this report.

Brief outline of the Animal Health Association of Pedroches county

687. The county of Pedroches (2 300 km^2) is an inner mountainous area located in the Autonomous Region of Andalusia (southern Spain). As many other less favoured areas, this county is specialised in extensive grazing systems, where dairy and meat cattle, sheep and goats and black Iberian pigs are bred, constituting one of the most important livestock districts in Spain.

688. In order to fulfil animal health legal requirements and improve the profitability of farms, almost all stockbreeders (1 650) are currently engaged in the ADSG of Pedroches. This ADSG collectively manages a common health programme implemented on 83 400 cattle (dairy and meat), 230 000 sheep/goats and 156 000 black Iberian pigs at county level.

Public goods provided by collective action

689. The primary role of ADSGs is to provide services (implementation of common health programmes) to their members aimed at the prevention of diseases in their herds (and also to the breeders themselves because of direct transmission of zoonoses). These services are for members only, i.e. club goods (excludable but non-rival goods).

690. Considering the role of prevention of animal diseases, the main objective of these associations is to minimise economic losses due to animal diseases: decreases in animal production, medical care costs and death of farm animals. However, from a wider perspective, the implementation of common animal health programmes by ADSGs also results in the provision of two pure public goods:

- *Farm animal welfare*. As health programmes implemented aim to prevent diseases in livestock, they enhance farm animal health, thus improving animal welfare.

- *Public health and food safety*. The implementation of health programmes prevents the transmission of zoonoses (infectious diseases transmitted form animals to humans) such as tuberculosis, brucellosis, etc., thereby improving public health.

691. ADSG activities also minimise the impact of livestock farming on the surrounding ecosystems for a number of reasons: i) controlling diseases of farm animals avoids the transmission of illnesses to wild fauna, ii) the health programmes implemented take into account a strict treatment for zoosanitary residues (remaining medicines, used syringes and needles, etc.) that are carefully collected and incinerated to avoid any biological pollution, and iii) veterinarians implementing health programmes also advise stockbreeders with regard to sustainable animal production.

Collective action

692. The first ADSGs were established in the 1980s to cope with the severe outbreaks of classical and African swine fevers (CSF and ASF) that jeopardised pig production in Spain. Their purpose was to create the necessary arrangements among pig breeders in each municipality to implement an active collective collaboration with the National Plan for CSF and ASF Eradication. This initiative was extremely successful allowing the whole of Spanish territory to be declared free of CSF and ASF within a few years. Within the span of two decades, Spain has become the second largest producer of pork in Europe, proving that ensuring adequate animal health conditions can be profitable and competitive.

693. Taking into account the success of this model, ADSGs were legally recognised in 1996 and expanded their activities to other livestock species. As stipulated by law, ADSGs are non-profit associations of stockbreeders with the following objectives.

- To implement prophylaxis programmes established by national plans for animal disease eradication and monitoring. The first are intended to eradicate more dangerous animal diseases such as brucellosis (cattle, sheep/goats), tuberculosis (cattle) and Aujeszky (pigs), while the second are aimed at controlling any new outbreaks of already eradicated diseases. These programmes need to be compulsory applied for all individual breeders. ADSGs allow these producers to fulfil these requirements in a collective way by using common veterinary services.

- To implement a voluntary common sanitary programme beyond the mandatory requirements mentioned above. These programmes usually include vaccinations and other activities improving the general hygienic conditions of farms (e.g. deworming of livestock, disinfestation or/and anti-rodent treatments, etc.), depending on the local breeders' health problems.

- To be alert to any new outbreak of animal diseases (disease surveillance), notifying sanitary authorities of any incidence as soon as possible, and collaborate actively with them in disease control and monitoring.

- To provide general advice to breeder members regarding animal identification and welfare.

694. For this purpose, all ADSGs need to hire a "veterinary in chief" as the person in charge of the correct implementation of the animal health programmes proposed by these associations and approved by sanitary authorities and the notification of any health incident in the livestock district where the association is located.

695. These associations are also required to have their own legal personality (statutes regulating their self-government and internal operation) and to incorporate a minimum share of the breeders and livestock existing in the districts covered. This last requirement has become stricter in recent years and now more than 40% of breeders and aggregated herd in the territory must be included in the ADSG. As a result, in practice only one association currently operates in each territory.

696. Members of ADSGs must pay a quota to finance the animal health services provided. This quota is fixed individually depending on the services required (each treatment has its own internal price to be invoiced periodically to breeders). However, associations are also supported by national and regional public authorities through subsidies that partially cover (around 50%) the animal health programmes implemented. Thus, being a member of an ADSG means that stockbreeders are able to reduce their zoosanitary costs (partially financed by the public budget). This is a key element of the success of ADSGs and explains why the majority of producers have joined. Recent data shows that more than 60% of Spanish breeders and more than 70% of the national herd are covered by these associations.

697. Nine ADSGs were initially established in Pedroches county during the 1990s, each covering one municipality. These associations included most of the livestock breeders operating in their territories (100-250 farmers each) in order to implement both the compulsory and voluntary animal health programmes co-operatively.

698. ADSG experience in animal health enhancement has proven there are economies of scale, with larger associations able to provide their services more efficiently. Based on this evidence, the nine existing ADSGs in Pedroches were integrated into a single association in 2007; the resulting county-level ADSG has become the second largest in Spain and includes 95% of breeders and 98% of livestock located in this area. In order to provide animal health services, this particular association has an annual budget of around EUR 2 million, 50% being covered by fees paid by stockbreeders, and the other 50% is funded by public subsidies. This large budget allows the ADSG to hire, in addition to the veterinary in chief, 40 veterinarians, accounting for 40% of the total budget. Other relevant expenditures include those related to zoosanitary products (40% of the total budget), residue treatment (5%), and bureaucratic activities, including the salary of one general administrator (5%).

699. Regarding subsidies, the amount received from public authorities has significantly decreased over the last three years. This reduction was planned before the ADSGs were recognised by law as key elements of animal health in Spain; these subsidies were considered a transitional instrument to aid the establishment and consolidation of the ADSGs. Thus, once these associations were consolidated and breeders were aware

of the importance of ADSGs as instruments to enhance profitability and competitiveness, plans were made to implement a phasing-out mechanism. However, since 2009 these reductions have been brought forward unexpectedly because of the economic situation (public budget cuts) which jeopardised the viability of less consolidated ADSGs.

Factors affecting collective action

700. The successful collective action of ADSGs is justified for a number of reasons.

- *Economies of scale*. The implementation of animal health programmes exhibits increasing returns-to-scale, resulting in the provision of health services being cheaper the larger the ADSG. This explains why only one ADSG has been established in each territory (natural monopoly) and why municipal ADSGs have integrated into larger county ADSGs. In fact, in the future these associations are also likely to integrate provincial ADSGs.

- *Economies of scope*. These associations are more economically efficient when they deal with different livestock species (joining health programmes for cattle, pigs, etc.) and when providing other additional services (reproduction, feeding, etc.).

- *External financial support*. Although it has been proved that a good sanitary status of the livestock is a key factor for profitability and competitiveness, and that these health requirements can be achieved more efficiently through collective action (ADSGs), there is no doubt that these associations could not have been founded without public support (subsidies). In this sense, subsidies can be considered as an incentive to overcome the initial transaction costs required to launch ADSGs (establishment and consolidation). There is some doubt as to whether these incentives are necessary for ordinary operations.

- *Democratic self-government*. Breeder members of ADSGs attend the Assembly of the association, where the main decisions are taken and the President and the Council members are elected. This democratic and transparent system to guide the operations of the ADSGs is also considered a requisite for strengthening these organisations.

- *Legal capacity*. The existing legal framework requires ADSGs to have a legal personality. This allows them to own any required asset, hire veterinarians and other staff, operate bank accounts, deal with the public administration and other external groups, or undertake any other activities.

- *Institutional arrangement*. The statutes of ADSGs state that breeders who do not collaborate with the accurate implementation of animal health programmes will be sanctioned by the association. Due to the benefit obtained by producers through ADSGs (provision of subsidised club goods), this mechanism is seldom applied.

- *Social capital*. As seen in the case study, the success of ADSGs seems to be positively correlated with previous existing networks of farmers in the district, such as co-operatives. This suggests that social capital plays a relevant role in explaining the establishment and proper operation of these associations.

701. It is worth noting that free-riding is still a problem. Although the share of membership usually reaches high values (95% of breeders in Pedroches), some farmers have not joined these associations for different reasons. In theory, these breeders should fulfil the same animal health requirements as the rest of producers and the public administration should verify their compliance. Nevertheless, in a real setting, public health services do not usually have the capacity to supervise all the activities of such small breeders.

The problem regarding this free-riding behaviour is that the herds kept by these "uncontrolled" breeders are reservoirs of pathogenic agents capable of generating new outbreaks in local farm animals, and thus jeopardise the sanitary status of the whole livestock district.

702. During the last five years, only a few members of the ADSG of Pedroches have dropped out, in most cases because they ceased their farming activity. This indicator shows that breeder members are relatively satisfied with the quality and the cost of the animal health services provided. In this sense, it is worth commenting on other relevant reasons to explain membership:

- *Profitability enhancement*. The main benefit for breeders for joining an ADSG is the reduction in zoosanitary costs because animal health services are more efficiently provided collectively and because these common veterinary services are partially subsidised.

- *Compliance with complex animal health and welfare requirements*. Stockbreeders are advised by the ADSG, which explains how to fulfil all the requirements stipulated by law and provides the adequate services. Thus, breeder members need not fear legal sanctions for breaking any rules.

- *Past experiences of outbreaks*. Although the sanitary status has improved a great deal over the last few decades (see next section), producers still remember the effect of past outbreaks (e.g. ASF in the 1980s, bluetongue disease in the 1990s, etc.), which seriously damaged farming business. Because of this, stockbreeders consider ADSGs to be useful risk mitigation instruments.

Government policy for collective action

703. Although the risk of animal diseases has increased over the last few decades (larger livestock and expansion in international trade of livestock and animal products), public veterinary services in Spain have been reduced, giving instead more responsibility to collective actions implemented by stockbreeders through the ADSGs. In this sense, these associations should be considered institutions that bridge the existing gap between producers and the public administration as they are now in charge of animal health responsibilities and are required to implement compulsory sanitary programmes designed to control animal diseases. Furthermore, ADSGs are also requested to collaborate in order to: i) control the correct identification of livestock; ii) supervise registers required for livestock farms; iii) fulfil legal requirements dealing with animal medical treatment; iv) control livestock movements; and v) provide relevant information to the National Disease Surveillance Network.

704. This explains why these breeders' associations are regulated by law when setting their objectives, functions and the basic rules for their internal operations. Only if these requirements are met are ADSGs recognised by national and regional governments, and thus partially funded. The implementation of all the functions mentioned above allows ADSGs to provide public goods to society as a whole. In this sense, the public subsidies received by ADSGs can be justified as a compensation for costs regarding functions that public administrations have delegated to them.

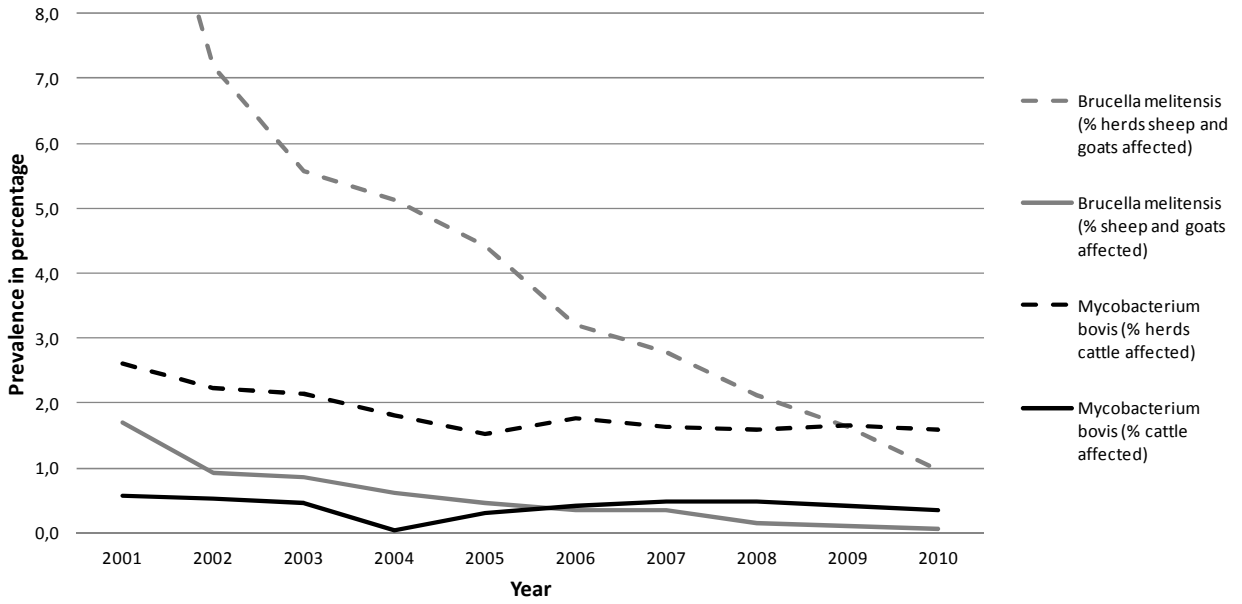
Cost-effectiveness of collective action

705. No specific assessment is available to evaluate the performance of ADSGs, either in Spain or in the particular case of Pedroches. However, some data illustrate the effectiveness of these associations in the provision of public goods.

706. Data regarding the prevalence of animal diseases can be considered as a good proxy of the effectiveness of ADSGs. As examples of relevant epizooties in Spain and Pedroches county, we can focus

on the cases of brucellosis in sheep and goats (caused by *Brucela melitensis*), and tuberculosis in cattle (caused by *Mycobaterium bovis*). The evolution of these animal diseases is seen in Figure 15.1. As can be observed, the prevalence of these diseases has markedly decreased over the last decade, both in terms of the percentage of herds and the percentage of heads affected. This implies a relevant improvement in animal welfare. However, no single figure can be taken as an estimation of the value for the enhanced provision of this public good.

Figure 15.1. Prevalence of representative farm animal diseases in Spain (2001-10)



Source: EFSA (2011).

707. These two animal diseases are also relevant for public health as they are zoonoses. Thus, there is a high level of correlation between the prevalence of these diseases in farm animals and humans. This correlation is confirmed by current official data (EFSA, 2011) regarding their prevalence in Spain and which also shows a decreasing trend in humans over the last decade. This improvement in public health also contributes to increasing social wellbeing (provision of public goods), which could be evaluated by implementing sophisticated valuation methods (Hammitt and Haninger, 2007), considering the costs due to workers being dismissed because of illness, medical treatment and even to death caused by zoonoses. However, no single estimate can be provided for the Spanish case in this sense.

15.3. Concluding remarks

708. The two Spanish case studies constitute successful experiences of collective action providing public goods and minimising negative environmental externalities. In the first case (Community of Irrigators of the BMD), the collective management of common irrigation infrastructures and water endowment permits the maintenance of irrigation facilities and rational water use, and minimises the negative environmental externalities regarding water quantity (minimisation of water withdrawals) and quality (minimising run-offs and diffuse pollution). In the case of the ADSG of Pedroches county, the implementation of collective animal health programmes provides two public goods: animal welfare (prevention of diseases in livestock), and public health and food safety (prevention of zoonoses).

709. Both cases of collective action have common features that can be considered as key factors to explain the provision of public goods.

- *Joint production*. The provision of public goods (or minimisation of negative environmental externalities) is the result of joint production. Both agricultural systems studied are good examples of multifunctional activities where commodities (irrigated crops and livestock) and non-commodities (public goods) are jointly produced. The main driver of the collective actions performed by farmers is self-interest (improvement of income from commodity production). For these producers, public goods are merely "secondary" outputs.
- *Evidence of the benefits of collective action for individual farmers*. The main benefit for farmers of the collective actions implemented is profitability enhancement. Furthermore, farmer membership allows them to: i) comply with complex administrative requirements; ii) minimise possible business risks; and iii) improve farmer wellbeing.
- *Economies of scale*. The management of irrigation water and the implementation of animal health programmes exhibit increasing returns-to-scale, thereby justifying collective action (*vis-a-vis* individual action) and explaining the large size of both associations.
- *Democratic self-government*. Members of CRs and ADSGs attend the Assembly of their associations, where the main decisions are taken and the President and Council members are elected following democratic and transparent rules.
- *Institutional arrangement*. CRs and ADSGs have their own statutes allowing them to enforce rules, monitor farmers' performance, and sanction inadequate behaviour. The roles of both kinds of associations are legally recognised and supported by public authorities. This transparent self-control system minimises conflicts and solves existing ones more easily.
- *Social capital*. The success of collective action is positively correlated with other existing networks of farmers in the district, such as co-operatives. This suggests that social capital plays a relevant role in explaining the provision of public goods.
- *External financial support*. Public subsidies are an indispensable incentive in overcoming the initial transaction costs required to launch collective action (investment in irrigation facilities, and establishment and consolidation of ADSGs). There is doubt over whether these incentives are also required for ordinary operations.

710. Although it has been proved that modernised irrigation facilities or a good sanitary status of livestock are key issues for farming profitability, and that these goals can be more efficiently achieved by collective action, the success of these cases would not have been possible without public financial support. In this sense, the role of the governmental has been crucial in designing economic incentives aimed to achieve win-win outcomes (both farmers and society as a whole benefit). Taking into account the double-dividend generated by the collective actions performed by CRs and ADSGs, Spanish national and regional governments have co-ordinated specific policies to partially fund (around 50%) the renewal of old irrigation infrastructures and the implementation of animal health programmes. In general terms, these public support programmes have been conceived as cost-sharing strategies to overcome the fact that irrigators and breeders cannot afford to implement such collective actions on their own, thus ensuring the provision of non-commodity outputs from both multifunctional agricultural systems (minimisation of market failures). Thus, public subsidies received by CRs and ADSGs can be justified as a compensation of costs regarding the actual provision of public goods/minimisation of negative externalities provided through collective action.

711. The success of collective action has shown that the Spanish policies implemented have been effective, although further research is required to confirm that the amount of subsidies granted make them efficient. This would require a complete assessment of benefits and costs (cost-effectiveness analysis) related to the provision of public goods, which is beyond the scope of this report.

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16. THE SWEDISH CASE STUDY: SÖNE MAD GRAZING ASSOCIATION[81]

712. Most production decisions in agriculture are taken at firm level. However, there are sometimes good reasons for collective action, such as cost savings due to economies of scale and synergies in production. The incentive for collective action is strong enough to lead to co-operation, even though the co-operation itself entails costs. In some situations there might be a need for policy measures to overcome these costs. To date, however, most agricultural policy measures in Sweden are directed at individual firms which *may* lead to less co-operation than desired. Thus in order to stimulate collective action, it is important to understand which factors promote and prevent collective action.

713. The aim of this case study is to illustrate which factors may be important as explanations to collective action. The study chose a case in the western part of Sweden where a group of farmers act collectively through a grazing association. Even though the case has similarities with the "tragedy of the commons" by Hardin (1968), there are important differences. For example, while the grazing possibilities and the production of animal fodder were valuable in Hardin's example, in the case described here, the main production are those of an open landscape, recreational possibilities and biodiversity. These goods are non-rival, hence there are no incentives for anyone to consume them exclusively or prevent others from consuming them. Instead, due to the low quality of the fodder, it is costly to graze the land. If subsidies had not been paid to maintain sufficient grazing pressure, it would not be profitable for farmers to graze on wet meadows such as Söne Mad.

16.1 Case study area: Söne Mad[82]

714. The Söne Mad ("Mad" means wet meadow in Swedish) is a grazing area located near Lake Vänern, the biggest lake in Sweden. There is no exact natural demarcation of the area, but it is estimated to be between 160 and 200 hectares. The wet meadow is a type of land that cannot be cultivated. This, together with recurrent flooding and grazing, contributes to the high nature values of the area. Semi-natural grazing lands are among the richest in biodiversity in Sweden, and in order to preserve the biodiversity they must be continuously grazed by a sufficient number of animals. Too few grazing animals will lead to an increase of bushes, and eventually trees, with a loss of biodiversity and the species that are typical to it.

715. In the past, the land was used collectively as a common grazing land and for haymaking. Ownership was formally privatised during the 18th and 19th centuries, but it was nevertheless grazed collectively until the mid of 20th century. Up to then, many farmers who owned small parts of the area had animals, and using the Söne Mad for grazing was a profitable part of an economically rational farming system. Gradually the number of farmers with grazing animals decreased as it became more profitable to let the animal graze on arable land where, for example, fertilisers contributed to a higher yield. After World War II, the land was leased and used by the Swedish Air Force. When the Air Force left the area in 1995, the former open land was overgrown and covered with bushes. It had lost its openness and part of the

81. This case study was prepared by Fredrik Holstein of the AgriFoods Economics Centre, Department of Economics, Swedish University of Agricultural Sciences

82. This section is based on Wästfelt et al. (Forthcoming) and on personal communications (2012) with members in the association.

biodiversity. From a national perspective, the loss of biodiversity was regarded as a problem. For the local inhabitants, the landscape was considered ugly.

716. In the late 1980s, there were arguments to resume grazing in this area. As mentioned, it was regarded as ugly and had lost historical continuity, although some farmers continued with meat production. Subsidies for biodiversity and cultural heritage values were introduced and there was a possibility to use them for Söne Mad. Thus three factors made it interesting to resume grazing: a common interest in restoring the former qualities of the area, the presence of some farmers with meat production, and the possibility to obtain subsidies. However, as the land was divided between more than 30 landowners, of which six had their own livestock, establishing so many individual contracts was not necessarily a good thing.

16.2. Collective action: Söne Mad Grazing Association[83]

717. The solution was to form an association, the Söne Mad Grazing Association. Its aim was to "*guarantee that the area in a natural way is maintained through grazing so that overgrowth is prevented*". The association establishes agreements with the landowners and then makes the land available for grazing to its members.

718. The association revenues are based mainly on subsidies paid if the area is sufficiently grazed. The landowners receive a symbolic compensation (SEK 25 = EUR 3) per year. In addition, the statutes of the association stipulate that an eventual positive financial result should be distributed so that landowners as a group receive at least 10% of the net income. The board of the association decides how the sum should be divided. Typically, each landowner receives a share that is differentiated by three types of sizes: small, medium, and large. This means that the sum is not linearly related to the size of the holding. For example, a landowner with 0.5 ha receives the same payment as a landowner with 4.5 ha (both classified as "small"). About 90% of the association's net revenue is then paid as compensation to the owners of the grazing animals. Each animal owner receives payment in relation to his share of number of grazing days. If the grazing pressure becomes too high, according to the statutes the board must restrict the number of animals allowed to graze. This should be done in relation to each owner's share of the land. So far, no such restrictions have been necessary and to date, the authorities responsible for the supervision have not had any complaints regarding a grazing pressure that is considered too high.

719. Today there are 28 landowners who have contracts with the association, with twelve of these landowners members of the association. Three farmers own the majority of about 200 cows and calves that graze the area. One elderly farmer owns a couple of animals. Since it is a local association, many of the members, as well as other landowners, know each other. Two of the livestock farmers are relatives.

720. The operating costs of the association relate mainly to fencing and minor administrative costs. The fencing costs are borne by the animal owners. They pay for materials and do not charge the association. There are no formal arrangements around this cost sharing, and to date animal owners have amicably resolved problems of sharing costs.

721. The application for subsidies is made by a consultant who is paid by the association. The remaining administrative work has been done primarily on a voluntary basis by the chairman of the association.

83. This section is based on Wästfelt et al. (Forthcoming) and on Personal communication (2012) with members of the association.

16.3. Goods and services provided by collective action

722. Institutional solutions will depend on the kind of good that is managed. For example, while a rival and exclusive good is typically handled efficiently by markets, goods characterised by non-rivalry and non-exclusiveness are typically not. What kind of goods and services are involved in the maintenance of Söne Mad? What are their characteristics? What are the potential consequences for the production and for the use of resources? Should one expect over-exploitation or insufficient production of any goods / services?

Grazing: common pool resource

723. One obvious outcome is grazing, i.e. the fodder during the summertime is beneficial for farmers who have cattle. It should be noted that this service, to feed the animals, is of limited value in this area as the fodder is of lower quality compared to pastures on arable land where, for example, fertilisers can be used to increase both the quality and quantity. Indeed, cows grazing in this area lose weight over the summer period, approximately as much as the calves gain, because the quality of the fodder is not sufficient to add any weight, which would have been desirable for profitable meat production.

724. Fodder is also characterised by rivalry in consumption. Within the group, consumption is characterised by non-exclusiveness although non-members can be excluded from grazing. It should be noted that the land is privately owned, which means that there could have been a situation of rivalry and perfect excludability if the private owners had not voluntarily refrained from that right and instead opt for collective action within the association. In the situation where the Grazing Association has the private landowners for the right to grazing, the grazing possibilities can be described as a common pool resource.

725. Resources with the characteristics of common pool resources run the risk of overexploitation. In general, the core problem is that individual users have the possibility to act in a way that increases their own income but imposes part of the costs on others. The production of grass/fodder is dependent on the grazing pressure, i.e. if the land is overgrazed, production would decrease. However, the statutes of the association allow the board to exclude grazing animals if the pressure becomes too high. Moreover, since private benefits from increasing the number of animals is more or less non-existent, there has been no real incentive to over-graze.

Landscape and related services: pure public goods

726. The main output of Söne Mad is the production of a landscape characterised by its openness, beauty and rich biodiversity. The consumption of these services is to a great extent characterised by non-rivalry and non-exclusiveness (pure public goods). Even though the landowners appreciate these goods/services, the "consumers" are likely to be found among a much wider group. This includes, for example, people in the vicinity who use the area for recreation as well as people, possibly in other parts of Sweden, who may ascribe the biodiversity as an indirect use value or an existence value. The grazed landscape can be enjoyed by anyone due to the Swedish right of public access. This means that owners of arable land and forestland in Sweden do not have the right to exclude anyone from visiting the land nor using it for recreation, i.e. these services are, by an institutional arrangement in Sweden, non-exclusive.

727. Because of the characteristics of pure public goods, even if landscape and related services are highly valued by the public, a market solution is not probable. Since non-exclusiveness makes it hard to collect any payment from the public, production costs would probably not be covered by a market solution. So, the central problem is not those eventually related to co-operation in a collective action, but rather that the willingness of consumers to pay cannot be transformed into actual payments as long as non-

exclusiveness is in force. The landscape related services are thus positive externalities and the landowners, as a group, do not have any incentives to produce these external benefits.

728. However, the same landscape services are also enjoyed by the landowners themselves. This means that part of the landscape-related values are not external benefits, but rather internal benefits. The landowners, as a group, do have an incentive to take these values into consideration. This is explicitly stated in the statutes of the association which the landowners respect. Nevertheless, although the landscape-related values might be positive for the members of the association, it is just a small part of the total landscape related values.

729. Thus, the sum of the value of the fodder and the value that the landowners ascribe to the landscape services is not high enough to cover the costs of their provision. Moreover, the external benefits cannot be transformed to any income through any market mechanism. However, there is a policy measurement, an environmental subsidy, which offers a payment for the production of landscape related services. Adding this to the other incomes has so far given the association sufficient benefits to cover the costs.

Association's earnings shared by the animal owners: common pool resource

730. The income of the association is the environmental subsidy that is paid for the grazing of the land. The subsidy is paid per hectare and subjected to a sufficiently high grazing pressure. Inspections by the authorities verify that the vegetation is of the kind that characterises wet meadows, i.e. the payment that the association receives is not directly related to the number of grazing animals. Indirectly, however, the grazing pressure and therefore the number of cattle have to be at a sufficiently high level to favour and preserve the characteristic flora and fulfil the requirements to receive the subsidy.

731. Once the subsidies have been received, the common costs paid, and the landowners have received their payments, the remaining sum constitutes the association's earnings which are distributed among the owners of grazing animals. This "resource" does in fact have the characteristic of a common. It is characterised by rivalry since more payment to one landowner means less to the others. It is exclusive in relation to others outside of the association. Finally, there are elements of non-exclusiveness among the members. The money that is to be distributed among the owners of grazing animals is distributed based on how many grazing days (number of animals * number of days) that each member has contributed in relation to the total number of grazing days. Hence, by increasing one's own number of grazing days, the individual farmer may affect the allocation so that he receives more, and the others less, of the economic outcome.

732. Accordingly, there are some incentives involved that seem to point to problems similar to the "tragedy of the commons". So far, problems of this kind have not emerged and the question arises why this is so. The board of the association has the possibility to restrict the number of animals if the grazing pressure becomes too high, although this has never been done. Still, this institutional arrangement would not impede a farmer from increasing the number of animals as long as the total grazing pressure does not become too high.

16.4. Factors affecting collective action

733. In the previous section it was concluded that three kinds of amenities are realised by grazing and have a potential value for the landowners. First, the fodder for the grazing animals has, theoretically, the characteristics that make overexploitation a substantial risk if managed as a common good. Second, the landscape-related services enjoyed by the landowners are to a great extent characterised by non-rivalry and non-exclusiveness, which means there are incentives for an individual to behave in a way that disfavours

the final outcome. Finally, there is the monetary income of environmental subsidies (which can be thought of as a compensation for the positive externalities). One may suspect that a collective action may fail because individuals pursue their own benefits. In this case, however, there is a collective solution that works. What factors promote collective action? Which factors work against a collective solution?

734. The factors affecting the occurrence of collective action can be classified into four groups: 1) the characteristics of resources; 2) the nature of groups that depend on resources; 3) the particulars of institutional regimes through which resources are managed; and 4) the nature of the relationship between a group and external forces and authorities (Agrawal, 2001). Based on this classification, Table 16.1 summarises the key factors that have enabled collective action by the Söne Mad Grazing Association to be successful.

Table 16.1. Factors affecting collective action (Swedish case)

1) Resource system characteristics	**2) Group characteristics**
• Variability in the quality of the resource • Common boundaries of the resource: fences • Value of public goods shared by a group	• Small group size • Social capital • Tolerance / non-rigidity
3) Institutional arrangement	**4) External environment**
• Local institution for collective action and transaction costs • Simple rules	• Environmental subsidies

Resource system characteristics

Variability in the quality of the resource

735. The different parts of the wet meadow produce different amounts and qualities of fodder. Depending on the weather conditions that vary from year to year, different parts produce better fodder some years and poorer fodder other years. By including different parcels with different qualities in the same pasture, at least some of the variability can be offset. The potential of decreasing the variability, and hence the risk of really poor grazing conditions, is a factor that speaks for a co-operative solution.

Common boundaries of the resource: fences

736. In order to make fodder available for grazing, land resources need fences. Without fences, the land has no value as grazing land. The amount of necessary fences, and hence the costs, varies considerably if each private parcel is fenced separately or if all parcels are fenced into a single pasture. Moreover, there are clearly economies of scale in fencing: the length of fence per hectare decreases with the size of the fenced area. This is once again a factor that favours co-operation.

737. A fence is characterised by non-rivalry and, in practice, by non-exclusiveness. Once a farmer has permission to graze the land, he cannot be excluded from the benefit of the fence. Hence, this resource is a potential free-rider problem. At the same time, since fences are non-rival, there is no extra cost imposed when an extra farmer is allowed to use the benefit of the fence. Hence, excluding someone would mean that potential benefits would not be realised. That is, excluding others would imply an opportunity cost and a loss in welfare. In order to handle this problem, there is a need for formal and/or informal institutions/rules about how the costs for fencing are shared among members. Lack of such institutions impedes co-operation. The Söne Mad Grazing Association has, so far, overcome this potential problem.

Value of public goods shared by a group

738. Landscape services (e.g. the openness), which landowners appreciate, are non-rival and non-exclusive. Hence, it is less probable that these values would be maintained for private use by the private parcels. In an individual solution, a large part of these values would be positive externalities without a positive value to the individual decision maker. However, for the association, these positive values are internal because of the objective of the association, and thus more likely to affect the decision to graze or not. This is a factor that does have a positive influence on collective action. However, because of, for example, the problems of sharing costs and incomes in an association, it is not a sufficient factor by itself to promote collective action by itself.

Group characteristics

739. Co-operation always involves, more or less, incentives to free-ride and to extract more than a fair share of what is produced by the group. At the same time, there is always the risk that co-operation fails so that the individual loses the positive outcome that a working co-operation would have produced. Several factors affect whether co-operation will succeed; one of them is the characteristics of the group.

Small group size

740. The number of landowners is, in this case, relatively few. This means that social control can work more easily. The contribution required from most landowners is no more than signing the contract that allows the association to rent the land. Since the opportunity cost is low or absent, there are, in most cases, no incentives to abstain from participation. In addition, it is simple for the others to control who does or does not participate.

741. There are few members who have grazing animals. These members receive a greater part of the net income from the association at the same time as the association requires a greater contribution from them than from members without cattle. The former are collectively responsible for maintaining the fences. This means they are paying for material and do the practical work. Hence, these individuals have more incentives to act in a way that favour themselves but potentially disfavours the collective; for example, you will have the benefits of the fence even if you leave much of the work to the others. These incentives are, however, balanced by the fact that this sub-group is even smaller (three or four farmers), a fact that facilitates social control.

Social capital

742. Söne Mad is characterised by the considerable presence of social capital. Collective action in this area has always been prevalent. Local people consider that "helping each other is the way to act." If something positive is to happen, you have to act instead of waiting for something to happen. One factor behind this attitude may be that many people are used to contributing to the public interest; they contribute to associations, such as local football clubs, without considering the precise outcome for themselves.

Tolerance / non-rigidity

743. Another factor closely related to the social capital that facilitates co-operation is the culture of tolerance and non-rigidity. Without this, there would have been a risk that individuals became disappointed if others did not contribute as much could be expected. Even though fairness is important it may become an obstacle if interpreted with rigidity. People have expressed the opinion that "*you know that some individuals never do as much as they should, but you feel much better if you choose not to care*".

Institutional arrangements

744. Some characteristics of the resources and amenities involve incentives that both favour and disfavour collective action. Some of the problems of collective action are mitigated by group characteristics, such as a small group and a culture of helpfulness. However, these factors are probably not sufficient; there are also institutional arrangements that contribute to the success.

Local institution for collective action and transaction costs

745. The main institutional arrangement is the presence of the association itself. The association has made it possible to design contracts between each landowner and *one* party, i.e. the association. This is, according to members, a central factor to explain the success. "*Without the association, it would have been impossible to maintain the Söne Mad as a wet meadow*". The alternative solution, with individual contracts between each owner of cattle and a number of landowners, would have implied significantly higher transaction costs. The effect of the association is thus to decrease the transaction costs of contracts. Hence, this factor promotes collective action.

746. Even if total transaction costs are lower, the operation of an association always involves other specific transaction costs that someone has to bear, for example administrating the association. Hence, even if overall costs are lower, an uneven distribution of these costs may imply that co-operation fails. This problem has been handled in two ways by the association. First, some of these costs have been borne by individuals that have sufficiently much to win and at the same time do not care too much about a slightly uneven distribution. An example is the chairman of the association who, up to now, has worked on a voluntary basis. Second, performances of other tasks, such as applying for environmental subsidies, have been undertaken by consultants. This means that this cost, which is necessary to receive the subsidy, is distributed among members in relation to their share of the association's profit.

Simple rules

747. The institutional arrangement also includes the statutes, i.e. the rules of the association. A characteristic feature of these rules is their simplicity even if this entails that the distribution of the net income is not perfectly fair. One may speculate that a positive effect of these simple rules is that it helps maintain the culture of "non-rigidity." The more obvious positive effect of simple rules is that it holds back administrative costs partly because they are easier to implement, but also because they do not promote potentially endless discussions on how details should be interpreted and implemented.

External environment

Environmental subsidies

748. As compensation for the landscape-related services produced (biodiversity, openness, etc.), environmental subsidies are paid if the land is sufficiently grazed. Grazing pressure that is too low means that the biodiversity the authorities want to maintain is not promoted and the association will not receive the subsidy. As the fodder quality is not very high, the environmental subsidies are the main income from the pasture. It is also the only income of the association itself. Hence, the environmental subsidies are crucial for the maintenance of the grazed landscape. Without the subsidies, the incentives for grazing, and thus for the association itself, would be too small to motivate appropriate actions. It should be noted, however, that the subsidies are not paid because of the collective action, but in relation to the hectares that is grazed and the same amount would have been paid to an individual farmer producing the same amount of wet meadows. The subsidy is thus a factor promoting grazing, but not necessarily for collective action.

749. Hence, the subsidy does not give a specific incentive for or against collective action. However, it does produce transaction costs, i.e. administrative costs to apply. These costs increase with the number of applications rather than with the area. Hence, there are economies of scale for the collective solution compared to the individual one, which in turn indicates that the subsidy, as long as it is paid to the association, indirectly promotes collective action.

16.5. Government policy for collective action

750. In the Söne Mad case, there is at present no specific government policy promoting *collective* action. However, through the Rural Development Program, i.e. the Second Pillar of CAP, agri-environmental subsidies can be paid to promote biodiversity and cultural heritage values in grazing land (Regeringskansliet, 2010). The subsidy is paid to individual farmers or to others who manages the land. So even though the payments are paid to individual farmers in most cases, in this one it is paid to the Söne Mad Grazing association.

751. In order to receive the subsidy, certain criteria need to be met. First, there are a number of general requirements: no harmful accumulation of litter is allowed; eventual vegetation that is not grazed shall be cut; any overgrowth should be prevented; and no use of biocides or fertilisers is allowed. Second, for each area, the authorities formulate a management plan that the beneficiary (e.g. the Söne Mad Grazing Association) must follow for a period of five years. During these years, the same area must be managed in accordance with the management plan and the general conditions, i.e. there are no barriers for organisations to be beneficiaries of the programme.

752. Today, in Sweden, about 500 000 hectares of semi-natural grazing lands fulfil the requirements and are managed to preserve biodiversity. In general, the level of the subsidy is based on the increased costs associated with these requirements (Regeringskansliet, 2010).

753. This case study shows that even if there are no specific policy measures to promote collective action, this can be fostered where suitable by general agri-environmental policies. In general, policies should not prevent collective action from being organised, for example by excluding groups from being beneficiaries of general governmental support.

16.6 Conclusions

754. The Söne Mad Grazing association is an example of a successful collective action. They produce "public goods", i.e. landscape and other associated services such as biodiversity and recreational possibilities that are characterised by non-rivalry and non-exclusiveness. Since these amenities are mainly positive externalities, i.e. the main part of the values realised by grazing is utilised by non-association members, the co-operation itself does *not* solve any market failure.

755. The landowners are indeed among those who appreciate the landscape maintained through grazing. In the statutes of the association, it is explicitly stated that the aim is to create and maintain such landscapes. Nevertheless, the value that the members ascribe to this landscape is not sufficiently high to cover the costs of provision and maintenance. Environmental subsidies, however, makes it possible to graze the area even if the quality of the fodder is so low that the production of meat is hardly profitable.

756. The main factor promoting collective action in this case is lower costs. Economies of scale by collective action lead to lower costs for fencing, when applying for environmental subsidies, and for the daily inspection of animals. Thus, there is potential for co-operation as long as increased net income can be distributed in such a way that everyone is sufficiently well off.

757. The incentives for behaviour which do not favour collective action are relatively small in Söne Mad case. All parties have a common interest to restore and maintain a grazed landscape that is appreciated by all. The opportunity costs are very low since there is, in practice, no alternative use for the land by the individual owner. Since the value of the fodder for meat production is low, there are in practice no incentives for the owners of cattle to overgraze the area. These owners have a greater responsibility to contribute to the fencing of the area. The free-riding incentives involved are not a problem partly because of attitude but also of the small group size.

758. The institutional arrangement, including simple rules on how to distribute net income, keeps administrative costs low. The landowners receive a small share of the profits. Together with the improved landscape, this is sufficient to compensate for the low opportunity costs. The owners of grazing animals share the greater part of the net income. This is necessary since they bear the costs of keeping grazing animals (that would have produced more meat by grazing on arable land) and of fencing.

759. The combination of: i) a production where no great profits can be made; ii) institutional arrangements including the role of association which overlooks the common interests of its members, and the application of simple and sufficiently fair rules for the distribution of incomes and costs, and iii) a culture characterised by helpfulness and non-rigidity has made the Söne Mad Grazing Association an example of a successful collective action. Moreover, although general agri-environmental subsidies are paid, this case works without any policy measures specifically directed towards co-operation.

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17. THE UNITED KINGDOM CASE STUDY: PAYMENTS FOR ECOSYSTEM SERVICES (PES) AND COLLECTIVE ACTION - UPSTREAM THINKING IN THE SOUTH WEST OF ENGLAND[84]

760. Over abstraction of water and its pollution, and thus the protection of water resources in terms of quantity and quality, are linked and sustained problems that require new solutions. They are dynamic challenges that evolve over time as both outcomes and society's preferences are driven by economic development and by environmental and social change. An innovative and relatively underdeveloped policy mechanism to address these issues is provided by Payments for Ecosystems Services (PES) schemes. PES schemes are an example of a new and more direct conservation paradigm that explicitly recognises the need to align the interests of landowners and other groups in society that benefit from environmental public goods. PES schemes are based on voluntary transactions in which a defined environmental service (often a land use providing this service) is paid for by one or more service buyer(s) from one of more service provider(s), with commitment to continuous provision of that service. PES develops mechanisms to capture environmental externalities and bring them into the marketplace, based on the principles that the beneficiaries of environmental services pay for their provision and the providers are paid for this. This can provide a mechanism to parallel the regulatory "polluter pays" mechanism with a complementary and voluntary "provider is paid" mechanism.

761. Arguably collective action is not an essential requirement for PES in so far as a PES arrangement could involve a one-to-one transaction between two independent actors; for example, an upstream landowner and a downstream water user such as a factory. A key premise that emerges from this case, however, is that the development and implementation of a PES scheme for water resource protection requires collective action in the form of networks, partnership working and creative knowledge exchange. Social capital and trust between the parties involved, and particularly on the part of an intermediary, can be expected to reduce transaction costs, help resolve conflicts and enhance sustainability.

762. Issues also arise in relation to the need for coordinated and collective engagement by landowners in order that the scheme may gain critical mass for impact. Land management interventions that are coherently targeted and planned will achieve greater impact for water resource protection than measures implemented in a scattered and ad hoc fashion. There is also the need for collective compliance by farmers with baseline regulation so as to achieve "additionality" in response to PES incentives, and to avoid concerns about equity that can arise if PES payments are seen to "reward polluters" whilst neglecting producers already demonstrating best practice. Regulation is difficult and costly in rural areas, and collective action by farmers that encourages peer-to-peer advice and monitoring can also be cost effective. Finally, although a PES scheme should in principle seek to achieve efficiency by matching payments to the specific opportunity cost of ecosystem service provision for each landowner, there is the possibility that a PES "buyer" could exercise monopsony market power in a given location. Thus there may also be scope for collective action in the form of collective bargaining by land managers to counter this.

763. It should be noted that a broad conception of PES is relevant to this case study. Narrow definitions of PES focus on periodic payments for income foregone, ideally matched to the opportunity

84. This case study was prepared by Laurence E.D. Smith, Centre for Development, Environment and Policy, SOAS, University of London.

cost of the ecosystem service provided, and conditional on defined ecosystem service delivery (Wunder, 2005; Engel et al., 2008). However, contemporary interest and policy guidance in the United Kingdom and elsewhere is adopting a broader scope as evidenced by reports and case studies centred on commonalities of financial incentives for land managers for investment in farm infrastructure and improved practice (e.g. URS-Scott Wilson, 2011). Most PES schemes fail to comply with a narrow definition (Salzman, 2009; Muradian et al., 2010). Prior establishment of a causal relationship between intervention and ecosystem enhancement is often lacking, and few schemes demonstrate conditionality for payment. Thus in practice most payments are based on farm infrastructure improvements and adoption of practices rather than ecosystem service outputs.

764. This case study examines a specific case in the United Kingdom: the "Upstream Thinking Project" of South West Water and the Westcountry Rivers Trust. It discusses the relationship between PES and collective action in identifying key factors for successful collective action for the provision of agri-environmental public goods. The structure of this chapter is as follows: Section 17.1 provides background information for the case study and its location; Section 17.2 summarises the challenges of water resources protection and contextualizes the need for collective action to manage non-point source water pollution and to provide related public goods; Section 17.3 provides a framework for understanding the roles of PES and collective action within a hierarchy of policy approaches for protecting water quality; Section 17.4 examines the lessons from the case study and identifies key factors for collective action; and finally Section 17.5 discusses the relevant policy issues.

17.1. Brief description of the case

765. In the rural areas of the South West of England intensive livestock and dairy farms can be a major source of diffuse water pollution in the form of sediment, nutrients and faecal organisms. The "Upstream Thinking Project" is a new approach to improving raw water resources in the UK context. The aim of the project is to improve raw water quality and manage the quantity of water at source through improved land management, long before it reaches the water treatment works that provide public water supply.

766. Currently the water industry tends to rely on costly energy and chemicals to treat poor quality raw water. Improving land management reduces surface run-off and water pollution, and thus the amount of resources needed to treat water to safe drinking water standards. Using fewer resources in terms of chemicals, energy and emissions reduces detrimental environmental impact, whilst the associated reduction in costs could help to reduce future increases in water bills for water consumers. It is anticipated that the project can delay, or even avoid, the need for investment to upgrade water treatment works in the short and medium-term future. Thus there is the potential to contribute to both the economic and environmental sustainability of the water industry in South West England. There are also multiple additional benefits extending beyond regulatory compliance with drinking water standards. These include increasing biodiversity, contributing to Water Framework Directive compliance, improving carbon sequestration and reducing the risk of flooding. The project represents genuine innovation by the privatised water industry and a departure from strict economic regulation by the government's industry regulating body, which has for the first time allowed capital investment by a water company on third-party land (the regulator is known as "Ofwat" or the Water Services Regulation Authority and is a non-ministerial government department established in 1989 when the water and sewerage industry in England and Wales was privatised). The project has achieved national recognition as a model to be replicated and has gained several industry awards (Box 17.1).

Box 17.1. Recognition and awards of the "Upstream Thinking Project"

"Upstream Thinking" was commended in Defra's Water White Paper last year and won the 2012 Partnership Initiative of the Year award at the Water Industry Achievement Awards.

"Upstream Thinking", South West Water's flagship environmental programme has been recognised for leading the way in business sustainability. The innovative project to restore wetlands and promote environmentally sensitive farming won the large business award at the Finance for the Future Awards on Tuesday, 19 June 2012 in London.

The project is delivered in partnership with a range of organisations including the Westcountry Rivers Trust, Dartmoor National Park Authority, Exmoor National Park Authority, Devon Wildlife Trust, Cornwall Wildlife Trust and the Environment Agency.

767. The project was co-developed by a private water supply company, South West Water, who as beneficiary and buyer of ecosystem services recognised the economic, ecological and regulatory benefit of improved raw water quality, and an environmental charity that as intermediary had knowledge of the catchment-wide actions that could be provided by farmers to improve water quality. Payments are based on action through investment in improved farm infrastructure and agricultural practice. Longevity of agreements and commitment by farmers are ensured through a ten or twenty-five year contract (based on the economic life of farmer infrastructure improvements) and restrictive covenants that specify conditions for improved farm infrastructure usage and specific land management practices.

768. The Westcountry Rivers Trust (WRT) is an environmental charity in South West England whose mission is to preserve, protect and improve watercourses and to educate the public in their management (West Country Rivers Trust, 2012). WRT's approach to project delivery depends upon a collaborative approach which sees landowners informed and assisted in the protection of river catchments as part of an integrated approach to good land management. Tailored one-to-one advice and farm plans that focus on both the environment and the objectives of the farm business are supported by a capital grant scheme. These elements of the project to be delivered by WRT represent an investment of approximately GBP 3.25 million over three years across four target catchments in South West England: the Upper Tamar, Roadford reservoir, Upper Fowey and Wimbleball. There are also parallel initiatives funded by South West Water and delivered with other partners which focus on the restoration of wetted peat moorlands in upland areas of the catchments concerned and restoration of floodplain wetlands.

17.2. The challenges of water resources protection and the need for collective action to provide public goods

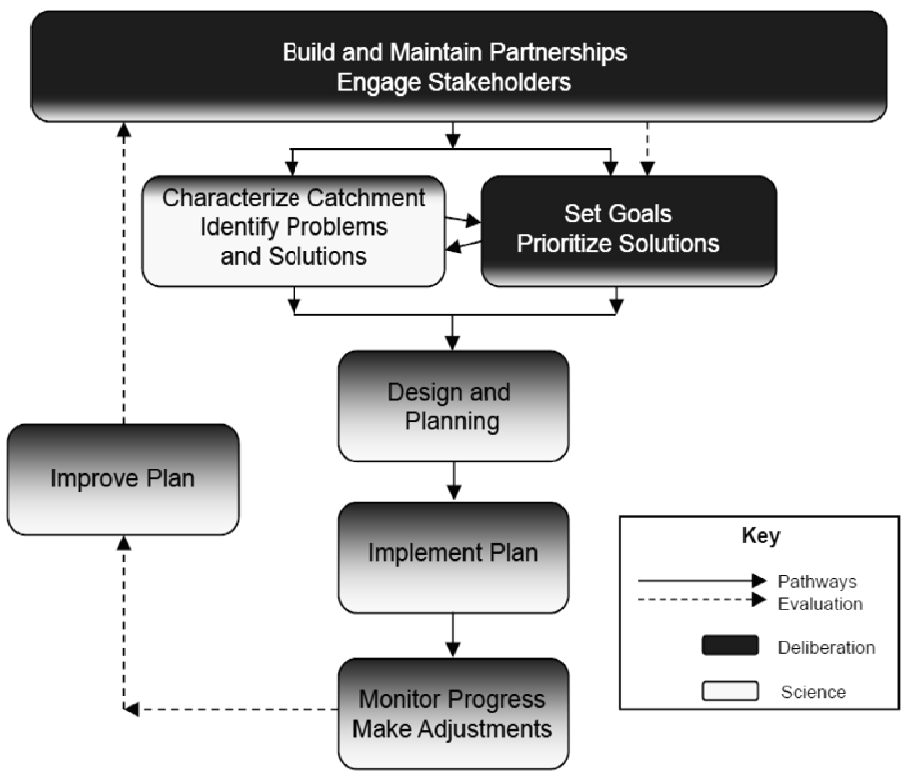
769. The need to protect water resources is a current priority and a challenge that becomes more pressing if climate change increases the variability of precipitation and the incidence of extreme droughts or rainfall events. For a given climate and location the quantity and quality of ground and surface waters are mainly determined by land uses. Thus the rural economy and land use options frame the alternatives for protection of water at its source and for adaptation to environmental and socio-economic change. This complexity frames this case study which focuses on water quality whilst recognising that measures to improve water quality also offer benefits in conserving water supplies and mitigating flood risk.

770. Subject to prevailing financial constraints and political/policy priorities, point sources of water pollution are generally amenable to solutions based on regulation, technology and investment. For example, for factories and sewage treatment works discharges to natural water bodies can be identified, monitored and regulated, and control or mitigation technologies can be installed. In contrast non-point sources of water contamination include diffuse pollution such as sheet run-off in fields or seepage of nutrients into groundwater, and multiple minor point sources such as farmyard drains and surface drains in

urban and rural areas. Such diffuse sources may be negligible individually but can have significant aggregate impact upon water quality at sub-catchment or river basin scale.

771. Diffuse pollution will be high cost to control through monitoring and regulation alone (Smith and Porter, 2010). Polluters are numerous, dispersed and often remote, and may not be fully aware of the consequences of their actions. There are multiple pathways to receiving water bodies which can be difficult to trace, and pollution events are unevenly distributed both spatially and temporally. Markets for agricultural commodities will not internalize water pollution externalities and signal their value to producers or consumers. This market failure is a difficult policy challenge and one that justifies intervention by government or community to achieve more socially optimal outcomes. In turn such an intervention will require collective action to achieve effectiveness, efficiency and legitimacy.

Figure 17.1. An analytic-deliberative adaptive management cycle for catchment management and the protection of water resources



772. The complexity of the challenges requires a holistic and integrated approach to water resources protection at a catchment scale. There is need for an analytic-deliberative "twin-track" approach (Figure 17.1) of scientific research and stakeholder participation and negotiation (Smith and Porter, 2010). The expectation is that change for which there is consensus and approval can be iteratively achieved over time, contrasting with the perhaps conventional expectation that a "solution" to the problem can be determined and implemented by a linear and reductionist approach of problem diagnosis, planning and implementation. Research to improve understanding of bio-physical and socio-economic processes must be integrated with a deliberative process situated at the appropriate scale and level of governance. The deliberative process should drive the scientific agenda, recognising that outcomes must be driven by value systems informed by scientific data and not directly by empirical measurements alone. In such a process collective action in the form of collective deliberation by stakeholders can formulate, or at least legitimise, environmental policy; and it can improve the quality of professional enquiry through integration of independent scientific and local contextual knowledge. Social learning, understood as the capability to

transform a problem situation through change in understanding and practice (Ison and Collins, 2008), is an integral and emergent property of such adaptive management. Social learning in this context will incorporate co-creation of knowledge by stakeholders, change in perceptions and values, strengthening of analytical and social capital and change in behaviour. Although these benefits of stakeholder participation are well accepted internationally in debates about natural resource management and the accountability of agencies (Fiorino, 1990; Creighton, 2005), this duality of research and deliberation is rarely made sufficiently explicit when considering collective and community-based solutions for natural resource management. As a result, inadequate attention may be paid to the processes, institutions and resources that facilitate it.

773. It is also clear that complex problems such as diffuse water pollution are unmanageable for a single agency. Collective action is required in the form of polycentric and multi-level collaborations between organisations (Sabatier et al., 2005; Pahl-Wostl, 2008; USEPA, 2008). This suggests the need for establishment of cooperative partnerships between agencies with relevant responsibilities, land managers and other interest groups. This must overcome the tendency of stakeholders to pursue narrow self-interests (whether land users, "single issue" interest environmental or recreational groups, or government agencies with mandates defined narrowly by discipline or economic sector). There must be clarity on the allocation of roles, responsibilities and authority both "vertically" between levels of government and "horizontally" at each level. Information should flow between levels and organisations so that there is also coordination of action (Smith and Porter, 2010). Despite these challenges, examples of working collaborations exist, and a literature is emerging that explains their existence and durability with reference to theories of institutional rational choice, social capital and advocacy coalitions (Ostrom, 2005; Sabatier et al., 2005).

17.3. A framework: PES and collective action within a policy hierarchy for water resource protection

774. Policy options to address diffuse water pollution include: regulation, economic incentives, voluntary agreements, self-regulation, advisory campaigns, and direct land management (i.e. land purchase or swapping). Programmes that demonstrate success in engaging with land users and achieving improved water quality usually exhibit a combination of these approaches, but putting in place the best combination of measures for a specific catchment is again a complex challenge (Smith and Porter, 2010; Bryan and Kandulu, 2011).

Table 17.1. A Policy hierarchy for diffuse pollution

Hierarchy of measures to address land use-based water pollution	Policy options
Ownership change/land acquisition	Conservation designations and protected reserves
Land use change (with income foregone or deferred; e.g. afforestation) Lower intensity (with income foregone; e.g. reduced stocking density)	Agri-environmental schemes/incentives *(PES)*
Improved farm infrastructure (e.g. increased manure storage, fencing streams)	Capital grants and cost sharing *(PES?)*
Farm best management practices offering farm and environmental benefits ("win-wins"; e.g. soil testing and nutrient management)	Advice and voluntary adoption of BMPs
Baseline regulation (e.g. cross compliance for the CAP Single Farm Payment; Nitrate Vulnerable Zones)	Effective enforcement

775. It is useful to recognise a hierarchy of interventions (Table 17.1). At the base is existing regulation for good agricultural and land use practice. Such regulation provides a baseline for standards of land and water management expected from land managers under all conditions. Examples include the specifications for Cross-Compliance as a requirement for receipt of the Single Farm Payment under the Common Agricultural Policy of the European Union, or the more restrictive regulations for Nitrate Vulnerable Zones which apply nationally in some EU countries and for selected regions in others.

776. Such baseline regulation alone is often insufficient to adequately protect water resources and the next stage typically involves voluntary adoption of best management practices by land managers with support and advice from farm advisors. Such practices are designed to deliver benefits in terms of water resources protection whilst saving farm input costs or providing other benefits for farm management and profitability. Examples include precision nutrient management for crops or livestock, and improved farm infrastructure such as farmyard separation and storage of clean and dirty water.

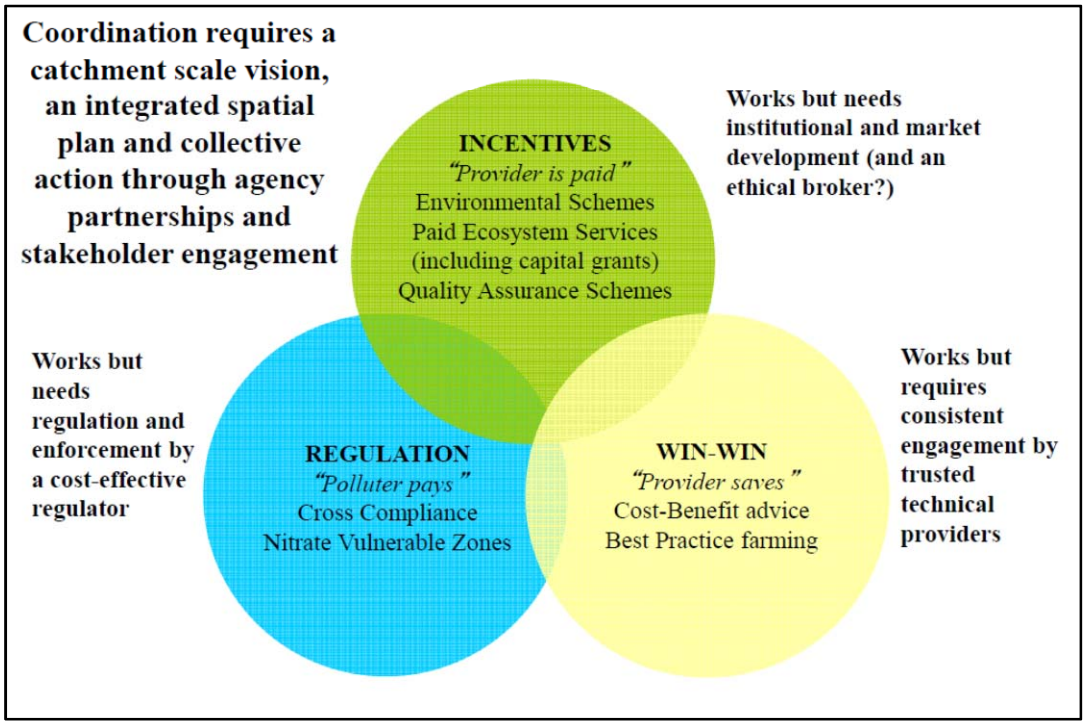
777. Even though such practices may offer "win-win"s in terms of water quality and farm management benefits their voluntary adoption can be constrained by capital cost and affordability. Thus the next policy measure may be to provide grant funding, in the case of the United Kingdom from European Union, national or charitable sources, that can finance capital improvements on a shared cost basis with the land owner. Typical examples include fencing of watercourses to exclude livestock and further farm infrastructure improvements such as expanded and improved facilities for manure handling and storage. In the United Kingdom such grants have been provided in selected areas in seeking to fulfil the objectives of the EU Water Framework Directive under the government financed Catchment Sensitive Farming (CSF) programme (Natural England, 2012), and by environmental charities such as the Westcountry Rivers Trust (West Country Rivers Trust, 2012). As noted above, under a broad conception and definition of PES schemes such grant funding of farm improvements to facilitate improved environmental outcomes can be considered a form of payments for ecosystem services.

778. A more purist form of PES is the next stage in the hierarchy if further land management improvements to protect water resources are required. Opportunities are created for farmers and other land managers to apply for incentive payments based on compensation for income foregone for less intensive farming or other conservation measures that similarly incur an opportunity cost in terms of farm production foregone. In the United Kingdom such payments have been made to farmers under Environmental Stewardship schemes (Natural England, 2011) financed under Pillar 2 of the Common Agricultural Policy of the European Union.

779. Last in this policy hierarchy comes use of direct land management through land purchase by the state or environmental charities (or swapping of targeted land parcels for less vulnerable areas), and/or regulatory use of highly restrictive land use designations. Sometimes described as "fortress conservation" (or the "fence and forget approach"), this typically provides the means to protect important habitats by designating special status such as a nature reserve or national park and allowing human impacts to be minimised. This approach is typically not cost effective and feasible for catchment scale protection of water resources because of the high costs of land purchase and ongoing management, and because of the potential trade-offs with other societal objectives for rural livelihoods and a productive land resource based rural economy.

780. Thus in practice a combined approach to the problems of diffuse pollution requires development of complementarity between regulation, voluntary action and the incentives provided by a PES mechanism (including the option of capital grants). This is illustrated by Figure 17.2 which emphasises that environmental improvement achieved through regulation and the "polluter pays" mechanism can be enhanced though complementary development of "provider saves" and "provider is paid" mechanisms.

Figure 17.2. Complementarities of policy approaches



Source: adapted from a diagram by L. Couldrick, Westcountry Rivers Trust.

17.4. PES for public goods, the collective action this requires and the supporting factors

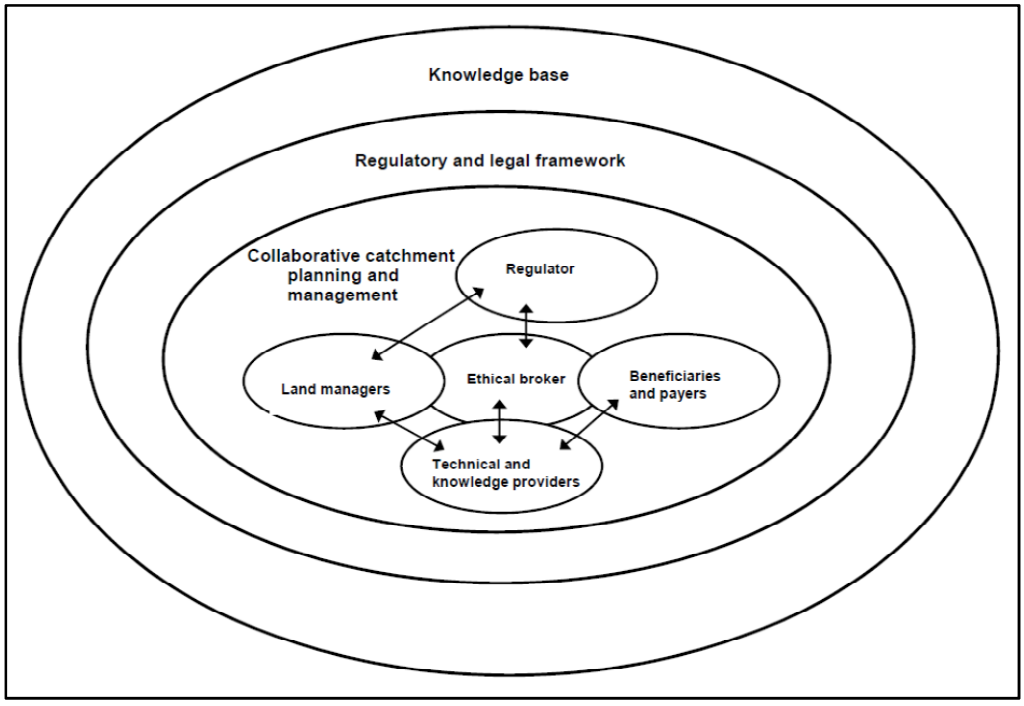
781. The case for PES schemes is based on the proposition that for better land stewardship, and thus environmental public goods, direct economic incentives for land users are more effective than indirect financing and command-and-control regulation. In principle PES can internalize the externalities associated with land use and use of ecosystem services. Globally examples of successful PES schemes are rapidly emerging and typically apply to four categories of environmental public goods: watershed protection, biodiversity conservation, landscape amenity, and carbon sequestration. For direct human uses of water the problem of water quality can be constructed as a choice between protection of water at the source and purification through treatment, but for ecosystems, recreational water uses and aesthetic landscape values – and thus for a range of public goods – there is no alternative to protecting both quality and at least minimum environmental flows at source. Ultimately water resources depend to a very great extent on how land in a catchment is management, and integrated approaches to the management of rural land, urban drainage and water are needed as emphasized above.

782. The Upstream Thinking project demonstrates that the development and implementation of a PES scheme for water protection requires collective action. This takes the form of collective action between individual land managers, collaboration between land managers and organisations, and partnership working between government and non-government agencies. The project demonstrates the need for five key collaborating groups within the collective action required (as below and in Figure 17.3):

- *providers of environmental services* (land managers; in this case farmers in the South West of England);
- *intermediaries* (the agency managing the scheme; in this case the WRT);

- *representatives of the beneficiaries of services* (the people and organisations that pay, in this case water consumers through a privatised water supply utility subject to government regulation);
- *further technical and knowledge providers* (other technical providers contracted by parties to the agreement, e.g. legal advisors, planning and building consultants and university based researchers; in this case local providers of such services in the South West of England, and the Universities of Exeter, London and East Anglia).
- *a cost effective regulator* to ensure baseline regulation and the "additionality" of ecosystems services that are paid for within the scheme (in this case the Environment Agency; an Executive Non-departmental Public Body responsible to the United Kingdom's Secretary of State for Environment, Food and Rural Affairs and tasked to protect and improve the environment, and to promote sustainable development).

Figure 17.3. Elements necessary for a PES scheme and necessary collective action participants



783. These groups can be overlapping; for example farmers can be opinion formers and leaders within their peer group, and beneficiaries could be trustees or employees of the intermediaries. Intermediaries can also be technical providers. This is simplistic given the many stakeholders in rural land and water management, but it clarifies the key requirements for a PES scheme.

784. Collective action between individual land managers and between land managers and local delivery organisations is important for several reasons. Coordinated and collective engagement by landowners in the targeted catchments is necessary in order that the scheme may gain the critical mass necessary for impact on water quality at a catchment scale. Land management interventions that are coherently targeted and planned, taking account of the areas that are most vulnerable as "hotspots" for diffuse pollution, will achieve greater impact for water resource protection than measures implemented in a scattered and *ad hoc* fashion. Similar concerns arise in relation to the need to develop environmental "corridors" to conserve biodiversity and avoid scattered "conservation sprawl." Key supporting factors to achieve this are that the WRT has been working in the region for over fifteen years and has the local knowledge and expertise necessary for this coordination and targeting. Its farm advisors have also built up

a high degree of trust and acceptance amongst the farming community. This trust and social capital has proved essential for the development and implementation of the Upstream Thinking project, and reduces the transaction costs of project implementation.

785. Collective complianc by farmers with baseline regulation is also important. This facilitates the achievement of "additionality" in response to PES incentives, helping to meet the concern that "poor" farmers should not be rewarded for poor practice and that payments should reward land management improvements that are "additional" to the expected norms of good practice. This also helps to avoid concerns about equity that can arise if PES payments are seen to "reward polluters" whilst neglecting producers already demonstrating best practice. Key supporting factors here are again the detailed local knowledge of the WRT and its farm advisors. Its ability to act as trusted intermediary and broker for the scheme are essential to its functionality and performance. It is also important that the regulatory framework for good farming practice is clear, understandable and known to farmers. The agency responsible for monitoring and regulatory enforcement, in this case the Environment Agency, must be accepted and respected by the farming community and able to carry out its functions efficiently and cost effectively.

786. Such regulation can, however, be relatively costly in rural areas and collective action by farmers that encourages peer-to-peer advice and monitoring has been found to be cost effective. This depends on processes that achieve genuine participation by stakeholders (farmer representatives) in catchment assessment and science-based decision making. Trust and acceptance of the decision making process and policies and measures implemented are again essential.

787. Although it has yet to become an issue in the Upstream Thinking project, there may be dangers of monopsony market power arising in a PES scheme and there is scope for collective action in response in the form of collective bargaining by land managers. This is turn must be balanced against aggregate efficiency concerns for scheme operation driven by the need to as far as possible match payments to the local opportunity cost of ecosystem service provision. An extensive literature details use of approaches such as "reverse auctions" as a means to address this issue in PES schemes. However, this literature often lacks emphasis on the continued for collective action, and in particular social capital and trust between the parties involved. Achievement of this on the part of the intermediary will continue to be a key factor, and can be expected to reduce transaction costs, help resolve conflicts and enhance sustainability, even for more complex payment allocation mechanisms.

788. As explained above, a PES scheme for water resources protection will be best established as part of a hierarchy of complementary policy approaches and as part of an integrated, holistic and adaptive approach to catchment management. Collective action is thus required in the form of polycentric and multi-level collaborations between organisations. Key factors to achieve this are a permissive and enabling policy and regulatory environment with delegation of authority for action from higher levels of government to regionally and locally based authorities and organisations. A key role is also played by intermediaries and knowledge brokers in achieving the necessary "vertical" integration and "horizontal" coordination of authorities and actions. In the Upstream Thinking Project horizontal coordination is provided by the WRT and vertical integration is achieved by the assumption of responsibility for action by South West Water, working in partnership with, and with the regulatory approval and support of Ofwat and the Environment Agency.

789. A key starting point in the development of collective action of this form is the collaborative framing of a shared understanding of the problem and the building of mutual commitment to its solution. The terms of reference and the purposes of decision-making processes need to be agreed at the start of any consensus building process (Sidaway, 2005). This does not necessarily require agreement but that stakeholders understand each other's positions sufficiently for effective dialogue about their interpretations of the problem and for use of collective action and shared information to address it (Conklin, 2006). The

aim is to design shared outcomes through development of shared values to guide decisions. All significant perceptions of the problem must be heard and acknowledged to ensure the problem is fully understood and shared. Discussions then progress from current problems to scenarios that meet collective needs and values, dissipating conflict arising from defence of current rights and benefits (Rogers, 2006). Thus future outcomes can be built on collective values that integrate stakeholder preferences, scientific knowledge and local experience, and this can create the capacity for collaborative strategic and annual planning. For the Upstream Thinking Project these processes are achieved by the communications and outreach activities of WRT and South West Water. Both have invested heavily in a series of workshops with stakeholders, presentations at other relevant events, public outreach and range of communication media.

17.5. Policy and institutional concerns for PES and collective action

790. A PES scheme such as the Upstream Thinking Project will rarely be successful in isolation. Complementarities with other policy mechanisms, including regulation and voluntary conservation measures, mean that a PES scheme should be developed within the context of a collaborative, holistic, integrated and catchment-scale approach to planning and land and water management. In turn this approach will be set within the prevailing regulatory and policy environment (Figure 17.3), enabling both facilitators and potential barriers at the national level to be identified.

791. To securely protect the water supplied by an inhabited catchment it is essential that farmers and other landowners, businesses, community leaders and residents willingly manage the sources of potential pollution they control. Thus management of non-point source of pollution in particular must be made a matter of local management. This requires the sharing and coordination of authorities between different levels of government. Integration of environmental and economic objectives and sustained protection of water quality can then be achieved through the necessary local acceptance of responsibility and the development of local capabilities, with support and guidance from scientific partners and higher levels of government.

792. Having put in place sound and cost effective baseline regulation of good farming practice and local capacity to identify and adopt best management practices that benefit both farm businesses and the environment, PES mechanisms can be developed to reward higher standards of land management to protect water resources (that may incur opportunity costs in terms of income foregone). Water supply utilities, such as South West Water, are leading candidates to resource such mechanisms, but policy and regulation must enable the local development of voluntary partnerships between communities, land managers, the water utility, and other government agencies with relevant responsibilities.

793. To deliver source water protection collective action will be required in a number of forms as described above and demonstrated by the Upstream Thinking Project. The establishment of local intermediaries and technical providers who are respected and trusted locally as members of the community is necessary for this to occur and critical for the acceptance and sustainability of the approaches adopted. The WRT provide a good example of a non-government and non-profit organisation undertaking and developing this role. Successful catchment management programmes coordinated by organisations such as the WRT often demonstrate the ability to generate financial resources from a diverse range of sources, including PES mechanisms, but core public funding will generally be necessary to launch and sustain development of such local capacity and coordination.

794. Despite the local capacity needs, transaction costs of scheme operation, and costs of on-farm measures shared with farmers, the Upstream Thinking Project is proving to be a highly cost effective means for South West Water to protect its raw water resources. A benefit-cost ration of 65:1 has been calculated for the project based on the benefits of deferred investment in water treatment plant upgrades alone. In addition the scheme is expected to deliver up to twenty percent savings in the operational

expenditure of existing water treatment plants. These financial benefits for South West Water and its customers could not be achieved without the collective action and collaboration of land managers in the catchments concerned and other project partner organisations.

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