Is Biodynamic Viticulture Environmentally and Economically Sustainable?

Laura Beth Kasten

Is BioDynamic Viticulture Environmentally and Economically Sustainable?

A senior project presented to the faculty of
Landscape Architecture at the University of California, Davis,
in fulfillment of the requirements for the degree of
Bachelors of Sciences in Landscape Architecture.

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By
Laura Beth Kasten
June 2012

ABSTRACT:

Despite its ongoing surge in popularity, biodynamic viticulture has experienced growing controversy over the past decade. While there is little doubt that biodynamic farming results in healthier soil, questions have arisen over the more abstract, metaphysical aspects of the practice, and these doubts have been compounded by reports of diminished yields and reduced produce size. The following pages have been written in an attempt to get to the bottom of the controversy by examining both the short and long-term economic effects of biodynamic viticulture, as well as its impact on the soil, the produce, and the consumer. Furthermore, the biological and theoretical aspects of the practice have been separated and weighed on their own merits.

BIOGRAPHICAL SKETCH:

Growing up in Napa allowed me to have an inside understanding of the importance of the vineyard when it comes to making wine. Breathing in the vineyard air, I wake up every day realizing "I get to live here." Of course, it took a few steps to find this path. After graduating high school in 2001, I chose to move away and attend California Lutheran University in Southern California, completing a Bachelor of Arts in Multimedia. Then in 2007 I received certificates in AutoCAD and Interior Design from Moorpark College and discovered a passion for space planning and energy efficient design. Since then, I moved back to Napa and decided that Landscape Architecture was the next step in order to combine all my aspirations. I feel blessed for the opportunities I have been given and appreciate the new journey. For this project, I chose to blend my passion of making beautiful wines with creating a beautiful design, wanting to have a better understanding of the viticulture and farming practices occurring in the surrounding community.

DEDICATION:

Jerod~ for the constant love and reassurance to keep excelling in whatever I do all while enduring my stress and still remaining patient with me.

My Parents~ for their unending support and willingness to put my education into practice on their property.

ACKNOWLEDGEMENTS:

Thank you to my committee members for choosing to work with me in creating this final product. I appreciate your support, feedback and encouragement, and especially the time that you set aside for me.

Elizabeth Boults
Carolina Monroy
Zach Tanner

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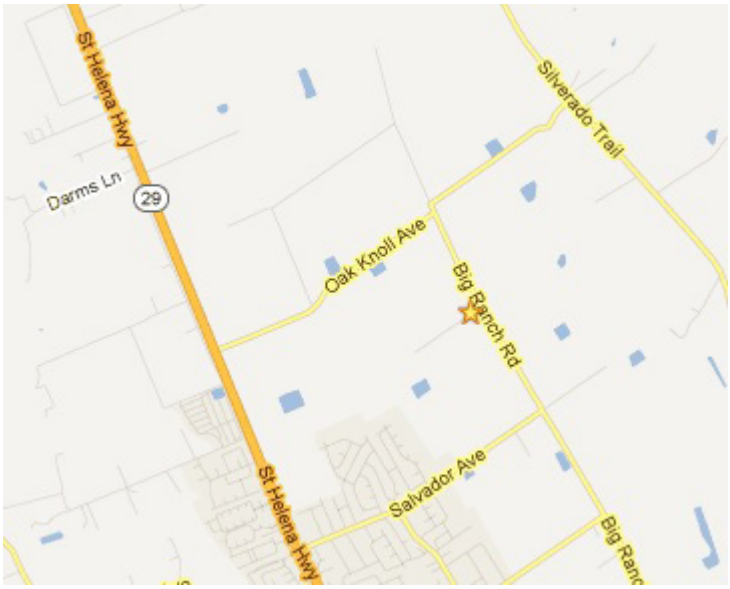
PART ONE: INTRODUCTION

1. Project Context

The idea for this project was to take an in-depth look at Biodynamic viticulture, reviewing case studies of this approach and comparing to other farming management strategies- organic and sustainable. The ultimate goal became to deduce from this research, the best practices to implement in the field and design an appropriate plant palette. My chosen site is a small family-owned vineyard located on 3 acres in the Napa Valley. This winery is just starting to establish itself in the market, so through their landscape I hope to help them to be self-sustaining. I will plan the landscape surrounding the vineyard to attract pollinators with native vegetation. The design of a garden or any vegetation near agriculture is important- not only aesthetically but environmentally. It needs to encourage healthy natural growth of both flora and fauna.

SITE CONTEXT MAPS



2. DEFINITIONS

BioDynamics: A spiritual-ethical-ecological approach to agriculture, food production and nutrition. (biodynamics.com)

Hedgerow: Rows of trees, shrubs, grasses and sedges that surround farm fields, beneficial to agricultural landscapes through weed control, air and water quality protection, soil erosion control, biodiversity, and increased beneficial insect activity. (http://anrcatalog.ucdavis.edu)

Native Plants: Plants that existed in California prior to the arrival of European explorers and colonists in the late 18th century. (wikipedia.org)

Organic: Grapes grown with managed with practices excluding the use artificial chemical fertilizers, pesticides, fungicides and herbicides; using cover crops and promoting biodiversity. (wikipedia.org)

Pollinator: Animal which carries pollen from one seed plant to another, unwittingly aiding the plant in its reproduction. Common pollinators include insects, especially bees, butterflies, and moths, birds, and bats. (everythingbio.com)

Sustainable: the practice of farming using principles of ecology, the study of relationships between organisms and their environment. It has been defined as "an integrated system of plant and animal production practices having a site-specific application that will last over the long term. (wikipedia.org)

Terroir: The unique taste of a specific place as shown in a wine, developed by the micro-climate, soil, weather conditions, and farming techniques. Loosely translated as "a sense of place." (Raymond Winery, wikipedia.org)

Vineyard: Ground planted with cultivated grapevines. A sphere of spiritual, mental, or physical endeavor. (freedictionary.com)

Viticulture: The science, art, or process of cultivating grapevines, the study of grapes and the growing of grapes (freedictionary.com)

Part Two:
BIODYNAMIC VITICULTURE INFORMATION

Part Two: BIODYNAMIC VITICULTURE INFORMATION

1. Introduction to Biodynamic Agriculture and Viticulture

Biodynamic agriculture (hereafter referred to as BDA) is a multi-faceted approach to the creation of a self-sustaining agricultural system in which the links between animals, plants, and soil are highly emphasized. In addition, "preparations" such as cow-horn manure (described later in detail) and crushed quartz mixed with water are used extensively, with the intention of bringing terrestrial and cosmic energy back to the soil after a harvest. The astronomical calendar is also used extensively to determine appropriate times for planting, fertilizing, and sowing. One of the primary focuses of BDA is the use of compost created onsite. Cow manure is a major component of this compost, and it is mixed with virtually any other organic matter to create a "compost pile."[1]

Biodynamic and organic farming are similar in that both are ecologically oriented and do not use chemical fertilizers and pesticides. The main difference is that biodynamic farmers add eight specific amendments, called preparations, to their soils, crops, and composts. Recently, there has been an increasing interest in biodynamic farming practices and systems because they show potential for mitigating some detrimental effects of chemical-dependent conventional agriculture.

Dr. Richard Smart, an Australian viticulturalist, and Monty Waldin, a wine journalist specializing in BD, debated the importance placed on bio-dynamics in December 2011. Smart is passionate that his approach to viticulture is 'based on conventional science, and not emotional "black magic".' While Waldin "believes the 'tastiest, healthiest grapes' are produced when Nature is 'stewarded not enslaved." A summary, found on Decanter.com, of the debate between Richard Smart and Monty Waldin that took place in London. According to Waldin, "Organic and biodynamic grape growing 'needn't be voodoo and black magic', as Smart had earlier suggested, but was simply the process of 'shutting the farm gate', that is, making your operation as self-sufficient as possible."

1 Steiner, Rudolf. *Agriculture Course: The Birth of the Biodynamic Method*. Forest Row: Rudolf Steiner, 2004. Print.

Where as Smart "said he didn't care if growers were organic or biodynamic, 'but I do care if they disadvantage others who are equally earnest in their care for the environment." He made an interesting point that "copper is 'the most toxic thing you can put on a vineyard', yet it is permitted in organic viticulture."[2]

2. The effect of biodynamic agriculture on soil

The methods of composting vary from farm to farm, but there are three primary methods. The first of these is a "Static Pile," in which alternating layers of carbon (brown matter such as manure) and nitrogen materials (green matter such as vegetation) are placed in rotating layers, then prepped with some or all of the seven common biodynamic (hereafter referred to as BD) compost preparations, and then left for up to a year to decompose. The second common method, referred to as the "Aerated Static Pile," is identical to the Static Pile method, but with the addition of aeration tubes to allow oxygen into the pile, which decreases the amount of time necessary for full decomposition. The third, and fastest method, referred to as the "Turned Compost Pile," involves a labor-intensive process of turning the compost pile once per week or more, but results in full decomposition within two to three months. The ultimate goal of these composting processes is the creation of "humus," or fully decomposed and stable biological matter that, when spread on a growing area, promotes healthy soil due to its high nutrient and microorganism content.

A critical element in BD composting is the addition of "preparations," all of which were outlined by the founder of modern BDA, Rudolf Steiner. There are two field preparations, known as 500 and 501, that are spread on unplanted fields or growing plants, and seven compost preparations, referred to as 502-508, which are meant to be incorporated into compost piles. The

2 "Biodynamics Are 'emotional Black Magic': Richard Smart." *Biodynamics Are 'black Magic' Debate Will Hear*. N.p., n.d. Web. 10 June 2012. <http://www.decanter.com/news/wine-news/529518/biodynamics-are-emotional-black-magic-richard-smart>.

two field preparations are the ones that are most commonly used in modern BDAs:

> "500: (horn-manure) a humus mixture prepared by filling the horn of a cow with cow manure and burying it in the ground (40–60 cm below the surface) in the autumn. It is left to decompose during the winter and recovered for use the following spring.
>
> "501: Crushed powdered quartz prepared by stuffing it into a horn of a cow and buried into the ground in spring and taken out in autumn. It can be mixed with 500 but usually prepared on its own (mixture of 1 tablespoon of quartz powder to 250 liters of water) The mixture is sprayed under very low pressure over the crop during the wet season, in an attempt to prevent fungal diseases. It should be sprayed on an overcast day or early in the morning to prevent burning of the leaves."[3]

The seven compost preparations are as follows:

> "502: Yarrow blossoms (Achillea millefolium) are stuffed into urinary bladders from Red Deer (Cervus elaphus) and retrieved in the spring.
>
> "503: Chamomile blossoms (Matricaria recutita) are stuffed into small intestines from cattle buried in humus-rich earth in the autumn and retrieved in the spring.
>
> "504: Stinging nettle (Urtica dioica) plants in full bloom are stuffed together underground surrounded on all sides by peat for a year.
>
> "505: Oak bark (Quercus robur) is chopped in small pieces, placed inside the skull of a domesticated animal, surrounded by peat and buried in earth in a place where lots of rain water runs past.
>
> "506: Dandelion flowers (Taraxacum officinale) is stuffed into the peritoneum of cattle and buried in earth during winter and retrieved in the spring.
>
> "507: Valerian flowers (Valeriana officinalis) are extracted into water.
>
> "508: Horsetail (Equisetum)"[4]

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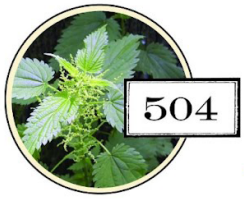
3 Steiner, Rudolf. *Agriculture Course: The Birth of the Biodynamic Method*. Forest Row: Rudolf Steiner, 2004. Print.

4 Steiner, Rudolf. *Agriculture Course: The Birth of the Biodynamic Method*. Forest Row: Rudolf Steiner, 2004. Print.

WORKING WITH NATURE

500 HORN MANURE
Stimulates soil life and root growth



504 NETTLE
Stimulates soil health

501 QUARTZ SILICA
Enhances light metabolism (photosynthesis)

505 OAK BARK
Provides healing forces to combat plant diseases

502 YARROW
Trace elements uptake

506 DANDELION
Stimulates relationship between silica and potassium so that silica can attract cosmic forces to the soil

503 CHAMOMILE
Stabilizes nitrogen in compost and enhances soil life

507 VALERIAN
Stimulates compost so that phosphorus will be properly used by the soil

508 HORSETAIL
Serves as a preventative to lessen the effects when conditions are conducive to fungus

© A TO Z WINEWORKS

In addition to the use of compost and preparations, BDA relies on the nature of biodynamically farmed soil to create an environment in which negative effects due to pests are minimized. These effects are partially due to birds, which tend to congregate on biodynamic farms so that they can take advantage of their typically high concentrations of earthworms, and partially because insects are reported to avoid soils that are "in balance."[5] Some of the nine common "preparations" were also created with the aim of reducing pest activity.

It is a generally accepted fact that biodynamic viticulture has a positive impact on the quality of soil. It has been said that biodynamic farming is "more about the soil than about the plants,"[6] and this is evidenced by the fact that major soil health indicators such as carbon content, nitrogen content, and the concentrations of phosphorous are all significantly higher in biodynamically farmed soil than conventionally farmed soil. Additionally, harmful sodium concentrations were reduced by more than half in a study that concluded in 1981 by using BDA methods.[7]

Table 3. Mean values of soils data from adjacent paddocks and plant data from pot trials, New South Wales Farm Pair, Australia (Forman, 1981).

Soil[1] and Plant Properties	Biodynamic Farm	Conventional Farm
Soil Properties in Field Study		
C(%)	1.43*	0.94
Total Nitrogen (%)[2,3]	0.23	0.13
Extractable P (mg/kg)	44.9*	27.8
Extractable Mg (cmol/kg)	1.65	1.86*
Extractible K (cmol/kg)	1.33	1.39
Extractable Na (cmol/kg)	2.17	4.63*
pH	6.12*	5.57

*Indicates a significantly higher value ($p<0.01$, usig a two-sided t-test for the field study ad a two-way ANOVA in a randomized complete block design for the pot study).
[1]Based on a sampling depth of 0-10 cm.
[2]Total N means are each based on analysis of only two bulked samples per paddock; all other soil properties are averages for 25 separate samples per paddock.

Unfortunately, little data is publicly available with regard to BDA soil, versus organically farmed soil. With regard to the end product of the vineyard, however, multiple studies have been conducted, which prove that both methods produce a higher quality product than traditional farming practices.

5 *One Man, One Cow, One Planet*. Dir. Thomas Burstyn. By Barbara Sumner-Burstyn. Perf. Rajeev Baruah, Ritu Baruah and Anil Bhokare. 2007. DVD.

6 *One Man, One Cow, One Planet*. Dir. Thomas Burstyn. By Barbara Sumner-Burstyn. Perf. Rajeev Baruah, Ritu Baruah and Anil Bhokare. 2007. DVD.

7 Reginald, John P. *Soil Quality & Profitability of Biodynamic & Conventional Farming Systems*. Comstock Pub. Associates, 2006. Print.

3. The effect of biodynamic agriculture on grapes

One of the downsides of biodynamic viticulture however, is a reduced crop yield. While BDA soil is usually healthier than conventionally farmed soil, BD farming methods seem to be outmatched by chemical farming methods when it comes to creating high yields and large produce sizes. One could posit that chemically-farmed produce is unnatural in size and yield, and this is an aspect of BD farming that can possibly be addressed by observing the quality of the fruit, as measured by its shelf life and taste. If these metrics for determining the quality of produce are used, they come into play alongside its size and weight.

Numerous winemakers have suggested that biodynamically farmed grapes create more complex, rich wines, but these observations are extremely suggestive. These remarks have been echoed by farmers of other types of fruits and vegetables, with equal subjectivity. Fortunately, a study was completed in 2006 which measured not just the size and weight of BD farmed chili peppers when compared to an organically farmed control group, but also their shelf life and ascorbic acid content (a major determining factor of their taste.) The results of this study are as follows.[8]

BDA Treatments + Organic Manures, as Compared to Chemically Farmed Chili Peppers:

Treatments	Fruits plant (no.)	Fruit weight (g)	Fruit length (cm)	Fruit Yield (Mg ha)	Shelf life (days)	Ascorbic acid content (mg 100 g)	Capsaicin content (%)
BD 500+BD 501+ organic manures	43.6	139.2	7.5	6.8	4.8	97.4	0.56
RP [20 Mg ha YM+75:40:25 N:P2 O5:K2 O kg ha]	60.5	179.2	9	8.8	3.2	95.4	0.65

The above chart shows that using the preparations accociated with BD did extend the shelf life and absorbic acid content found in the final product but the yield and size of the fruit was significantly smaller.

8 Jayasree, P., and Annamma George. "Do Biodynamic Practices Influence Yield, Quality, and Economics of Cultivation of Chilli (Capsicum Annuum L.)?" *Journal of Tropical Agriculture* (2006): n. pag. Print.

4. The effect of biodynamic agriculture on the consumer

Since the term biodynamic has become more of a fad it is important to look at whether or not the consumer needs to be buying into this certification. "Biodynamic winemakers claim to have noted stronger, clearer, more vibrant tastes, as well as wines that remain drinkable longer. In a blind tasting of 10 pairs of biodynamic and conventionally-made wines, conducted by Fortune and judged by seven wine experts including a Master of Wine and head sommeliers, nine of the biodynamic wines were judged superior to their conventional counterpart. The biodynamic wines "were found to have better expressions of terroir, the way in which a wine can represent its specific place of origin in its aroma, flavor, and texture."[9] One must acknowledge however, that the higher quality of biodynamic wines would most likely occur through basic organic farming, without the practice of cow horns filled with humus.

9 Reilly, Jean K. "Why Are Top Winemakers Burying Cow Horns Filled with Manure on the Equinox? Because It Seems to Help Make Great Wine." *Fortune*. N.p., 23 Aug. 2004. Web.

Given modern education and technology, consumers should always have access to affordable, healthy, high quality produce. Through BDA, this food can also be "produced in a way that includes humane treatment of animals, preservation of land, and sustainability of its farmers."[10] This management strategy emphasizes both consumer and production-based values to promote a successful BD farm. This holistic approach to farming not only includes soil cultivation, but also must take into account the means by which the final product reaches the consumer.

In terms of the consumers' experience, the impact of BDA is significant when compared to conventional farming for two reasons: the quality of the food, and its cost. While the taste and shelf life of the produce that comes from BDFs are both markedly improved, the cost of BD grown food is between 10% and 100% higher than produce that is farmed using conventional methods.[11]

5. The short-term vs. long-term economic effects of biodynamic viticulture

The short-term economic effects on a farmer who begins using BD techniques are decidedly negative in most cases, even after taking into account the chemical fertilizer costs associated with more accepted farming approaches. However, if the farmer lives in an area where BD foods are valued to the extent that the consumer is willing to pay a higher price for them, this economic downside is significantly mitigated, and may even result in a higher return on investment (ROI) for the farmer during their initial years of BD farming than if he or she had continued using chemical farming methods.

10 Bloom, John, and Gary Sprague. "A Holistic Approach..." *Beyond Organic*. N.p., Fall 2009. Web. 27 Apr. 2012. <http://rsfsocialfinance.org/>.

11 *One Man, One Cow, One Planet*. Dir. Thomas Burstyn. By Barbara Sumner-Burstyn. Perf. Rajeev Baruah, Ritu Baruah and Anil Bhokare. 2007. DVD.

To better understand the disparity between BDA and conventional farming methods with regard to initial ROI, the following table is useful; it shows that the benefit to cost ratio for biodynamic farming, which is 20% lower than conventional farming during the first year of BD production in this study:

Treatments	Fruits plant (no.)	Fruit weight (g)	Fruit length (cm)	Fruit Yield (Mg ha)	Shelf life (days)	Ascorbic acid content (mg 100 g)	Capsaicin content (%)	Net returns (Rs ha)	Benefit cost ratio
BD 500+BD 501+ organic manures	43.6	139.2	7.5	6.8	4.8	97.4	0.56	22475	1.2
RP [20 Mg ha YM+75:40:25 N:P2 O5:K2 O kg ha]	60.5	179.2	9	8.8	3.2	95.4	0.65	49266	1.5

[12]

Multiple studies have shown that the initialization of BDA is financially difficult, or even unfeasible, for many farmers unless they receive direct support from organizations such as the CSA. Given a long term approach, however, BDA begins to seem more fiscally accessible.

Despite the initial negative economic impact of BDA to the farmer, over time, BDF seems to not only pay for itself, but create additional profits. This is evidenced by a study done on mature BD farms in Germany during the same period as the chili pepper study that was referenced earlier. In the Germany study, gross revenue, expenses, and profit for BDFs and conventional farms were compared with each other at three farm sizes, to eliminate economies of scale.

Regardless of the size of the farm, the study came to the conclusion that, while revenue remained relatively consistent between the two farming types, expenses for BDA farms were significantly lower, which led to a profit per hectare that was nearly double that of conventional farms during the course of the study.

Farm Size:	10-20 ha		20-30 ha		30-40 ha	
	Bio	Con	Bio	Con	Bio	Con
Number of Farms	4	928	4	1,689	4	1,612
Average Size of farms (ha)	17.7	16.2	22.1	25	38.4	37.6
Gross revenue (DM ha yr)	6,369	6,625	6,874	5,774	3,507	4,689
Expenses (DM ha yr)	3,934	5,093	3,713	4,505	2,415	3,755
Profit (DM ha yr)	2,435	1,532	3,161	1,269	1,092	934

[13]

12 Jayasree, P., and Annamma George. "Do Biodynamic Practices Influence Yield, Quality, and Economics of Cultivation of Chilli (Capsicum Annuum L.)?" *Journal of Tropical Agriculture* (2006): n. pag. Print.

13 Jayasree, P., and Annamma George. "Do Biodynamic Practices Influence Yield, Quality, and Economics of Cultivation of Chilli (Capsicum Annuum L.)?" *Journal of Tropical Agriculture* (2006): n. pag. Print.

6. The efficacy of the metaphysical aspects of biodynamic viticulture

While most of the research cited in this paper contrasts BDA against conventional, chemical farming, one of the most common questions on the web, and amongst farmers, seems to be, "Is biodynamic viticulture any better than organic viticulture?"

The publicly available data that compares BDA and organic practices is limited, but based on these few studies, the answer to this question is a resounding, "No."

When comparing and contrasting BDA with properly conducted organic farming, it appears that almost all of the benefits of BDA can be attained by simply adhering to the biological aspects of the practice, while ignoring the "preparations" and reliance on the astronomical calendar that separates BDA from organic farming.

During the BDA chili experiment of 2006, which has been referenced earlier in this report, a control group was created in which all BDA principles aside from the nine preparations, and the astronomical calendar, were strictly followed. The results of this study showed that not only were the preparation-treated BDA chilis of the same, if not lower, quality than the organically farmed chilis, but also that there was no positive effect on the produce derived from astronomical planting, fertilizing, and harvesting schedules.

Treatments	Fruits plant (no.)	Fruit weight (g)	Fruit length (cm)	Fruit Yield (Mg ha)	Shelf life (days)	Ascorbic acid content (mg 100 g)	Capsaicin content (%)	Net returns (Rs ha)	Benefit cost ratio
Adopting biodynamic calendar	46.5	141.6	7.6	7.4	4.5	97.3	0.58	28265	1.37
Not adopting biodynamic calendar	46.9	144.8	7.8	7.3	4.3	97.1	0.58	26824	1.32

[14]

14 Jayasree, P., and Annamma George. "Do Biodynamic Practices Influence Yield, Quality, and Economics of Cultivation of Chilli (Capsicum Annuum L.)?" *Journal of Tropical Agriculture* (2006): n. pag. Print.

Part Three:
CASE STUDIES

Part Three: CASE STUDIES

I visited and researched eight local wineries that use various farming practices to get a better idea of how each system works in a real environment. Five of these practice Biodynamic viticulture. Three are CCOF certified organic and two use sustainable management tactics.

1. Benziger

The Benziger Family opened the doors to their Sonoma winery almost thirty years ago, with no intention of farming differently. After some time, they noticed their land looked harsher, the soil was drier and they started thinking of how to correct the situation. Fortunately, in the mid-90s, the family brought a leading expert on Biodynamics on board- Alan York, and the transition began. By eliminating chemicals and artificial fertilizers, the vineyard became more naturally balanced. They grow flowers which attract bugs needed for pest control, created more biodiversity through habitats for birds and owls, and keep cows, sheep and chickens on property. Today, the wines are grown from a more healthy and vibrant place and in turn have developed a distinct authenticity that really helps the winery's philosophy to shine.

2. Domaine Carneros

Owned by Champagne Taittinger, Domaine Carneros was completed in 1989, making high-level sparkling wine and pinot noir. As of 2008, the estate vineyards are certified organic- a three year process approved by the California Certified Organic Farmers (CCOF) Winemaker and CEO Eileen Crane believes, "Exceptional wine originates from exceptional vineyards. Growing our own grapes assures that they are farmed to high standards essential to the quality of wine we create." In 2003, the winery also installed the largest photovoltaic solar collection system to be found on any other winery in the world. Other features of natural energy include skylights and building into the hillside for better insulation. To improve rodent management, owl boxes have been placed in all four vineyard locations.

3. Grgich Hills Estate Winery

Opening in 1977 by Miljenko "Mike" Grgich and Austin Hills, this winery farms 366 acres that as of 2006 are now Demeter Certified Biodynamic and organic. This was done in order to save vines that were dying due to red leaf virus. As a result of beginning this process, the vineyard recovered and started producing intensely-flavored fruit. During this same year, the winery switched to solar power and to encourage pollination they keep bees within the vineyard.

4. Frog's Leap Winery

In 1994 this winery opened and received a "Gold" LEED certification after renovating the 110-year-old red barn, now surrounded by 40 acres of organic vineyards. Frog's Leap became 100% solar powered in 2005 and are using geothermal energy to fully support the entire winery. Frog's Leap gardens by the phases of the moon- following waxing and waning, gardeners know when it is best for certain farming and planting activities. To produce strong balanced grapes, they dry-farm over 200 acres of vineyards which also helps them to be even more sustainable, relying on cover crops and tilling the soil. Oats, winter pea, clover, and vetch are planted in the vineyards every winter providing the soil with nutrients and organic matter, improving root growth and encouraging beneficial insects and birds that eat vineyard pests. Birdboxes are provided for bluebirds, owls and hawks to help eat pests that can destroy the vines.

5. Honig Vineyard & Winery

HONIG VINEYARD & WINERY
GREEN REPORT CARD
Term: *Harvest 2010 through Harvest 2011*

SUBJECT	Excellent	Satisfactory	Needs Improvement
Vineyard Practices			
• Receive California Sustainable Winegrowing Certification	X		
• Provide habitat for bluebirds, hawks, and owls	X		
• Plant cover crops to maintain soil health	X		
• Replant vineyard borders with native species	X		
• Certified in Fish Friendly Farming	X		
• Participate in RDRT to restore the Napa River	X		
• Use drip irrigation to minimize water use	X		
Winery Practices			
• Use solar energy to power winery	X		
• Use environmentally friendly cleaning products	X		
• Compost grape skins, seeds, stems	X		
• Use energy efficient lighting and timed thermostats	X		
• Recycle glass, cardboard, metal, paper and plastics	X		
• ***Bottle wine in lighter weight glass***	**X**		
• ***Reduce traffic to winery by consolidating shipments***	**X**		
• Use local suppliers	X		
• Landscape with drought tolerant plants	X		
Business Practices	X		
• Provide comprehensive employee benefits	X		
• Encourage employees to carpool		X	
• Support our community	X		

Comments: Honig Winery is working hard to reduce the winery's impact on the environment. We need to continue to find ways to improve upon our sustainable practices and implement changes as necessary. NOTE: Improvements from previous year are in **BOLD.**

Evaluator: Michael Honig, President Honig Vineyard & Winery

Signature  **Date** October 2011

Honig Vineyard & Winery . P.O. Box 406 . Rutherford, Napa Valley . CA . 94573 . www.honigwine.com

Louis Honig planted 68 acres of Sauvignon Blanc and Cabernet Sauvignon in 1964. In 1984, his grandson, Michael took over the winery and now is leading the sustainable viticulture movement. Over the years he has implemented a new "Code of Sustainable Winegrowing Practices," which is a voluntary program that has established statewide guidelines for sustainable farming and winemaking. They have been using solar power for six years and have houses and habitats for bluebirds, bats, hawks and owls. Beehives are located on property along the river, encouraging pollination within the vines and cover crops. The winery also trains yellow lab puppies to detect vine mealy bugs in the vineyard. Mealy bugs are almost impossible to see and detect with a human eye, attacking vineyards by feeding on the young new growth leaving a black mold behind. This program helps to keep the problem in check by finding it before it can spread throughout an entire vineyard.

6. Quintessa

Valeria and Agustin Huneeus bought the estate in 1990, naming it after the property's five hills that create the five distinct microclimates. According to Valeria "The most important lesson in diversity learned at Quintessa is the need to keep the soil alive with a variety of plant life. Pests are managed through the use of organic materials, cover crops and other innovative practices, and only when required. From it's very inception, the vineyard has been maintained with a strict criteria of care for the soil and the environment. It is a very special feeling to know that at Quintessa, there was never any other kind of grape growing." They started with sustainable practices, planting native grasses and flowers around the vineyard to encourage beneficial insects. Then, in 1997 Biodynamic farming was introduced and as of 2004, all 170 acres had been converted. The building itself is built into the hillside in a crescent-shape disturbing as little of the environment as possible. Caves provide natural insulation for the winery which sits under a canopy of old oak trees.

7. Quixote Winery

The 28 acre estate vineyard was planted in 1996, now exclusively organically-farmed with sustainable practices. The winery was designed by Viennese artist, architect and environmentalist Friedensreich Hundertwasser following his philosophy that "You are a guest of Nature. Behave." There are no straight lines anywhere in the building- aside from the doors- and the roofs are planted with grass and trees. At Quixote, each vineyard block is individually harvested two or three times, taking only grapes that are perfectly ripe, also keeping the fruit separate for fermentation.

8. Raymond Vineyards

Roy Raymond Sr. and his family began making wine at this property in 1974, only recently implementing organic and Biodynamic practices in 2010 on their 300 acres. The transition is taking place through cover crops, using preparations and composts provided in part by the sheep, goats and chickens living on property in the "Theater of Nature" ~ a self-guided tour educating visitors on the importance of the specific farming methods used.

Part Four:
DESIGN GUIDELINES & DESIGN

Part Four: DESIGN GUIDELINES & DESIGN
1. Site Analysis

The property sits just south-west of Big Ranch Road with wind blowing from the north-west. It is surrounded on three sides by other vineyards. Even in only 1.5 acres, it produces 7-10 tons of Cabernet Sauvignon, Merlot and Cabernet Franc each fall. The topography while fairly flat does have a storm ditch along the main road that drains water away in the winter and early spring. It has a very high water table so the vineyard is primarily dry-farmed, using the drip line only one or two days in the summer during extreme heatwaves.

2. Design Content

Along with the following design ideas, plantings are to be native and drought tolerant. The site should also provide areas for event space, seating and recreation.

Chickens, goats, sheep

Cover Crops

Owl and bat boxes

Birdhouses

3. Plant List

This list was created from researching the plants found at the wineries in my case studies as well as from an article produced by UC Davis and Hedgerow Farms in Yolo County.[15]

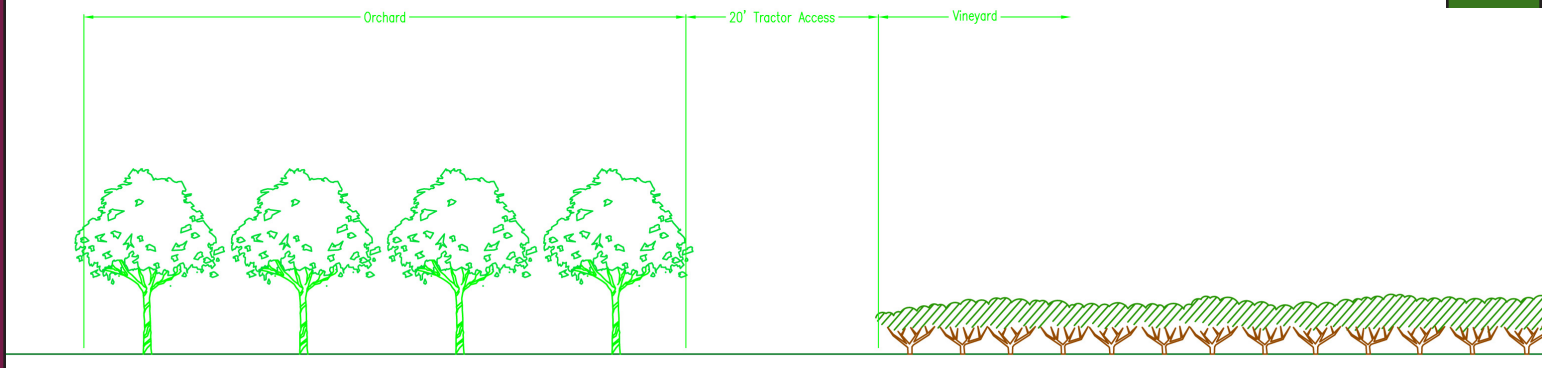
Large Shrubs: Toyon, Western redbud, Coyote brush, Ceanothus, Elderberry, Coffeeberry, Wild blackberry

Smaller Shrubs: California buckwheat, Yarrow, Milkweed, Aster, Goldenrod, Mugwort, Phacelia, Gum plant, Blue mist shrub

Native Grass mix: Purple needlegrass, Nodding needlegrass, California oniongrass, Squirrel tail, One-sided bluegrass, Blue wildrye, Creeping wildrye, Slender wheatgrass, Meadow barley

Trees: Willow, Cottonwood, Oak, California buckeye, California sycamore, California black walnut

Forb strip seed mix: Lupine, Clovers, Tarweed, Vinegar weed, California poppy

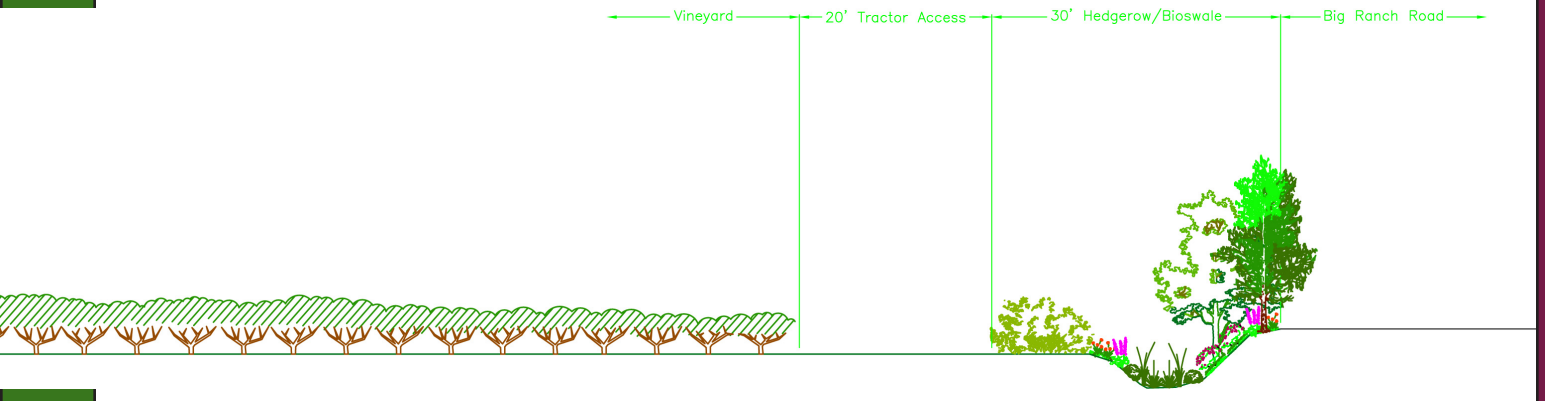


15 Long, Rachael F., and John H. Anderson. "Establishing Hedgerows on Farms in California."*Http://ucfoodsafety.ucdavis.edu*. N.p., Apr. 2010. Web. May 2012.

4. Sustainable Vineyard Guidelines

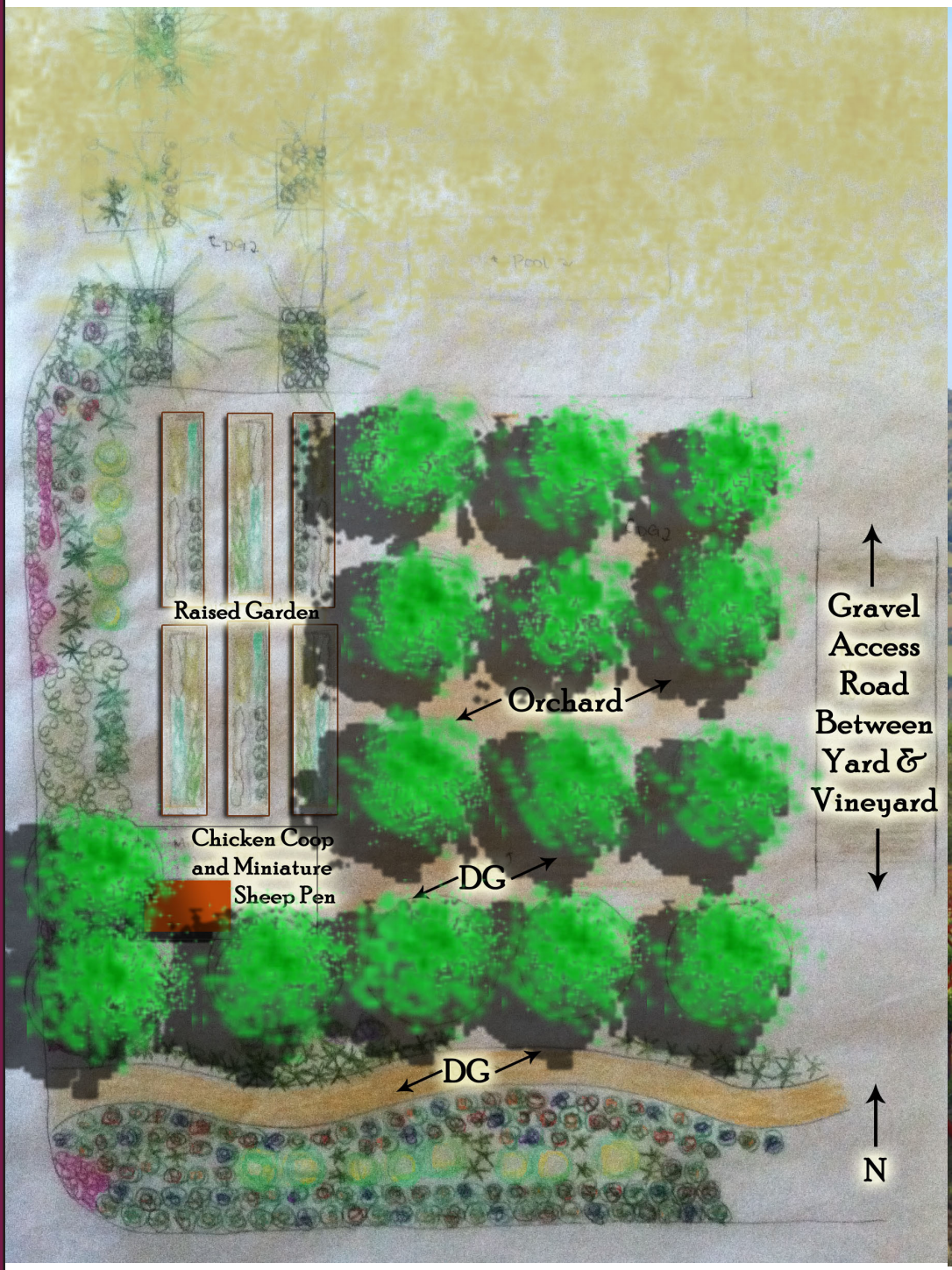
The following practices were adapted from Honig Vineyards, Frog's Leap Winery and General Viticulture.

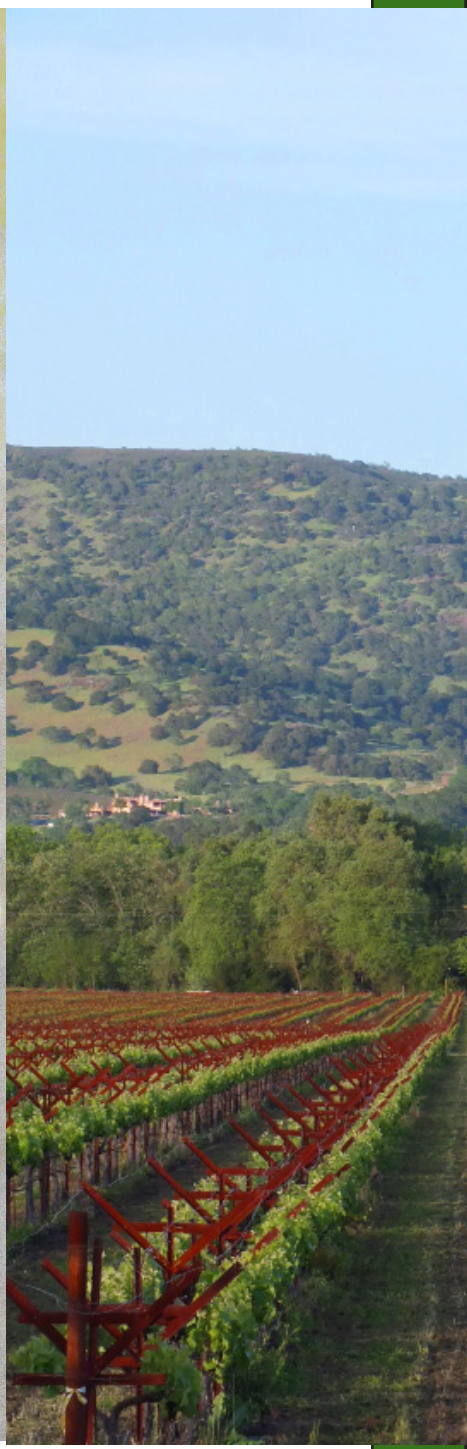
~Planting cover crops to provide nutrients and soil microorganisms
~Installing owl boxes rather than poisons for rodent control and bat boxes to promote more pollination and insect control
~Mechanically tilling rather than spraying herbicides
~Installing blue bird nesting boxes
~Using bio diesel in our tractors
~Using drip irrigation
~Improving habitat along the edge of the vineyard through hedgerow design
~Profusion of bees, butterflies and other beneficial insects
~Photovoltaic system generating solar energy
~Insect control through nearby vegetation~ planting wild blackberries (Rubus ursinus) helps to sustain a over-wintering population of a parasitic wasp, Anagrus epos, that manages to eliminate the Grape Leaf Hopper which would otherwise destroy the leaves.



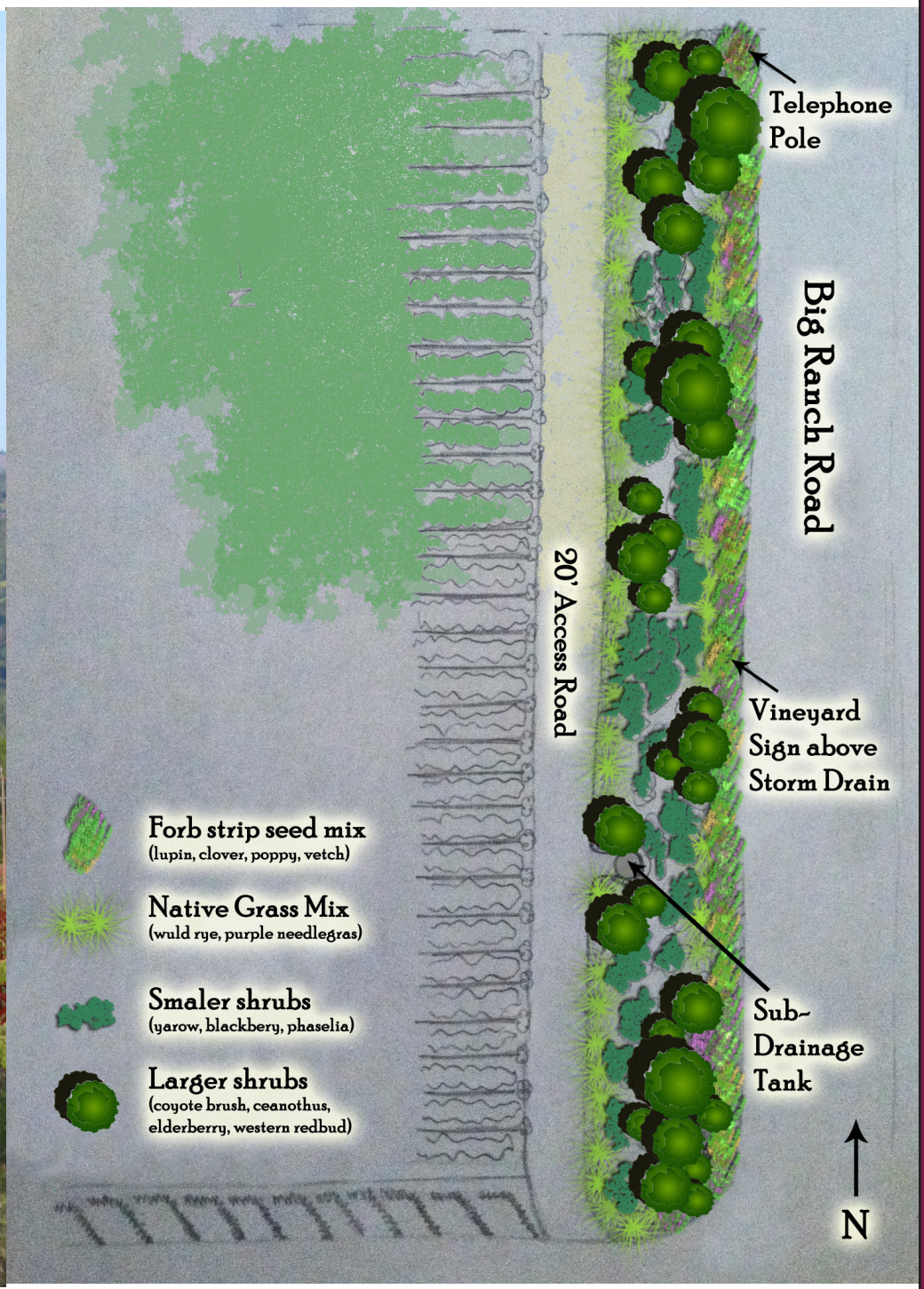
5. Final Designs

Site Plan Layout ~ Design of landscape surrounding the selected vineyard.





Design Additions:
~Raised garden beds, planted with permaculture practices.
~Fruit orchard, selected for traits suited to the area.
~Native vegetation of flowers and grasses.
~Decomposed granite pathways provide permeable surface.
~Chickens and sheep to be raised for grazing and fertilizer.
~Owl boxes in the vineyard for pest control.
~Bird houses for habitat creation and promotion.
~Cover crops planted among vineyard for added nutrients.



Proposed Hedgrow Simulation along Big Ranch Road

Part Four:
CONCLUSIONS

Part Four: CONCLUSIONS

It is important to keep in mind that the studies referenced here are limited in their scope, and duration, and are therefore statistically unreliable. Despite this, existing research indicates that there is a tangible economic benefit to the farmer who embraces Biodynamic viticultural practices over the long term, despite initial losses during the first years of BD production. Present research also suggests that most, if not all, of these economic benefits can also be had by farmers who follow organic agricultural practices, without the additional man-hours necessitated by so-called "cow-horn and moon beam" exercises. After reviewing the case studies, I have reached the conclusion that the sustainable practices such as those found at Honig and Frog's Leap wineries are the best option for both short and long term goals. Each winery I visited did follow many of the same management techniques but it seems that BD takes it to an unnecessary costly extreme. Viticulturalist Doug Hill appreciates "the concept of organic and biodynamic, as it focuses on healthy soils and a balanced environment. However, the ideology limits some activities that can be very practical and much more economical and save on fossil fuel consumption. Most people think that organic means more environmentally sensitive or safer. This is not always the case. Just because you mine your products from the earth or squeeze them from a plant does not make your application safer. In fact the organic products we use for powdery mildew prevention are considered less safe to our field workers. We maintain longer re-entry periods where our workers need to stay out of the fields for a longer period after using the organic products available because of health concerns." Also, Hill believes, "It is frequently much cheaper to farm sustainably." Simply adhering to the specific methods of sustainable viticulture, is the most practical farming choice. Even close adherents to BDA principals have begun to speak openly about the limitations of BDA, which its founder would have probably encouraged: "Steiner himself said that his ideas (sic) had to be tested under real conditions, and if they didn't work, then they were rubbish. He said that we must keep developing spiritual science, and that his work was just a beginning."

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