

TABLE 22

Ranges of maximum effective rooting depth (Z_r), and soil water depletion fraction for no stress (p), for common crops

Crop	Maximum Root Depth ¹ (m)	Depletion Fraction ² (for $ET \approx 5$ mm/day) p
a. Small Vegetables		
Broccoli	0.4-0.6	0.45
Brussel Sprouts	0.4-0.6	0.45
Cabbage	0.5-0.8	0.45
Carrots	0.5-1.0	0.35
Cauliflower	0.4-0.7	0.45
Celery	0.3-0.5	0.20
Garlic	0.3-0.5	0.30
Lettuce	0.3-0.5	0.30
Onions - dry	0.3-0.6	0.30
- green	0.3-0.6	0.30
- seed	0.3-0.6	0.35
Spinach	0.3-0.5	0.20
Radishes	0.3-0.5	0.30
b. Vegetables – Solanum Family (<i>Solanaceae</i>)		
Egg Plant	0.7-1.2	0.45
Sweet Peppers (bell)	0.5-1.0	0.30
Tomato	0.7-1.5	0.40
c. Vegetables – Cucumber Family (<i>Cucurbitaceae</i>)		
Cantaloupe	0.9-1.5	0.45
Cucumber – Fresh Market	0.7-1.2	0.50
– Machine harvest	0.7-1.2	0.50
Pumpkin, Winter Squash	1.0-1.5	0.35
Squash, Zucchini	0.6-1.0	0.50
Sweet Melons	0.8-1.5	0.40
Watermelon	0.8-1.5	0.40
d. Roots and Tubers		
Beets, table	0.6-1.0	0.50
Cassava – year 1	0.5-0.8	0.35
– year 2	0.7-1.0	0.40
Parsnip	0.5-1.0	0.40
Potato	0.4-0.6	0.35
Sweet Potato	1.0-1.5	0.65
Turnip (and Rutabaga)	0.5-1.0	0.50
Sugar Beet	0.7-1.2	0.55 ³

continued...

¹ The larger values for Z_r are for soils having no significant layering or other characteristics that can restrict rooting depth. The smaller values for Z_r may be used for irrigation scheduling and the larger values for modeling soil water stress or for rainfed conditions.

² The values for p apply for $ET_c \approx 5$ mm/day. The value for p can be adjusted for different ET_c according to

$$p = p_{\text{table 22}} + 0.04 (5 - ET_c)$$

where p is expressed as a fraction and ET_c as mm/day.

³ Sugar beets often experience late afternoon wilting in arid climates even at $p < 0.55$, with usually only minor impact on sugar yield.

Table 22 continued

Crop	Maximum Root Depth ¹ (m)	Depletion Fraction ² (for ET ≈ 5 mm/day) p
e. Legumes (<i>Leguminosae</i>)		
Beans, green	0.5-0.7	0.45
Beans, dry and Pulses	0.6-0.9	0.45
Beans, lima, large vines	0.8-1.2	0.45
Chick pea	0.6-1.0	0.50
Fababean (broad bean) - Fresh	0.5-0.7	0.45
- Dry/Seed	0.5-0.7	0.45
Grabanzo	0.6-1.0	0.45
Green Gram and Cowpeas	0.6-1.0	0.45
Groundnut (Peanut)	0.5-1.0	0.50
Lentil	0.6-0.8	0.50
Peas - Fresh	0.6-1.0	0.35
- Dry/Seed	0.6-1.0	0.40
Soybeans	0.6-1.3	0.50
f. Perennial Vegetables (with winter dormancy and initially bare or mulched soil)		
Artichokes	0.6-0.9	0.45
Asparagus	1.2-1.8	0.45
Mint	0.4-0.8	0.40
Strawberries	0.2-0.3	0.20
g. Fibre Crops		
Cotton	1.0-1.7	0.65
Flax	1.0-1.5	0.50
Sisal	0.5-1.0	0.80
h. Oil Crops		
Castorbean (<i>Ricinus</i>)	1.0-2.0	0.50
Rapeseed, Canola	1.0-1.5	0.60
Safflower	1.0-2.0	0.60
Sesame	1.0-1.5	0.60
Sunflower	0.8-1.5	0.45
i. Cereals		
Barley	1.0-1.5	0.55
Oats	1.0-1.5	0.55
Spring Wheat	1.0-1.5	0.55
Winter Wheat	1.5-1.8	0.55
Maize, Field (grain) (<i>field corn</i>)	1.0-1.7	0.55
Maize, Sweet (<i>sweet corn</i>)	0.8-1.2	0.50
Millet	1.0-2.0	0.55
Sorghum - grain	1.0-2.0	0.55
- sweet	1.0-2.0	0.50
Rice	0.5-1.0	0.20 ⁴

continued...

⁴ The value for p for rice is 0.20 of saturation.

Table 22 continued

Crop	Maximum Root Depth ¹ (m)	Depletion Fraction ² (for ET ≈ 5 mm/day) p
j. Forages		
Alfalfa – for hay	1.0-2.0	0.55
– for seed	1.0-3.0	0.60
Bermuda – for hay	1.0-1.5	0.55
– Spring crop for seed	1.0-1.5	0.60
Clover hay, Berseem	0.6-0.9	0.50
Rye Grass hay	0.6-1.0	0.60
Sudan Grass hay (annual)	1.0-1.5	0.55
Grazing Pasture - Rotated Grazing	0.5-1.5	0.60
– Extensive Grazing	0.5-1.5	0.60
Turf grass - cool season ⁵	0.5-1.0	0.40
– warm season ⁵	0.5-1.0	0.50
k. Sugar Cane	1.2-2.0	0.65
l. Tropical Fruits and Trees		
Banana – 1 st year	0.5-0.9	0.35
– 2 nd year	0.5-0.9	0.35
Cacao	0.7-1.0	0.30
Coffee	0.9-1.5	0.40
Date Palms	1.5-2.5	0.50
Palm Trees	0.7-1.1	0.65
Pineapple	0.3-0.6	0.50
Rubber Trees	1.0-1.5	0.40
Tea – non-shaded	0.9-1.5	0.40
– shaded	0.9-1.5	0.45
m. Grapes and Berries		
Berries (bushes)	0.6-1.2	0.50
Grapes – Table or Raisin	1.0-2.0	0.35
– Wine	1.0-2.0	0.45
Hops	1.0-1.2	0.50
n. Fruit Trees		
Almonds	1.0-2.0	0.40
Apples, Cherries, Pears	1.0-2.0	0.50
Apricots, Peaches, Stone Fruit	1.0-2.0	0.50
Avocado	0.5-1.0	0.70
Citrus		
– 70% canopy	1.2-1.5	0.50
– 50% canopy	1.1-1.5	0.50
– 20% canopy	0.8-1.1	0.50
Conifer Trees	1.0-1.5	0.70
Kiwi	0.7-1.3	0.35
Olives (40 to 60% ground coverage by canopy)	1.2-1.7	0.65
Pistachios	1.0-1.5	0.40
Walnut Orchard	1.7-2.4	0.50

⁵ Cool season grass varieties include bluegrass, ryegrass and fescue. Warm season varieties include bermuda grass, buffalo grass and St. Augustine grass. Grasses are variable in rooting depth. Some root below 1.2 m while others have shallow rooting depths. The deeper rooting depths for grasses represent conditions where careful water management is practiced with higher depletion between irrigations to encourage the deeper root exploration.