MSU BOZEMAN
THE DEPARTMENT OF LAND RESOURCES AND ENVIRONMENTAL SCIENCES
WATER QUALITY & IRRIGATION MANAGEMENT

Selection of Crops For Drought Conditions

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What crop uses the least water? What crop is the most resistant to drought? Different plant species vary greatly in terms of the amount of water that can be lost before a plant reaches the permanent wilting point (PWP). They also have different vulnerable or critical periods when limited moisture is likely to reduce yields. Some plant varieties perform better than others in terms of water use efficiency, meaning it takes less water to produce a given amount of dry matter. These characteristics help producers make wise choices when deciding what crops to plant. In making the choice of which crop to use, one must also consider planting date. In general, earlier planting dates are preferable

Rate of Maturation

Millet's quick development and maturation allow it to utilize moisture stored in the upper part of the soil profile before evaporation and drought take their tole, thus making it a relatively drought resistant crop. Similar to millet, beans also mature fairly early. Because of their quick maturation, navy beans blossom over a short period of time, meaning a brief heat wave or dry spell during blossoming could adversely affect the yield. Pinto beans, soybeans, and buckwheat blossom over a prolonged period of time; thus, the critical period for pollination and filling is spread over a greater time period, giving some degree of drought resistance.

Recovery from Drought Stress

Sorghum has the capacity to recover from drought stress and resume growth. Despite reduced yields, the plants can often make a surprising recovery. Sorghum exposed to severe moisture shortages and high temperature over a prolonged period of time is not likely to recover enough to produce economic yields, even though the plant does not die. Corn, oats and flax show varying degrees of drought resistance. Moisture at pollination time is critical for corn.

Root Depth

While sunflowers are considered drought resistant, soybeans are able to withstand higher moisture tensions. Sunflowers apparently have an extensive root system that is available to explore the root zone more completely and extract more of the available water from it. Wheat appears to be able to produce quite well under limited moisture conditions, probably because it develops roots to a depth of 5'.

Components of Yield

The components of yield include the number of heads (ears) per acre, number of kernels per head, and weight per kernel. Environmental conditions have a large influence on these components of yield at different stages in a plant's life cycle. .

The following tables show the water requirements of a variety of crops in terms of pounds of water required for each pound of dry matter produced.

Low Water Requirement

(<400 lb. water/lb Dry Plant Weight)

Crop	Pounds Water per Pound Dry Plant Weight
Millet	274
Sorghum	274
Corn	361
Sugar Beet	377
Sudan Grass	380

Medium Water Requirement

(400-700 lb. water/lb. Dry Plant Weight)

Crop	Pounds Water per Pound Dry Plant Weight
Potatoes	499
Barley	523
Buckwheat	540
Wheat	584
Oats	594
Rye	634
Soybeans	646

High Water Requirement

(>700 lb. water/lb. Dry Plant Weight)

Crop	Pounds Water per Pound Dry Plant Weight
Red Clover	759
Sweet Clover	748
Flax	835
Alfalfa	866
Bromegrass	977
Quackgrass	1000

Home Page

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