

IRRIGATED ALFALFA MANAGEMENT UNDER DROUGHT CONDITIONS

Alfalfa and Drought

Alfalfa is a very drought tolerant crop that has the ability to go dormant during extended dry conditions and is one of the few crops that can recover once adequate moisture returns. Drought conditions will have a number of impacts on alfalfa prior to it entering dormancy, primarily reduction in yield and changes in quality, as well as impacting its ability to survive winter.

Irrigation and crop management during periods of drought and limited water supplies can have a significant impact on crop yield, quality and survival.

Irrigation Management

Irrigation management during periods of drought will depend upon the water source and its availability throughout the season. If the water source is from stored water or a large surface water source (reservoirs, lakes, major rivers) that will ensure at least some water is available throughout the season, it may be best to delay irrigation until soil moisture indicates irrigation is required. In some years, there is adequate available soil moisture from winter snowmelt to grow the first cut with minimal yield reduction.



If irrigation is from small streams with mainly freshet water, and the supply will be reduced later in the season, it is best to store as much water as possible in the soil when water is available. The amount of soil water that can be stored is limited to the *available water storage capacity* of the soil, determined by the soil texture and crop rooting depth.

Factsheet No. 619.000-1 *Soil Water Storage Capacity and Available Soil Moisture*

Use the following irrigation management practices:

- delay irrigation until after first cut if stored water is available for later in the growing season
- irrigate to soil water storage capacity if water is only available early in the growing season
- delay irrigation after a harvest until a leaf canopy has formed - this reduces evaporation and leaf scald
- reducing or eliminating irrigation in late summer (causing the crop to go into drought-induced dormancy) can improve winter survival
- manage irrigation to fill soil water storage capacity at each irrigation (frequent small applications increases evaporation, has little effect on yield, but reduces the capacity of alfalfa to extract water from dry soils the following season)

Irrigate All or Part of Your Acreage ?

Assuming not enough water is available to fully irrigate all alfalfa crops, should a little be applied to the entire acreage, or the full amount to a smaller acreage? Water should go first to the crops or fields that offer the highest economic return, or will suffer the greatest loss if not irrigated. (e.g. new seedings). An example of how to make this decision is given by some work done by Utah Farm Management Specialists at: <http://extension.usu.edu/files/engrpubs/biewm35.pdf>

The results of this study on alfalfa indicated that when water is limited, the best strategy was to apply full irrigation to fewer acres and let the rest go dry. When the soil moisture reserves are not as depleted, the decision to irrigate only a few acres is less clear, and will depend on the cost of irrigating and harvesting all the acres at reduced yield versus fewer acres at normal yield. Refer to Factsheet No. 4 in this series *Irrigation Decisions With Limited Water* as to how this might apply to BC conditions.

Fertilizer Management

Phosphorous

Modifying the fertilizer management of alfalfa when irrigation is limited is not as critical as with grasses and cereals, as the primary fertilizer required by alfalfa in southern BC is phosphorous, which is stable in the soil and can remain available to the crop when normal growing conditions return. If not all the phosphorous applied is used by the crop, it will not have a negative affect on crop quality, as can happen with excess nitrogen on grass or cereal crops.

- phosphorous soil test levels should be greater than 30 parts per million

Boron

More critical for alfalfa is boron, a micronutrient that is only required in small amounts, but is more likely to be deficient under drought conditions. The best way to determine if boron is required is through a soil test. Boron applications should only be made based on soil test recommendations, as the range between deficient and toxic is quite narrow.

- boron soil test levels should be between 1 to 3 parts per million

Potassium

If your soil test recommends potassium, keep in mind the expected crop yield under reduced irrigation and adjust the potassium application accordingly. While applying more potassium than the crop will use in the current season is not going to harm the crop, it can have a negative impact on crop quality by increasing forage levels of potassium beyond what is recommended for livestock. It is important to maintain potassium levels in the recommended range as it can improve survival during periods of stress.

- potassium soil test levels should be between 150 to 400 parts per million

Weed Control

Weed control is important any time, but is critical when water is short. Many weeds are well adapted to drought conditions, growing rapidly when water is available and using moisture that should be used by the crop. This is especially important on new seedings. New seedings should be sown without a cover crop and herbicides should be used to control weeds. This ensures that the limited water is available for use by the crop.

Cutting Management

Cutting management may not change much during drought conditions, if you are currently cutting at about 10% bloom. Cutting at this stage allows the plant enough time to build root reserves that are necessary for the plant to survive during periods of stress, such as drought or winter.



If you normally cut at the bud stage to maximize quality, in order to improve the survival of the alfalfa during winter or drought stress, allow at least one cut to mature to the early (10%) bloom stage. This can improve plant survival.

Do not delay cutting beyond the mid-bloom stage, as yield will not increase and quality will decrease significantly.

If a crop has gone into drought induced dormancy at the time that it started to flower, and then growth resumes due to more available moisture, the plant will continue flowering. The crop should be clipped or harvested. It takes as much moisture for the crop to mature from flower to seed (4 to 6 weeks) as it takes to produce enough new growth to harvest as high quality hay.

Hay Quality

Alfalfa grown under drought conditions can be of higher quality, with lower fiber levels and higher protein, when compared to non-drought stressed crops at a similar stage of maturity. Stage of maturity still has the biggest impact on forage quality.

Grasses, in contrast, tend to have higher levels of fiber and lower levels of protein when drought stressed. In mixed stands of alfalfa-grass, drought impacts on quality tend to balance each other and the net effect will be minimal change.