



EM4816

# Hop Management in Water-Short Periods

Grower decisions on hop management in a water-short year will depend not only on the total amount of water available, but also on the timing of its distribution through the season. Under potential restricted delivery schedules, where water would be available early season and again in early July and into August, it should still be possible to harvest a reasonable crop with careful management on the better soils. However, a constant delivery of the same amount of water at a very low flow rate throughout the season may result in substantial yield reductions for hops.

Hops are fairly drought tolerant and will often produce a crop with excellent quality and fair yields under limited irrigation programs on deep soils. Nevertheless, overall management of hopyards could be crucial to their continued long-term economic production. Expect damage to young plantings or to hopyards on shallow soils or on soils with otherwise low water holding capacities in the absence of adequate water supplies. If mid- to late season water is greatly limited, large reductions in yields can be expected, and plant survival may become a problem even in established yards.

The total potential water use of most hop cultivars grown in the Yakima Valley is 24 to 28 inches of water per year, although annual applications often exceed 50 to 60 inches. Hop roots can develop to relatively large depths and cover large areas, but the vast majority of roots will be in the top 4 feet. While plants usually extract 50% to 60% of their water from the top 2 feet of soil, hops will extract some water from a depth of 8 feet or more.

Research at the Washington State University Prosser Irrigated Agriculture Research and Extension Center has shown that 75% to 80% of the total annual water use of hops occurs after mid-June, with the greatest daily amounts occurring in late July and early August (Fig. 1).

The most critical hop growth stages, which require an adequate soil water supply are early spring before mid-April, and from just prior to, and through the flowering period in early July. It is important to start the growing season with the root zone as full of water as possible, but excessive early irrigations can harm roots. Growers should not overirrigate. Some cultural practices used to deter powdery mildew in hops will delay the crop development stages and corresponding water use referenced in this bulletin.

## Seasonal Distribution: Water Use during Growing Season

Most hops grown in the Yakima Valley are located on good sites with deep soils. These soils gener-

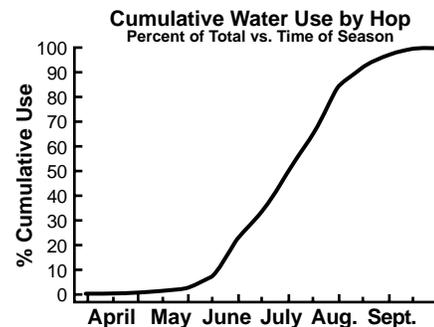


Fig. 1. Cumulative water use of hop during the growing season.

ally hold more water and will provide a definite advantage in water-short years over crops planted in shallow or sandy soils. The deep soils and well-developed root systems will assist plant survival during periods of reduced water. However, make every effort to use all available moisture stored in the soil water reservoir.

The most efficient and uniform applications of water will be very important in stretching supplies even in the "senior" Yakima irrigation districts. All irrigation systems are designed to work under prescribed flow conditions and operations above or below these design limits can greatly reduce efficiencies and will waste water. Thus, trying to stretch too little water on too much area is not conducive to efficient, effective irrigation (and would not be nearly as beneficial in hop production) as applying the same quantity of water at higher rates at selected times during the season. If water is only available at a constant but very low flow rate, it should be concentrated on smaller acreages and/or supplemented by wells or water transferred from fallow fields, so that the supply would be able to approach irrigation system design rates.

Only irrigation systems that are in good shape can conserve water by applying it efficiently. Maintaining or upgrading irrigation systems to obtain the benefit of every drop of water will be essential. It may be necessary to modify existing water application systems to smaller sets or lower flow requirements to be more efficient under the expected operating conditions. Adoption of improved, water-saving irrigation techniques, such as trickle or surge flow furrow (rill) irrigation and a tailwater reuse system will help stretch water supplies.

If nearly adequate water levels are available for most of the season, scientific irrigation scheduling, based on climatic and soil water data will determine timing of irrigations and eliminate nonessential applications. Scheduling may not be as useful when water is severely limited, and the grower has little control of the timing of water availability. Serious scheduling problems may be the case within "junior" irrigation districts, where irrigations could occur only if and when there was water.

Information on soil moisture monitoring and crop evapotranspiration from Washington's Public Agricultural Weather Stations (PAWS) and Washington Irrigation Scheduling Expert (WISE) are available on the Scientific Irrigation Scheduling (SIS): web page <http://sis.prosser.wsu.edu>

If irrigation water is not projected to be available after mid-July for hop yards, growers would be advised to develop programs to ensure plant survival and to minimize seasonal crop water use requirements.

The decision not to string the yard might be appropriate in this case, since not stringing hops would greatly reduce the canopy size. If hops are already strung, growers could cut them down later if the water shortage becomes more severe.

Another option would be to let the hops continue on the twine and harvest whatever is produced, but this might weaken the plants, making them more susceptible to winter damage. Stringing only one vine per hill could reduce potential maximum annual water use.

Planting and establishment of new yards should be discouraged in areas where water shortages are most likely to occur. Young plantings require more frequent, light irrigations (if possible) because their root systems are not as well developed as more mature plantings. Carefully monitor soil water levels in new yards throughout the season.

Growers should seriously consider the advisability of stringing one-year-old plantings if water supplies are severely rationed.

Winter freeze damage to roots may occur if late water to increase the thermal capacity of the soil is lacking. Poor winter survival of plants may also be due to reduced root carbohydrate accumulations in the fall if the vines are sufficiently stressed, particularly on late cultivars. Expect problems with plant survival if water supplies are substantially limited over two or more growing seasons.

Reduce or eliminate mechanical tillage and cultivation operations to avoid soil moisture evapora-

tion losses. The use of mulches (that is, straw, dry soils, plastic sheeting, etc.) can help. Good weed control will be important in conserving all available soil water for the hop plants. Control weeds chemically instead of mechanically, particularly after training. Use a good aphid and mite control program to reduce additional stresses on plants. Mites may be a significant problem under the expected dry and dusty conditions.

Adjust nitrogen fertilizer applications downward if yield potentials will be limited by available water. If the water situation improves, you can add a side dressing later in the season. Generally speaking, existing levels of fertilizers are high enough in most hopyards so that delayed applications of any material would have minimal impacts on production. Applying fertilizers without adequate irrigation water supplies may cause temporary salt problems.

Knowing the total water holding capacities and infiltration rates of the soils will benefit a program for maximizing irrigation efficiencies and uniformities. The existence of fairly shallow water tables (that is, 4-5 feet below ground surface) can provide much of the crop's water needs during the

season and greatly reduce the need for irrigation. Using only one furrow per plant row for irrigation instead of three or more, and irrigating at night will tend to save water.

Publications available at your county Cooperative Extension office can guide you in evaluating your irrigation system. The Natural Resources Conservation Service and the Conservation Districts can also guide you in making changes.

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