Water management strategies for caneberries during drought periods.

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Central coast fruit and vegetable growers are interested in how to most efficiently and effectively respond to growing water shortages and effects of the current water drought situation. Expanding acreage of small fruit production on the Central Coast has created many new growers of fresh raspberries and blackberries who have recently begun producing these crops and have continuing questions about efficient water management. The berry crops as a group are overall quite sensitive to water stress – even for short periods – and deficit irrigation is not a realistic alternative for these crops. There are often potential gains possible with better irrigation management and improvements that make irrigation and water use more efficient. Growers should be very cautious however, attempting to reduce irrigation frequency or duration and should instead focus on reducing acreage to the point that there is sufficient water for optimum irrigation scheduling.

Consistent moisture supply is important for normal caneberry vegetative development, flowering, and fruit formation and quality. Drip irrigation is the most common irrigation system used for caneberries because it supplies water more efficiently and can be directed only to the soil area needed by the plant. Other types of irrigation can be successfully used for caneberry production but use of drip irrigation should be encouraged, particularly during periods of deficit rainfall.

Water availability should be carefully determined for these crops and a reliable management system is critical. Even small amount of moisture stress can initiate a cascade of plant responses that can convert to serious seasonal losses.

The design of the drip irrigation system is the first critical step because design considerations will take into account the water source, soil type, farm layout, and water requirements of the crop. The design should incorporate any specialized needed fixtures or fittings to optimize the efficiency of water delivery. The drip system can also be used to deliver fertilizer at a time and amount that best matches plant needs (fertigation) and can also improve fertilizer use efficiency. Special fertilizer materials are available for managing caneberries in compliance with certified organic requirements.

Well-designed drip systems can have application efficiencies above 85% but the source of water, system management, and the maintenance of the system are also important for efficient water use. The timing, frequency, and duration of application of water must carefully match the soil type, growth stage, and weather conditions. It is important to assure moisture availability to the plants; particularly during periods of high atmospheric demand (e.g warm, windy conditions). The irrigation system is also subject to plugging from biological growth (algae, fungi, bacteria, etc) and from precipitates formed from naturally occurring salts. And the plugging will reduce uniformity of water and fertilizer application in the field and induce stress in the plants. Periodic injection of acid

is important to dissolve precipitates that form in the system and chlorine treatment is normally used for cleaning organic particles and residues.

The overall water needs of the caneberry crop can range from 8” to 17” of water per acre for a particular crop cycle, depending on time of year and specific crop sequence. The California Irrigation Management Information System (CIMIS) has a network of sites throughout California and weather conditions at those sites is collected and made available on the CIMIS website (http://wwwcimis.water.ca.gov). The CIMIS site is useful for obtaining estimates of potential evapotranspiration for a given area and this number is used to calculate an estimate of the actual evapotranspiration for a specific field site; depending on the crop development stage and the soil water holding capacity. For these more detailed calculations a spreadsheet or notebook with the appropriate formulas should be used. Additional details of the calculations are available from the CIMIS website and the Fresh Market Caneberry Manual cited at the end of this article.

Soil type can influence the irrigation frequency because it determines the amount of available water that can be stored in the soil between irrigations. Caneberries typically have root systems that are most active in the upper 18” - depending on soil conditions. Heavier loam and clay loam soils hold more available water than sandy soils and the range across soil types is typically 0.7 inches per foot to over 2.5 inches per foot. The total available water content should not fall more than 20-30% from field capacity for moisture sensitive crops like raspberries and blackberries. Thus, it is easy to see that the best drought

management strategy is to cut back acreage to assure adequate and consistent moisture.

Much of caneberry production on the California coast has moved into high tunnels for much or all of the crop cycle and the tunnel environment reduces water use by 20 to 30%. Tunnels also create a somewhat warmer and dryer environment for the plants and protect them from wind and sunburn.

Salinity problems often develop during even brief drought periods and this can be related to soil salt accumulation, water quality deterioration, decreased rainfall, or most often, a combination of these factors. Winter rains traditionally flush salts that have accumulated in the soil profile over the prior dry season and this returns the soil root zone to acceptable salinity levels. When winter rains are deficient, irrigation with increasing rates of water is necessary to flush these accumulated salts from the root zone. And the irrigation water contains some salts as well so the soil salinity cannot fall below that of the irrigation water as it might otherwise with normal winter rainfall. This is another reason why drought periods confound irrigation management and lower the overall efficiency of water use.

The clear message with small fruit berry crops then should be that in times of drought, reduce acreage rather then attempting deficit irrigation strategies.

For more information see: Fresh Market Caneberry Production Manual , Publication No 3325 (http://anrcatalog.ucdavis.edu/Items/3525.aspx)
