DROUGHT ADVISORY

EM4830E

VEGETABLE CROPS

Vegetable crops, with few exceptions, are grown under irrigation. Even in areas such as western Washington, where precipitation is relatively high, reliable yields generally require supplemental irrigation. In low rainfall areas, such as central Washington, irrigation assumes a special importance. Commercial vegetable production is possible here only because of irrigation availability. Drought conditions threaten vegetable production and demand more efficient water use.

There are two main reasons for irrigating vegetable crops. First, most vegetables have shallow roots, which rarely exceed 24 inches in depth. Second, the useful product is sold on the basis of fresh weight and appearance. These characteristics make vegetables particularly sensitive to water shortages.

Other reasons for irrigating vegetables include: allowing flexibility in planting time, establishing a more uniform plant stand, influencing soil temperature, controlling wind erosion, utilizing certain herbicides and soil fumigants more effectively, and assuring reliable yields. While the benefits may be difficult to quantify, they make irrigation an indispensable practice for growers.

Crop Requirements and Responses

Vegetable crops require from around 6 inches of water in a season for radishes to 24 inches for tomatoes and watermelons. Precise irrigation requirements can be predicted based on consumptive use and effective precipitation values.

Lack of water influences crop growth in many ways. The effect depends on the severity, duration, and time of stress in relation to the stage of growth. The large number of individual vegetable crops also complicates management.

Two sensitive periods are common to nearly all vegetable crops—during harvest and 2 to 3 weeks before harvest. More than 20 different vegetable crops are grown commercially in central Washington. These may be classified according to the edible product, for although all vegetables benefit from irrigation, each class responds differently.

Leaf vegetables. Cabbage, lettuce, and spinach are generally planted at or near field capacity. Being shallow rooted, they benefit from frequent irrigations throughout the season. As leaf expansion relates closely to water availability, these crops, especially cabbage and lettuce, are particularly sensitive to water stress during the period of head formation through harvest. Overwatering can result in burst heads.

Broccoli and cauliflower, although not grown specifically for their leaves, respond to irrigation much as the leaf vegetables do. Cauliflower, in particular, is noted for being sensitive to water stress at all stages of growth, responding to drought with reduced growth and premature heading.

Root, tuber, and bulb vegetables. In carrots, beets, radishes, potatoes, and onions, yield depends on the production and translocation of carbohydrates from the leaf to the root or bulb. The most sensitive stage of growth generally occurs as these storage organs enlarge. Carrots require an even and abundant supply of water throughout the season. Stress causes small, woody, and poorly flavored roots. Uneven irrigation can lead to misshapen or split roots in carrots and early bulbing in onions.

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Fruit and seed vegetables. Cucumbers, melons, pumpkins and squashes, lima beans, snap beans and peas, and peppers and tomatoes are most sensitive to water stress at flowering and as fruits and seeds develop. Fruit set on these crops can be seriously reduced if water becomes limiting. Regular supplies of water during the period of fruit enlargement can reduce the incidence of fruit cracking and blossom-end rot in tomatoes. Irrigation is often reduced as fruit and seed crops mature.

Irrigation Practices and Strategies

Water is a precious resource. It is also a costly input that must be managed properly. Efficient irrigation demands application of the correct amount of water at the correct time. A number of irrigation practices and strategies are recommended for vegetable crops to make every drop of water count.

1. **Reduce area planted.** Reducing irrigation below the level required for best production can reduce yield and quality of vegetable crops greatly. No advantage is gained in trying to spread a given water supply over too large an area. When irrigation water is in short supply, it may be necessary to take some land out of production. If you have a choice, plant the most productive land rather than marginal land.

2. **Select less sensitive crops and cultivars.** Commercial growers weigh economic factors heavily in selecting crops. However, during periods of anticipated drought, factors such as water requirements assume increased importance. Certain crops and cultivars are less sensitive to short periods of water stress than others. These are not necessarily the highest yielding selections and may not have greatest market demand. Short season cultivars generally require less water.

   When released as a new potato cultivar in 1974, 'Nooksack' was reported to be less sensitive to soil moisture fluctuations than 'Russet Burbank.' Trials conducted in central Washington confirmed this water stress resistance. 'Nooksack' produced a higher percentage of US No. 1 tubers than 'Russet Burbank' when grown under conditions of declining or interrupted irrigation. However, total yields were reduced in both cultivars.

3. **Begin season with adequate soil moisture.** Preplant irrigation benefits many vegetable crops. Such irrigation builds subsurface soil moisture and promotes a deeper root system. Avoid over-irrigation, which wastes water and can leach chemicals into groundwater supplies.

4. **Establish proper plant stand.** Rapid emergence and a uniform plant stand make the most efficient use of soil moisture. Wet soil exposed to sunlight has greater evaporation loss than does soil shaded by a crop. Once a full canopy has developed, differences in evapotranspiration per area due to plant population are negligible. Reducing the plant population in vegetable crops saves little water.

5. **Consider transplants.** Proper germination and emergence in the field require careful water management. Less water and more precise control can often be obtained by using transplants. Once in the field, however, transplanted crops generally develop shallower root systems than direct seeded crops and may require more frequent irrigation.

6. **Use mulches and row covers.** Vegetable growers commonly use mulches and plastic or spunbonded row covers to increase temperatures for more rapid plant growth. These also can save water by reducing surface evaporation.

7. **Consider drip irrigation.** Drip or microirrigation is an expensive, but efficient system of irrigating high value crops, such as vegetables. Combine use of such systems with mulches and row covers for added efficiency.

8. **Improve irrigation scheduling.** Good irrigation scheduling is essential for all irrigation systems if growers are to apply the correct amount of water at the correct time. Irriga-

tion scheduling requires careful attention to monitoring soil moisture, climate, and crop growth.

9. **Maintain proper Soil structure and fertility.** Proper soil structure permits optimum infiltration and water holding. Proper soil fertility encourages the best plant growth and utilization of available soil moisture.

10. **Achieve good weed control.** Weeds compete with crops for soil moisture and decrease yields. In particularly weedy fields, weeds can use more water than the crop. Good weed control reduces competition for soil moisture and increases water use efficiency.

11. **Maintain good plant health.** Insect and disease damage restrict the growth and water use efficiency of vegetable crops, reducing both yields and quality. Maintaining good plant health is especially important in regard to diseases classified as wilts, which reduce the ability of the crop to absorb and translocate water.

Careful attention to irrigation is always an essential part of vegetable production and will pay off with improved crop quality, a more reliable product, and greater profit. As production costs rise, so do the needs to safeguard investments in seed, fertilizer, labor, and land against losses resulting from changes in the weather.

Vegetables are more sensitive to water stress than are most other crops. Even short periods of drought can adversely affect both yield and quality. Commercial production in central Washington should be considered only where adequate water supplies are available.

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

Drought advisories and other Washington State University Extension Bulletins are available online at
http://pubs.wsu.edu
Type "drought" in the search box for downloadable files.

By Erik J. Sorensen, Ph.D., former Washington State University Extension Area Agent—Horticulture, Benton and Franklin counties. Reviewed by An N. Hang, Extension Agronomist, Washington State University Prosser Irrigated Agriculture Research and Extension Service (WSU-IAREC).

College of Agricultural, Human, and Natural Resource Sciences.

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