

START RIGHT WITH AVOCADO ORCHARD SPRINKLERS

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In California most avocado orchards are irrigated by sprinklers. Sprinkler irrigation is preferred in avocado areas because of its adaptability to orchards with steep terrain, shallow soils and high water cost, and for its convenience of operation. Avocados respond to proper irrigation management. Definite practices must be followed to avoid problems such as salt buildup from inadequate moisture on the one hand to waterlogging and root decay from excessive watering on the other. It is important that special attention be given in the design of sprinkler systems in avocado orchards. Attention and expense invested in adequate planning is more than repaid by satisfactory operation and performance. This article presents a method that orchard managers can follow in determining if sprinkling is a suitable irrigation method for an orchard, and it outlines steps in planning and operating orchard sprinkler systems.

WHY SPRINKLERS?

Every grower looks for better returns to justify capital expenditures such as sprinkler systems. This net profit increase may come from an improvement in crop value, a reduction in overall production cost, or a combination of both. In addition, there are factors such as convenience or greater labor efficiency favoring sprinkling. Some of the advantages are: (1) Better water control because the desired amount of water can be applied to a selected location. This is especially important in avoiding and containing root rot, an incurable soil borne disease. (2) It is possible to irrigate satisfactorily on a variety of terrain; topography is not limiting as with surface flow. (3) A wide range of soils can be irrigated since adjustments can be made for changes in depth, moisture storage capacity, and water intake rate of the soil. (4) Waste is reduced, especially important where water is expensive as it is in many avocado growing areas. (5) Mechanical labor savers can be incorporated into the design to reduce labor inputs. A few limitations with sprinkler irrigation include: (1) High initial cost for some installations. (2) An improper system may be designed because of inadequate information about soil, topography, water supply, and crop. (3) Salinity control may be difficult.

After evaluating the pros and cons, many orchard managers have tried sprinklers and found improved tree performance. They prefer this method to other types of irrigation.

MANAGEMENT, KEY TO SUCCESS

The role of farm management in the avocado irrigation program is to develop objectives and policies that give the operation of the grove purpose and direction. The objective of

any orchard operation is to make a profit. The policy is to do this as efficiently as possible. The duty of a grove manager is to achieve this objective or goal by a production program that covers each phase of culture.

The management approach is a practical method for developing the irrigation phase of fruit production. Installing and operating any irrigation system requires sound decisions which are the result of this management approach, namely, planning, organizing, coordinating and controlling.

The technique utilized by management begins with a collection of accurate data and measurements pertinent to the orchard's location and topography, the climate, the soil, the water supply, the tree, and its water use characteristics. Next comes the evaluation of this information leading to decisions about the method of irrigation. If sprinkling is chosen as the method, then comes the job of designing the system and organizing the various components such as sprinklers, pipe and pump. This is followed by physical installation of the designed system. Next, the system is put into operation and checked out to see that its performance measures up to expectations. Finally, it is soundly operated according to trees' needs and soil characteristics.

PLANNING

In planning an irrigation system it is necessary to bring together the objectives of the system, develop procedures for operations, and establish goals related to performance. Good planning results in a sprinkling system design achieving the intended results.

In planning an irrigation system the following information must be secured and evaluated prior to the design stage. Boundary and topographical surveys of the land should be made that show acreage, elevation contours, location of buildings, roads, pipelines and other items of culture. The soil should be investigated for depth, structure, texture, salinity, lime content, and special features such as stratification, claypan, hardpan or consolidated material within the rooting zone. Any soil characteristic that impedes water movement increases the risk factor of avocado root rot. If necessary, simple tests should be made of the water storage capacity and water intake rates.

Effective irrigation requires various climatological information such as length of growing season, periods of maximum and minimum temperatures, humidity and air movement. This information leads to an understanding of water use by the trees. The water supply should be investigated as to its quantity, quality and availability. Avocados require water of low salt content. In some cases attention should be paid to its legality. The behavior of the tree itself should be considered. Avocados are susceptible to an incurable soil borne disease, root rot, in addition to salinity. Irrigation and soil management practices must include considerations about the disease and salt control in the planning stage. Planning should also consider that an orchard requires maximum water during the warm, summer and minimum amounts during the cool winter. Trees growing where climate is cool and moist require less water than those growing in a hot, dry climate.

ORGANIZING

The organization phase of a sprinkler system's development is the bringing together of components that result in a design accomplishing the desired results. With the information accumulated during the planning phase it is now possible to calculate sprinkler application rates and irrigation frequency, determine sprinkler and pipeline layout, obtain pump capacity, and compute installation cost.

Information about soil moisture storage capacity and the rate of the trees' water consumption gives the approximate irrigation frequency. The soil's water intake rate determines the application rate of sprinklers. The length of time a sprinkler operates is calculated from the intake rate and the moisture storage capacity of the root zone. Special attention should be given to salinity control and root rot hazard with avocados. The number of sprinklers operating at one time must allow for completion of the irrigation cycle without causing moisture stress to the trees.

The most economical system is one which operates continuously throughout the irrigation cycle. However, it is desirable to complete the irrigation with time to spare to permit completion of other cultural operations where the ground is dry.

COORDINATING

Considerable coordination takes place automatically during the planning and organizing of a sprinkler system. However, there are occasions when certain features of a design must be adjusted. For example, a supply source such as a water district may change its policy about the hours that water will be delivered. This may cause a storage reservoir to become a necessary part of a sprinkler system. All facets of design and installation must be coordinated to the new feature so the resulting sprinkler system is capable of doing its intended job.

Irrigation operations must be coordinated with other phases of orchard cultures as well as the changing needs of trees resulting from weather and soil factors. It may also be necessary to redesign pipeline layouts because of changes in harvesting, pest control, or soil management practices.

CONTROLLING

This phase of sprinkler irrigation is concerned with the system's meeting its desired efficient operation. Satisfactory results would include: (1) high level of production, (2) suitable fruit size and quality, (3) reasonable production expenses, and (4) reasonable labor inputs. Since irrigation has a pronounced influence on each of these factors, it follows that some means of measurement and control are necessary to insure proper irrigation practices giving the desired results. Control in this sense means keeping track of performance and adjusting it when required.

The methods of the measuring and controlling system will be determined by the nature of the enterprise. An orchard that is owner-operated requires the simplest mechanisms, while large management concerns may demand complex records and files to assure a job being done properly. Here are some suggested guidelines for growers to consider

as they set up the control system for their orchard operations, especially sprinkler irrigation: (1) Maintain records on production and income in a manner that permits analysis of separate units. (2) Maintain records on expenses and labor inputs in accounts that also permits analysis of separate units. (3) Maintain records on water application and use, irrigation intervals, amounts and dates of application. (4) Attempt to make irrigation timing schedules as objective as possible by use of instruments such as tensiometers that remove the guesswork from the two strategic control points—turning the water on or off. Monitoring moisture enables performance with minimum root rot risk. It also provides salinity control information. (5) Compare records of performance and inputs during the growing season and adjust where required.

IMPORTANCE OF EFFECTIVE IRRIGATION

Water is essential for plant growth. Both the yield and quality of fruits depend on an adequate and timely water supply. Drought or water stress means smaller fruit size and reduced tree vigor, and contributes to excessive leaf drop. On the other hand, waterlogging of the root zone results in root decay, poor tree growth and, eventually, an uneconomical orchard. Effective irrigation attempts to supply the needs of the tree for maximum return and minimum hazard. The management approach discussed for developing an avocado orchard sprinkling system integrates these considerations into the design. Attention to good planning, organizing, coordinating and controlling result in an efficient system that gives satisfactory operation and performance.