

Extension Toolkit Notes

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Considerations for Vineyard Drip Irrigation Systems

Notes Compiled from—

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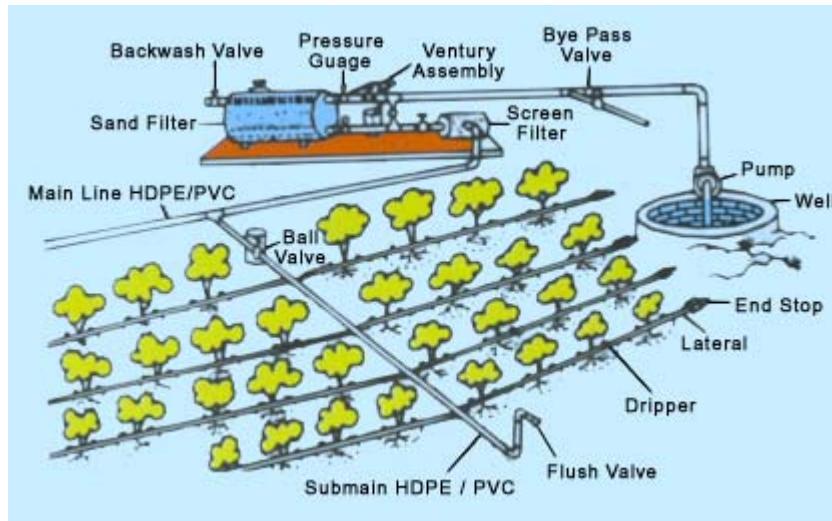
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Drip Irrigation - A grape grower's guide, 70 pages, published by NSW Agriculture. It is written for grape growers by a team of Australian extension officers and manufacturer's reps. It costs around \$10 AUD; first published in 1993 and now has a second edition. Copies available by contacting NSW Agriculture at Daretton (write to NSW Agriculture, Daretton, NSW 2717, Australia or send an e-mail message to Mr. Eddie Parr, Program Leader, Water Management at NSW Agriculture's head office at Orange. parre@agric.nsw.gov.au)



1. Advantages of drip irrigation

1. Drip is adaptable to fields with odd shapes or uneven topography. Drip irrigation can work well where other irrigation systems are inefficient because parts of the field have excessive infiltration, water puddling, or runoff.
2. Drip irrigation can be helpful if water is scarce or expensive. Precise water application is possible with drip irrigation. Irrigation with drip can be more efficient because evaporation is reduced, runoff is reduced or eliminated, deep percolation is reduced, and irrigation uniformity is improved so it is no longer necessary to "over water" parts of a field to adequately irrigate the more difficult parts.
3. Proven yield and crop quality responses to drip irrigation have been observed in onion, broccoli, cauliflower, lettuce, melon, tomato. Grapes were one of the first crops to use drip irrigation and it is widely used by California grape farmers.

2. Disadvantages of drip irrigation

1. Drip irrigation systems typically cost \$500 to \$1,200 per acre. Part of the system cost is a capital investment useful for several years and part of the cost is annual. Systems can easily be over-designed. Growers without experience should start with a simple system on a portion of the vineyard to gain management experience.
2. Drip tape has to be managed to avoid leaking or plugging. Drip emitters (the part of the system that delivers water to the plant) can easily be plugged by silt or other particles not filtered out of the irrigation water. Emitter plugging also occurs by algae growing in the tape and chemical deposits at the emitter. Tape depth will have to be carefully chosen for compatibility with other operations such as cultivation and weeding.

3. Major Components

1. Drip emitter configurations
 - a) Compensating drip emitters: provide nearly the same discharge rate over a wide range of operating pressures.
 - b) Non-compensating emitters: will have a change of discharge rate corresponding with a change of operating pressures; their application is most advantageous with changing topography or extended tubing length.
2. Drip emitter styles
 - a) Online emitters: are typically attached to the outside of the supply tubing in the field using a barbed fitting. Thus the emitter spacing can be random or repeating, depending on the desired outcome.
 - b) Inline emitters: are placed inside the tubing during the manufacturing process and are spaced at a predetermined interval.
3. Reservoirs

Reservoirs (water tanks) must be large enough to service the daily water needs of an entire field. Otherwise, their intake rate from a well must be sufficient to recharge them before they empty. A trellised vineyard (~1260 vines/ha) on a single wire system (small canopy) in California during peak season uses 35,500

liters/ha daily; a crossbeam trellised system (large canopy) uses 47,200 liters/ha. Vineyards in Shamali that are not trellised probably require at least 19,100 liters/ha daily during the peak season.

4. Filters

A drip irrigation system must have a filtration system to prevent emitter clogging (even with a filtration system emitters can become clogged). Many systems use sand filtration in the reservoir to filter out particles from well-water. If the water source is dirty (e.g. pond or river water) then an additional screen filter may be required.

5. Chemicals

Periodic application of chlorine tablets to the reservoir are required to keep algae growth from clogging lines and filters. Dilute acid also should be flushed through the lines periodically to prevent the build-up of calcium deposits that will clog the lines.

4. Above-ground systems

Most drip irrigation systems use a wire hung approximately 16 to 24 inches above the ground to support the irrigation tubing along the entire length of the grape row. During system operation, water is applied between the vines from the drip emitters.

Problems with above ground systems

1. Above ground drip irrigation promotes weed growth and moisture directly under the vines. Weeds are more difficult to control here as opposed to the row centers.
2. Pre-emergent herbicides are washed out during the growing season due to the large amount of water applied under the drip emitters.
3. Most vines are grown on berms, and in clayey soils water runs off to form tire ruts in the rows.
4. Moisture is always problematic under the vine canopy, especially where the drip emitters are placed.

However, despite these problems the use of above ground drip irrigation on grapevines has proven to be an effective method for producing grapes. Placing the emitters above ground allows for observation during operation and easy replacement of defective emitters.

5. Underground Systems

When the emitters are placed 18 to 24 inches beneath the surface and directly in the row middle, weed growth is suppressed. Placing the emitters closer to the surface will allow moisture to reach the surface and support cover crop growth.

Problems with underground systems

1. The major concern with underground installations is plugged emitters. Plugs from root intrusion. Root intrusion must be controlled through some type of chemical

barrier. The use of Trifluralin is the most common method for control of root intrusion.

2. Plugs from soil ingestion occur at system shutdown. As water drains in the system it can create a vacuum which can suck back soil particles from outside the emitter. Saturated soil particles can become lodged in the emitter discharge opening. It is important that subsurface drip systems have proper air and vacuum relief installed to prevent these plugs.
3. It is not as easy to discover system problems when the emitters are placed underground.

6. Drip irrigation effects

Drip irrigation wets a small soil volume within which the root growth is restricted unless there is significant precipitation. Restricting the root zone can provide a means to control vigor; vigorous vines can be a problem because energy is spent on vegetative growth at the expense of reproductive growth (i.e. grape clusters). However, a root system that is too small may not take up sufficient water to satisfy canopy requirements during hot dry weather. This water stress can result in permanent leaf damage both from lack of water and overheating. A shallow root system is also more prone to winter freeze damage. It is important to install a drip system with appropriate emitter numbers, spacing and delivery rates and to operate the system at run durations that wet a sufficient volume of soil for the vine canopy size. Fertilizers that are broadcast onto the soil surface will not be carried to the roots except by rainfall.

7. Extension

A group of farmers in your district wish to speak to you about the water shortage affecting their vineyards. You know that boring wells will be required to alleviate their water problems. However, you are concerned that the agricultural use of well-water might lower the water table so much that drinking water might be threatened. One solution is to add a drip irrigation component to well-water use.

You need to consider the feasibility of such an approach before meeting with the farmers. What size reservoir would be needed to serve these farmers? What management tasks would be required to keep the system operational (would these farmers be capable of handling these tasks)? What are the expenses involved with a drip irrigation system? Can these farmers get loans to finance the purchase and installation of drip irrigation? Would a demonstration system be beneficial? Would enough farmers see it to justify the effort and expense in putting it in?