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Irrigation Solutions

The Advantages of Closely Spaced Emitters

Benefits of Closely Spaced Emitters:

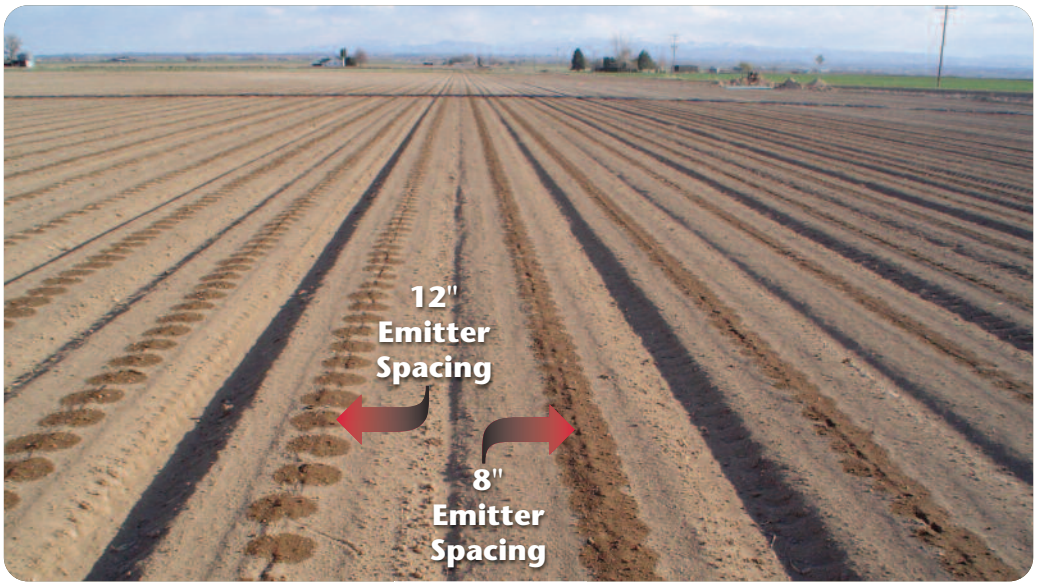
- Enhance salt management for seed germination
- Leach salts in permanent crops
- Dilute soil salinity for salt sensitive crops
- Achieve a more continuous soil wetting pattern on many soil types
- Manipulate the wetting patter as desired without raising pressures or requiring thicker mil tapes on wider spaced emitter tapes.

Drip irrigation allows for targeted water applications, where runoff, leaching and wetting of non-targeted areas is avoided or completely eliminated.

Choosing the right drip tape emitter spacing can be more of an art than a science. This is because of the many variables that exist in each farming application, including tape placement, soil type, crop, plant population, soil and water salinity, tape quality and cost, etc. Fortunately, Cal Poly San Luis Obispo's recent Drip and Micro Irrigation Design and Management Manual, published by the Irrigation Training and Research Center (ITRC) in 2007, provides a great deal of guidance for this important decision. In particular, the new manual discusses how closely spaced drip tape emitters can enhance salt management for seed germination, leach salts in permanent crops, and dilute soil salinity for salt sensitive crops. In addition, the manual highlights some of the agronomic and economic disadvantages of using widely spaced emitters. The following provides some discussion and excerpts from the manual.

Closer Emitters Improve Salinity Management

Salinity management is especially important during seed germination and emergence, and closely spaced emitters and bed shape can help. "Use surface tape (or tape only a few centimeters below the soil's surface) with closely spaced emitters to leach salts downward. In more arid areas, widely spaced holes (i.e. one tape for every two rows, or hole spacing greater than 16") can cause salt buildup between the holes. If seeds are later planted in those salty areas, they will



Toro Aqua-Traxx drip tape

Dual dripline on almond orchard.

not emerge. Decades of experience with flood irrigation has taught farmers to shape furrows so that salt-laden irrigation water evaporates at high points in the bed – and the plants/seeds are located at lower points. Likewise, drip irrigated beds should be shaped with an indentation where salts will accumulate away from the seed line planted below the indentation." (pgs.76-77).

Salinity management is also important in established drip irrigated orchards and vineyards. Drip laterals typically wet less than 40% of the total soil surface, and over time, salts carried to this wetted strip through the irrigation water will safely leach away from the soil close to the emitter. However, salts will concentrate in the soil as distance from the emitter increases. For this reason, the standard "leaching requirement" equations and principles for maintenance leaching are not applicable for drip/micro irrigation. Instead, periodic "reclamation" leaching is needed to remove the salt from these outer zones of the soil.

For reclamation, broadcast flood or sprinkler irrigation is typically used to leach these concentrated salts below the root zone, but this can be wasteful since only 20-40% of the surface area of the orchard or vineyard needs to be leached. "If 100% of the soil area is wet to treat this 20-40% of the area, 2.5 to 5.0 times the necessary leaching water will be applied. Most of the water is ineffective because it is applied to zones that do not need leaching." Instead, ITRC researchers have suggested using a portable drip tape system to "target leach" the orchard or vineyard dripline zone. In 2005, Burt and Isbell showed that salts were effectively removed in a pistachio orchard using six lines of retrievable surface drip tape with emitters spaced closely, 12" apart, to "target leach" the dripline zone. Subsequent leaching experiments closely match the pistachio orchard results. Once leaching is complete, the drip tape can be retrieved and reused. In this way, closely spaced tape emitters perform leaching with less water (pgs. 82-83).

Drip irrigation can also help dilute soil salinity such that yields may be improved. Yields typically decrease once the soil salinity reaches a threshold value, and as the soil dries in-between traditional irrigations, salinity concentration becomes worse. Irrigating frequently with closely spaced emitters can help. "Years of experience with drip have shown that if it is managed so that the soil salinity remains dilute, yields can be higher than they would be with the same water quality using sprinklers or furrow irrigation. For some crops such as processing tomatoes, some research has

observed (Hanson and May, 2003) that on very salty fields the crops have no damage even though the salinity levels would traditionally cause serious yield declines." (pg. 86).

Closer Emitters Provide a Better Wetting Pattern for Better Results

Closely spaced emitters can also help achieve the right wetting pattern, increase crop quality and reduce both purchase and operational costs vs. wider spaced emitters. "For the Central Coast of California, most growers use an emitter spacing of 8" – 16", with a shallow burial depth. Even with these close spacings it may be important to match the spacing to the soil type. Closer hole spacings can result in a more continuous soil wetting pattern. The most common hole spacing in California is 12 inches. Eighteen inch spacing is often too great. In order to use wide spacing (in SDI applications), one must do all of the following: a) Raise the pressure 20 psi during germination to provide a higher flow rate that subs better, b) Apply water to the soil surface until it is very wet (in fact, water will actually be standing in the furrows), and c) Use heavy wall drip tape (about 15 mil) in order to handle the high pressure without tape damage." (pg. 288.) Clearly, buying heavier mil tape, increasing pressures and wetting the soil surface are all undesirable side effects of using widely spaced emitters in an SDI application. Initial buying costs and post-purchase operation costs will be higher, and soil surface wetting may damage crop quality and/or encourage unwanted weed growth. For optimal performance, closely spaced emitters are often the best choice.

Closely spaced emitters can help push salts away from seeds and enhance germination.

In summary, ITRC's new Manual points out that properly managed drip systems with closely spaced emitters have many advantages. First, closely spaced emitters can help push salts away from seeds and enhance germination. Second, closely spaced emitters can be used to perform reclamation leaching in orchards and vineyards and significantly reduce water requirements for this task. Third, closely spaced emitters help to dilute soil salinity such that crop yield is not adversely affected. And fourth, closely spaced emitters can be used to manipulate the wetting pattern as desired without raising pressures or requiring thicker mil tapes.

References: Burt, C.M. and Styles, S.W., Drip and Micro Irrigation Design and Management for Trees, Vines, and Field Crops, 3rd Edition, 2007, Irrigation and Training Research Center, California Polytechnic State University, San Luis Obispo, CA 93407. www.itrc.org

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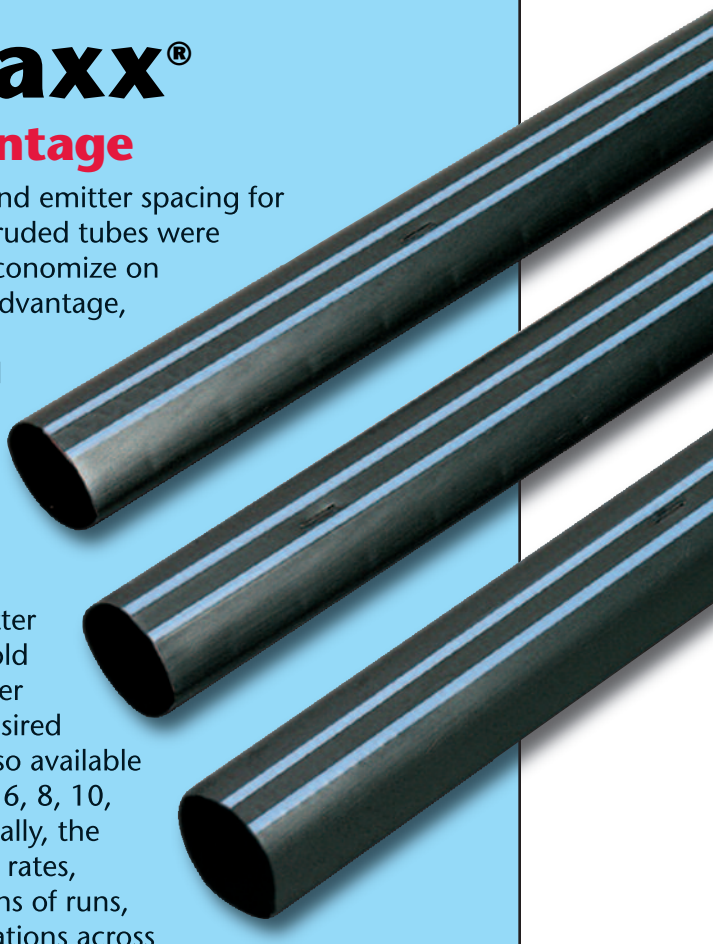
with the PBX Advantage



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