



# **DRIP IRRIGATED ALFALFA**

## How Subsurface Drip Irrigation Increases Productivity with Less Water

---

Amy Roberts  
February 2016

Brought to you by



California's drought continues to demonstrate how farmers forced to use less water are surviving (succeeded to raise crop productivity) by incorporating sub-surface drip irrigation onto crops once thought could only be watered via flood or sprinkler methods.

Alfalfa, an important economic part of the state's total acreage, is one such crop. While only about three percent of alfalfa growers have embraced subsurface drip to date, the potential growth is substantial and as the early adopters report higher productivity on less water, interest is growing.

Making the decision to invest in a field-wide capital irrigation improvement project may be daunting, but it ends up paying for itself much sooner than the life of the system in water savings, higher yields and improved forage quality.

Once the decision is made to install subsurface drip, farmers should allow time, energy and research to understand how this will impact the farm's working model. When changing any type of cultural practice, it's necessary to allow an adjustment and learning curve period to accommodate the conversion. In this case, alfalfa growers are shifting to greater water use efficiency, but it requires understanding water infiltration through the farm's soil type, monitoring soil moisture to adjust for optimum results, scouting the field for leaks, and stepped-up attention for vertebrate monitoring and trapping. While positive reports are encouraging farmers to evaluate the cost-effectiveness of switching to buried drip, one drawback is protecting the investment from gophers.

Growers using flood or sprinkler irrigation on alfalfa know there are populations of these pests in the soil profile - and likely chewing on some alfalfa roots and crowns. Switching to drip means growers must be committed to stepping up management of gophers or voles who, when encountering drip tape, will chew on it also. Keeping on top of pest populations, that may have previously only been considered a nuisance, will ultimately improve the detrimental aspects of vertebrate populations to increase yields.

---

## RANCH MANAGER SETH ROSSOW

After graduating in 2008 from Cal Poly in San Luis Obispo, California with a degree in agriculture, Seth Rossow was hired by Bert Wilgenburg Farms to oversee the revamping of the farm's alfalfa fields to incorporate subsurface drip irrigation. The drip irrigation and water management classes he completed sufficiently impressed the owner to earn him the job - and challenge - of completing this task on the ranch near Merced, in California's San Joaquin Valley.

"I was hired to change it from an older-school management to a new more efficient style," Rossow said of the project started in the fall of 2009. Part of the pre-planning process included deciding on which product to use. Rossow selected Netafim's 15 mil subsurface dripline for durability.

Before installing drip, he says, the farm averaged 8.3 tons per acre and used about 5-acre feet of water per acre, which yielded about 1.6 tons of alfalfa per acre foot of water used.

"After putting in all the drip and learning how to manage it correctly we're now getting 2.6 tons of alfalfa per acre foot which is a 62.5 percent increase of dry matter per acre foot of water used," Rossow said. "We save a bit of water, but we make a lot more yield so it's those ratios that really help start paying back. What water we do use, we use very efficiently."



Ranch Manager Seth Rossow surveys one of the alfalfa fields he manages.

Other benefits noticed after switching to drip, he says, include getting one point better test results in both crude protein and total digestible nutrients.

“A lot of that is due to the plant being irrigated more often in smaller amounts and goes through less stress patterns than a flood-irrigated field where it gets too wet and then too dry.”

The older irrigation method was much less intense, Rossow says, but despite needing more employees to scout the fields for leaks and staying on top of gophers, the end result is worth it.

### BEFORE SUBSURFACE DRIP

Yield = 1.6 tons/acre

### WITH SUBSURFACE DRIP

Yield = 2.6 tons/acre

**62.5% INCREASE**  
in dry matter per acre  
foot of water used

## GOPHER MONITORING & MANAGEMENT

Depending on soil type, gophers have the ability to dig through a substantial swath of ground.

The average depth they are found is between 6-12 inches deep, according to Roger Baldwin, a University of California Cooperative Extension specialist in the Department of Wildlife, Fish and Conservation Biology at UC Davis. However, he adds some nesting chambers can be found up to 2.5 feet deep and in some reported cases gophers have been discovered much deeper.

“You’re not going to get away from any of the damage by going deeper, and it’s just that much more difficult to repair at deeper depths,” Baldwin said of buried driplines in alfalfa fields.

“By moving to subsurface drip there’s going to be more gopher damage so growers have to be more diligent in scouting for them,” he says. “Controlling them should be a zero tolerance policy.”

He recommends growers focus their trapping control efforts during the winter and early spring before the crop starts growing to decimate the population. As the season initiates, Baldwin said, scouting after every single cutting is imperative to get rid of new gophers.

“It shouldn’t be too labor intensive once the field is under control,” he said acknowledging that getting it under control is the difficult part.

Where possible, kill trapping is often more effective than baiting given inconsistent bait consumption by gophers, Baldwin says. If baits are used, strychnine products are most effective. Other beneficial tools include fumigating with aluminum phosphide after a rain or periodically flooding the field to move them out. The injection of carbon monoxide from the PERC machine (<http://www.hmgophercontrol.com>) into the burrow system is also moderately effective, he said.

“The best advice I can give growers using subsurface drip in alfalfa is to be extraordinarily diligent. If you have gophers out there they are going to chew on drip tape and that’s going to cause problems so keep those populations as low as possible,” Baldwin stated emphatically.



Growers must be diligent in keeping gopher populations low to avoid drip tape damage.

## INSTALLING DRIPLINES

After the decision is made to install driplines, the next step is selecting a drip system best suited to fit the grower's site specifications and budget.

Besides having an array of products to fit those needs, Netafim USA offers assistance beyond installation to ensure the system is performing at peak efficiency.

Dennis Hannaford is Netafim's most experienced product application support manager. Based in California's San Joaquin Valley, he consults with growers anywhere west of the Rockies to facilitate a positive outcome for those using Netafim dripline.

While Hannaford points out that each field must be evaluated individually, part of his job is to evaluate regional differences so Netafim has a broader base of understanding site-specific needs.

He is also working with his colleague, Dr. Emanuel (Ami) Gips, a Netafim agronomist from Israel, to establish an optimal irrigation scheduling protocol.

Hannaford explains, that Gips is working in California, "to identify and fix the most limiting factor in our ability to produce high yielding, good quality alfalfa with high water use efficiency and we've identified irrigation scheduling as the number one factor that limits us."

Evaluating drip irrigation scheduling will also follow how the crop uses the water throughout the soil profile.

"The advantage of using drip is it has a very high distribution uniformity compared to other irrigation methods," he says, and the report will highlight how using drip in alfalfa fields will improve harvesting and productivity over other irrigation practices.

Hannaford points out that recommendations involving specific tape thickness, emitter and tape spacing, field preparation to install the tape, what depth the driplines are buried and other considerations are determined by the variables of the field and soil type. Generally though, he advises that the lines be buried

Rossow shows the dripline buried in his alfalfa field.



between 10-12 inches deep and 40 inches between lines. The cost of putting in a system, Hannaford says, can fall between \$1,800 and \$2,500 an acre, depending on how much field preparation is done by the grower.

Depending on what a grower wants and needs such as electrical access, pump availability, and other unknowns will determine the final cost of the investment.

Hannaford and Gips are also investigating the efficacy of placing lines 30 inches apart to prevent any striping in the field with the goal of improving overall efficiency.

"We've run some preliminary economic analysis with UC Davis and our corporation on 30s versus 40s and the return, we think, is there for the added investment cost," he says.

Regardless of the distance between lines, Hannaford stresses the importance of properly completing field compaction work after the tape is laid to prevent any rippling.

"That can trap water that comes to the surface and runs down like a furrow and eventually can drown out the alfalfa," he says.

The bottom line, Hannaford said, is the great need for continued alfalfa production in California and the future of using drip irrigation to meet that need will only increase. Netafim, he adds, is ready to help growers meet any water challenges through research and providing any necessary support.

## HISTORY AND FUTURE OF ALFALFA

The past and future of alfalfa is tied to California's robust dairy and livestock culture. The crop, first called Chilean Clover when brought to the state during the early part of the gold rush, was instantly successful on the state's deep soils and bright sunlight after the introduction of irrigation, according to Dan Putnam, University of California's alfalfa and forage crop specialist based at UC Davis.

As farms expanded to meet the needs of an exploding population, the hay-making business rapidly developed with alfalfa topping the list as the preferred hay crop to raise to feed dairy cows and horses. Today, it is still the favored feed choice.

**ALFALFA IS ONE  
OF THE TOP  
5 CROPS  
IN CALIFORNIA**

In terms of economic importance, alfalfa is one of the top five crops in the state bringing in over \$1 billion a year and ranks fourth in economic value nationally, Putnam says. Annually, California has between 850,000 to a million acres in year-around alfalfa production, making the amount of water required to grow the crop seem staggering, but he adds so would many types of crops planted in that amount of acreage.

As the state's drought worries escalate it's becoming more prevalent to point fingers at agriculture - and a crop like alfalfa - as using too much water, Putnam said.

On closer examination, though, he says alfalfa may be one of the best crops to have in a drought, due to its flexible ability to 'dry down' during summer months, unlike permanent crops such as orchards.

"At least a partial crop is feasible in water-short years, unlike most annual crops", Putnam said.

As a perennial crop with a fully developed root system, alfalfa can regrow early in the season as temperatures rise and its deep roots can penetrate residual moisture lower in the soil profile, he explained. Alfalfa is also able to tolerate brackish water and recycled wastewater and since 100 percent of the above-ground plant matter is harvested, that equates to a high water use efficiency compared to other crops. Putnam added that alfalfa can survive on less water if necessary although yields will go down and in extreme cases there's more flexibility to deficit irrigate the crop, which is not an option for most annual or tree crops.

"There are so many misconceptions about alfalfa," Putnam says. "One thing that is frequently said about alfalfa is that it has a low value, but it depends on how you judge value. In California alone it's worth \$1.2 billion per year, but more importantly it's a vital component of the top agricultural product in the state - dairy - worth over \$7 billion a year."

He added that individual farmers depend on alfalfa greatly to satisfy need and it represents a reliable crop that can be grown and cut numerous times with very low risk. It is also an important rotation crop for many farmers.

"We are continually looking at this issue of can you grow alfalfa with less water," Putnam said, noting that if only 50 percent of the required water needed is applied, growers can often obtain 65 percent or greater of normal yields.

In regards to drip, Putnam says growers need to justify the cost of adding it by harvesting higher yields over check-flood irrigation.



Alfalfa being picked up from a subsurface drip irrigation field on the Wilgenburg Farm near Merced, CA.

## IRRIGATION SUSTAINABILITY DRIVES NETAFIM

Celebrating its 50th anniversary of delivering water solutions to areas of scarcity, Netafim is a global leader in marketing drip irrigation products to secure a sustainable future.

As part of this goal, Netafim created an initiative five years ago to ramp up its efforts to market subsurface drip on alfalfa fields, said Todd Rinkenberger, Director of Sales for Netafim USA's Western Agriculture and Strategic Projects Division.

"We thought there was a good fit for our technology because of the amount of water the crop consumes at current farming practices and the ability to drive a solid return," he says of targeting alfalfa to more efficiently apply water and nutrient delivery while improving yields.

Ze'ev Barylka, Director of Marketing for Netafim USA echoes Rinkenberger's comments, adding when growers decide to install drip they are willing to make the investment to take advantage of the steep increase in yield production while saving a substantial amount of water.

"We approach new market opportunities incorporating agronomic discussions: the task at hand is not only to increase yields, but rather also to improve the quality of the yield," Barylka says. "It's about making the farmer successful."

He added that Netafim partners with different key influencers to study crops - in this case with Dan Putnam at UC Davis - to fully understand alfalfa and the exciting potential drip will have on the crop.



Netafim distribution center in Fresno, CA.

