

BERMS: For citrus production

by Roger Smith

In the past decade, some farming operations have adopted a concept that had not been commonly utilized in California. This concept requires an added cost per acre when developing a citrus property. The use of berms or mounds as indicated in the photo, is an interesting effort that lends itself to further discussion.

When looking into the literature and research studies that have been done on berms for citrus production, it is easy to see the value of their use in areas of high rainfall. In the Indian River region of Florida, these berms are extensive and can be as deep of five feet from the top of the berm to the bottom of the trench between the berms. The compelling reason for this degree of grading is the massive amount of rainfall that drenches the area as tropical storms and hurricanes move through this east coast region of the Florida Peninsula. It is not uncommon in this region to have many inches of rain in one day, so the berms function as a means to conduct this massive amount of rainfall away from the trees.

In addition to the periodic downpours, the water table in this area of Florida is very high. So high in fact, that the root systems often can only survive in the top 12 inches of soil. The use of berms greatly enhances the ability of citrus trees to survive in regions of high rainfall.

California is far from falling into the high rainfall category. So the question is, why go to the extra expense of berms if their primary use is to improve drainage in high rainfall areas? This expense can be as low as \$100 to as high as \$475 an acre, which is a significant additional cost to any new citrus development. This additional cost can't be taken lightly and there should be results in the new planting that would guarantee economic payback of the added costs.



Dense planting of mandarins on high berms with flat middles. Trees 1 1/2 years old.

PROS AND CONS FOR BERMS IN CALIFORNIA

Most of the companies we talked to that are committed to the use of berms in their new citrus developments rely on personal experience or anecdotal evidence as justification for the added developmental costs that berms require. We also found different approaches to how big the berm should be. Here are some of the advantages that were shared with us:

1. Moves water down and away from the tree's root system.
2. There is the rationale that the top of the berm may heat up faster than traditional plantings on flat fields. This may encourage faster root development on the berms.

3. Trees on berms have appeared to grow about one-third faster than trees planted using traditional methods of land preparation.
4. The incidence of soil borne diseases may be reduced.
5. Fruit drops and rolls toward the middles, which keeps inoculums that cause rotting away from the tree.
6. Development of berms creates more aeration in the soil, which allows for more rapid rooting of the developing tree.
7. It inhibits lateral movement across a grove, which restricts foot traffic that could spread soil pathogens throughout the property.

Please see **BERMS** on page 3



“Industry Interview”



Tom Avinelis operates AgriCare Inc., a diversified farm management company that principally cares for citrus, grapes, cherries, and olives. The company is based in Terra Bella and provides services in Kern, Tulare, and Fresno counties. Tom worked as an agronomist for 6 years prior to returning to farming and starting AgriCare in 1993.

TS: What do you think of berms for citrus plantings?

Tom: We've bermed 80% of our citrus plantings in the last five years and have been using the concept in many of our citrus developments for the last 8 years.

TS: What is your berming strategy?

Tom: If anything is under drip we berm it. By berming, you concentrate a higher percentage of roots in the berm and this is an important part of managing a drip irrigation system. Many of our Clementine developments are on

drip because it allows us better irrigation management, which is a critical management tool for setting and holding a Clementine crop.

In other citrus crops, we berm for different reasons. Many of the best citrus locations tend to have shallow and heavier soils, so we use berms on those soils to maximize topsoil development. When you berm on shallow soils, the active soil at the base of the tree can be expanded from 18 inches up to 32 inches. This creates a better soil environment near the tree and allows better drainage which keeps standing water away from the trunk of the tree.

In our industry we have very few soils with a uniform soil type so we find ourselves irrigating to the middle, which means some of the grove is either under irrigated or over irrigated. The berm buys you a layer of “caution factor” that helps you not over irrigate and gives you more loose topsoil to work with than a flat planting.

TS: What made you decide to implement berming strategies?

Tom: General observations of different crops and their performance and evaluation of old orchards that have low spots with standing water. Also, all of our new citrus plantings are high density and higher density plantings lend itself to a berming program like in many other

crops like grapes, almonds, and cherries. These crops have a tremendous improvement in growth versus flat plantings.

TS: Have you seen “tremendous improvement” in citrus plantings?

Tom: It's difficult to gauge because many of the orchards aren't old enough. I haven't seen big differences in our young citrus plantings yet. I think in some soils you're not going to see a big difference, but berms are a significant tool for certain varieties and certain soils to maximize their long-term potential. There is a real benefit in heavier soils and shallow soils, but you won't see as many benefits with lighter, well-drained soils that are irrigated with mini-sprinklers.

TS: What are the costs?

Tom: About \$50-75 an acre in order to construct the berm that measures about 6 feet by 2-2.5 feet in height. We try to keep the costs down and use a scraper/terracer, or border discs.

TS: Any 20-20 hindsight or things you've learned?

Tom: A mistake we made when we did the berms prior to planting, we buried the drip hose to minimize damage by coyotes. We buried the hose too deep, which exposed it to

Please see **INTERVIEW** on page 4

Tree Pick-up Procedures

Call our office at (559)592-2304 about 2-3 weeks before the day you want to plant.

WE NEED TO KNOW:

- **The EXACT tree count.** Please don't rely on the count of the crew that marks the field. Sometimes they make mistakes and it is best to double-check their count before you call us. Always count a field twice to avoid errors.
- **The address and the county of the planting location for the Ag Permit.**
- **The name of the bins you are providing for the trees.** We put 50 balled trees and 220 citripot trees in each bin. We request you drop the bins at the nursery 7-10 days prior to your planting date.
- **Whether you want us to deliver the trees or you want to pick them up yourself.** We charge a modest delivery charge and use Danny Lopez who provides us with very fair rates. His drivers are also experienced tree haulers and forklift drivers. If you have less than 200 trees, it pays to pick them up yourself.
- **The time you need the trees delivered.** Once scheduled, make sure we know of

any delays. We try to be ready in advance of your planting date, so please notify us right away if a problem comes up.

Good communication helps us serve you best, so give us some time to handle your order properly. We also are providing a brochure that will help you plan out the planting process. Pick one up at the Ag Expo or call us and we'll mail you one.

Tulare County regulations require a moving permit for ALL citrus trees and budwood. Even small orders need a minimum of 48 hours notice for us to get the paperwork done. 🍷



BERMS continued from page 1

8. It may help in draining off cold air. Because cold air runs like water, it is possible that berms may move that air out of the grove more effectively.

The above advantages have to be balanced with a few challenges. In our investigation, we also discovered some skilled growers that aren't convinced that berms are always a good idea. The use of berms in citrus plantings does create some long-term consequences that are not always easy to deal with. Those may include:

1. Irrigation water for young trees may run off the berm and not effectively irrigate the newly planted tree.
2. Harvest is more difficult on large berms. When picking citrus groves, lateral movement on foot is required, often while carrying a 16-foot ladder. Climbing up and over berms encumbered by a ladder and heavy picking sack makes the job of harvest more difficult for fieldworkers and would slow their efficiency and production per day.
3. Lateral movement is very difficult. If an irrigator needs to move across the tree row, he either must go up and over the berms or travel to the end of the grove.
4. Cross-hedging or cross-row weed spraying is very difficult or nearly impossible to achieve with berms.
5. Berms require modification to orchard equipment. In some berm designs, the drive row is not flat. So machines like brush shredders, mowers, boom weed sprayers, etc., must be modified to accommodate a v-shaped drive row.
6. The cost of development is increased by \$100 to \$475 per acre. These costs are not just the costs of berming, but also the costs of insuring the ends of the grove are properly graded and that there is a proper accommodation for runoff water.
7. Large berms on undulating field may create mud holes that can't drain. It may be advisable to plant flat and invest the money saved in tile drainage systems.
8. If berms are primarily to improve drainage, installing on hillsides may not be necessary since hillsides automatically drain. They may be helpful to increase soil depth.
9. Some believe berms may restrict the maxi-



Young planting on high berms with V-shaped middles. Property has undulations.

imum soil area an older tree can access when compared with flat ground. Research should be done to investigate this concern

10. Tillage between berms may be difficult and could cut roots if the equipment comes too close to the berms. (Some growers offer that a little root pruning is a good thing).

DISCUSSION

Because of the absence of university trials in California, comparing the use of berms versus traditional methods makes it difficult to recommend the practice in all cases. There is no question that working the soil and raising the beds creates a better environment for root development. What is difficult to justify is the added expense per acre. It isn't clear yet that there is adequate payback for the increased cost in development, but it is clear that there is only one time to create a berm and that is prior to planting.

Where citrus is planted in Central California, soil types vary dramatically. Heavy Porterville adobe clay, fine sandy loams of Sanger, the red San Joaquin soil series, and the light wind-blown soils of Kern County, there is considerable variation. To be able to make a blanket recommendation for that many variables is impossible. But it is possible to say that berming is a great help for heavy soil conditions, shallow soils, or areas where there is poor drainage. It isn't clear what the

advantages of berming are for lighter soils, but it must be mentioned that many progressive citrus companies have chosen to berm even where light soils exist.

In the field nurseries at TreeSource, we find that improving the drainage around the root system of young nurs-

ery trees is an important factor that may actually enhance root development. If this same effort is accomplished by berms in the newly planted citrus grove it may truly encourage that grove to come into production faster. A citrus grower must focus on doing everything in his power to create the optimum environment to encourage the root development of young trees.

The advantage of the berm is that it forces the grower to do the optimum amount of land preparation prior to planting. This one factor may be enough of a justification to encourage the investment in building berms for new plantings, but it cannot be over emphasized the importance of trees getting adequate water when they are sitting on top of a "hill." At TreeSource, we encourage you to take the time to work the soil and prepare your site to encourage optimum root growth for the new trees we supply. A part of that process can be the use of berms, but their use may not be justified in all circumstances. ☺



4 year old Mineola/trifoliolate on shallow berms with flat row middles.



502 North Kaweah, Suite "B"
Exeter, California 93221

Presort Std
U.S. Postage
PAID
Visalia, CA
Permit #520

INTERVIEW continued from page 2

moles, gophers, and the tree roots grew over and around the hose. We'll never do that again! Now, the soil cover over the hose is very shallow and at least 18 inches away from the tree trunk. It still reduces coyotes chewing on it without the other negative problems.

For sandy ground with mini-sprinklers, I don't see a lot of advantage to berms and I don't

think berms make a whole lot of difference one way or the other. Also, ideally from a tillage standpoint, you need to go to non-tillage. You leave yourself to a wider area of damage to the roots by tillage when a lot of the roots are concentrated in the berms. Berming doesn't change our farming techniques all that much.

TS: Final comments?

Tom: I think it's important to look at every piece

of ground and develop strategies for each piece. We need to ask ourselves, how can I best grow roots to maximize the development of the plant? For citrus trees, we have one time to do it right and that's before we plant. I think that even if berming adds to developments costs, that the long-term benefit outweighs the short-term costs.

TS: Thanks Tom. ☺

FOR THE BEST SELECTION

NOW IS THE TIME TO ORDER FOR 2005

B&B TREES: \$8.75*

Custom budding deadline March 1, 2004

4" X 18" CITRIPOT: \$7.50*

Custom budding deadline September 1, 2004

*prices do not include royalties

SOME TREES STILL AVAILABLE FOR 2004!!

Call Roger Smith at 559-804-6176 or stop by our booth at the AgExpo to book your order.

ALSO AVAILABLE:  **ROOTSTOCK SEEDLINGS**  **ROOTSTOCK SEED**  **REGISTERED BUDWOOD**

Come visit us at the

2004 World Ag Expo

February 10 thru 12, 2004

Pavilion "A" • Booth #1073

Come and take a look at our "Starter Trees" & "Citripot Trees"

