PORTABLE IRRIGATION ON THE RIDGE

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Does Irrigation Pay? This question has been asked many times by Growers located in the Ridge Citrus Producing area of Florida. If it does not pay, there has been millions of dollars very foolishly spent in the Ridge area, especially in the past two years. There are two methods of irrigation used in this area I am discussing. First, is with permanent installation of pumps with power units, using underground mains or conductor lines and either overhead sprinklers or portable sprinkler or flooding lines. This type requires greater initial investment with less operational expenditures. The second type is with portable pumps and power units and portable conductor and distribution pipe. With a source of water available, this type of unit can be moved from property to property, thereby on an acreage basis reducing the initial investment but, increasing the operational expense. This method is used by many in the Ridge Section which has many lakes.

Do you know that many Growers who were dependent on Portable Irrigation during the past spring and summer, have more money invested in the present crop for irrigation than all the other production costs combined? Yes, when a property is far removed from a source of water, portable irrigation certainly does deplete the bank roll fast. This is true even if you own the equipment and not just when you hire it done. In addition, it is a job which has no end until it rains. When will it rain is the sixty-four dollar question.

In my opinion there are two types of irrigation. One is "Preventive" which implies not allowing the tree to develop a tight wilted leaf condition or soft fruit and the other is "Curative." This type is used in salvaging a crop or preventing mortality of the trees.

It is bad, but true that many Growers never plan on irrigation until it gets dry. Then those without irrigation get panicky and will pay virtually any price to obtain water. Unfortunately, in many cases this type of irrigation presents the greatest gamble.

My initiation to portable irrigation was with a worn out Buick motor and a low head centrifugal pump. The suction was a 22-foot length of 6-inch well casing. There were 400 feet of 6-inch 28 gauge galvanized slip joint pipe for conductor line and 2,000 feet of 4-inch, 28 gauge slip joint pipe for conductor and distribution line. The distribution was by the flood system. I had many experiences in attempting to keep water on the tops of some of those hills or preventing washing on the hillsides. Of course, keeping pipe together going up some of the steep grades sometimes produced a problem. The principle requirement then to operate that type of unit was the "Patience of Job." If we had the maximum of luck, we put water on part of ten acres in four twelve to fourteen hour days. As usual, during most dry periods we were working around the clock.

During the late thirties after two successive dry Springs with very little irrigation and much hauling of water in barrels to groves, some decent portable irrigation equipment began creeping into the picture. The pumps and power units were some better but the big improvement was in portable pipe. This was known as "Lock Joint Type." It was fourteen gauge zinc coated steel with enlarged or bell type female end. Inside the female end was a rubber gasket. This gasket grew tighter as

water flowed from the pump. Protruding from the female end were two or four receptacles so arranged that when the lugs, located on the male end, fitted into these recesses and the pipe was slightly turned, it locked. In addition to being virtually leak proof, under pressure, and slightly flexible, in the event of a power unit stopping and the foot valve on the pump suction not seating there would not be a vacuum created and causing the pipe to flatten. This was the case with slip joint pipe. The main trouble with that zinc coated steel pipe which was in sixteen foot lengths, was its weight. One man could carry it but with great difficulty. During the war years with a scarcity of labor, this presented an acute problem.

The labor problem and the increased use of aluminum after World War II was the next important step in Portable Irrigation. The production of portable aluminum pipe began to appear in this territory. This was a definite improvement. Not only a labor saver, which was greatly needed, but due to less pipe friction more water was pumped with less power through the same size pipe. With this type pipe, using 4-inch sprinklers one Grower's daughter in our organization handles the moving of the sprinkler lines by herself.

Along with aluminum pipe there developed more careful selection, by the buyer and seller, of the pump and power unit required for that particular job.

In the past a Grower bought a pump and obtained a power unit of some description and hooked them up. The power unit might gain maximum efficiency at 2,400 RPM and the pump at 1,600 RPM but it didn't make a great deal of difference. The main object was to have at least some water flowing at the end of the pipe.

At the present, one sees high head pumps, which pump a great deal of water with high pressure against much pipe friction and terrain elevation. Power units pull these pumps direct connected or belt driven. Most of them have a clutch which allows easier starting of the power unit and priming of the centrifugal pumps.

There are some Growers with properties not located near lakes which do the following: Drill a well and mount a turbine pump on the well with a gearhead and power take off shaft extended. They put the same size pump on the various wells. Then they use one power unit and their portable pipe on all three or four properties.

In selecting equipment for use in portable irrigation much thought should be given to the subject. Such as height of property above level of water, size acreage, and distance from source of water. I am assuming that you would want the most economical unit to operate. Beginning with a smaller unit to be used on plots located on a lake consisting of ten acres or less. In this situation, a small power unit with small high head pump that will supply a minimum of 300 GPM with a maximum head involved, is sufficient. I would suggest 6-inch aluminum conductor lines and 4-inch aluminum sprinkler lines. This unit, after assembling, can easily be operated by one man. This type of grove would usually have a rather steep slope and therefore, you would not want very much water flowing. With less water, the soil will absorb it without washing. Your sprinkler lines would be approximately 330 feet in length. One 330 foot line would be operating while the other was being moved.

The next size unit would be a high head pump that would deliver 700-750 GPM with comparable power unit that would deliver the maximum of water required with a maximum of head to operate against. The optimum conductor line would be 8-inch aluminum or with less head, 6-inch would suffice. The

sprinkler lines would be 5-inch aluminum of 660 feet in length per operating line. Where there is a maximum head to be operated against or where it is advantageous to use 990-foot sprinkler lines, I would suggest 1000 or 1100 GPM pump with power unit. The Big Bertha of Portable Irrigation is the 1,500 to 1,600 GPM high head pump and power unit to match. This would use 8-inch aluminum conductor pipe with 6-inch sprinkler lines either two 660-foot operating lines or one 1,320-foot operating line. This unit is used to a good advantage where a number of 10 or 20-acre tracts can be irrigated from one source of water. In addition it can furnish water to properties up to one and one-half miles distance from a source of water and against extreme heads. Actually you are operating two conventional 660-foot lines with just one pump and power unit. The time factor is increased by inserting crosses with valves into the conductor lines. With the use of one additional sprinkler line to change from one property to another the pump never ceases operation. For example, when crosses with valves are inserted in the conductor line while it is being assembled eighteen or twenty different blocks spread over a long distance, can be irrigated without ever stopping the pump. Of course, it isn't economical to use on small individual acreages due to cost of moving and setting up.

There are two factors of great importance in Portable Irrigation. They are the method employed in moving and time factor between moves. They work very closely together. It is always like working a jigsaw puzzle and shortage of pipe is usually the "fly in the ointment." Avoid successive moves where all the pipe you have is required. It is indeed difficult to always have enough pipe for any type of portable irrigation. Due to pipe scarcity during extended periods of drouth a bit of trading by various organizations has proven beneficial to all involved. In other words when one organization is set up near a property of another, the organization, so set up does the irrigation for another or at least rents the pipe for that property to be irrigated prior to its being moved.

In the method of moving, is the all important question of what type of equipment to use in hauling the pipe. This depends on distance between moves and many times what is available to use. Almost every conceivable type of equipment is used on the Ridge. Everything from mules and sleds to semi-trailers. One organization comes up with a useful piece of moving equipment and it is quickly copied by others.

The time factor mentioned above is all important. This means primarily do not over extend yourself. During extended periods of drouth properties have to be irrigated even six or seven consecutive times. Therefore, to protect your interest or the Growers' interest, you must be able to repeat the operation prior to the property being depleted of moisture. If you do not, the previous irrigation or irrigations have gone for naught and much is lost.

Make a survey of your needs, have a reputable organization advise you as to your requirements, usually add 25% average on these requirements and you will be in position to have an economical operation.

There are indications that the Portable Irrigation in the Ridge area is being improved every year. This improvement is being made by semi-permanent installations. This is where growers are putting in an underground permanent conductor line by a cooperative plan. Portable pumps and sprinkler pipe is used. This is an excellent opera-

tional saving and reduces the time factor, as it is moving of conductor line which is the bottleneck.

I think we are yet in the dark ages on Portable Irrigation. Much has been done in its development during the past two or three years. Yet more has to be done in lowering the cost per acre inch of water applied to the citrus groves. More Growers are thinking in terms of Water Conservation which is vitally necessary. More efficient facilities *will* have to be developed in reducing application costs. More research work is necessary in order that water is not wasted. This operation of Portable Irrigation will definitely develop fast if the next ten years are as generally dry as in the past ten. In closing, I urge you to start thinking and doing something about this all important problem of Portable Irrigation.

THE RESPONSE OF YOUNG VALENCIA ORANGE TREES TO DIFFERENTIAL BORON SUPPLY IN SAND CULTURE

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Previous reports on the boron nutrition of citrus have been concerned chiefly with deficiency and toxicity responses. The objective of the present study was to maintain trees at different levels of boron between these two extremes and to observe any differences that occurred in regard to general growth pattern, mineral composition of the leaves, and fruiting behavior.

Twelve young Valencia orange trees which were budded on Routh lemon stock, were planted into 50-gallon containers filled with white quartz sand.

Beginning May 28, 1947, complete nutrient solution was applied twice weekly at the rate of 2 to 3 liters per application. The rate of boron used in the nutrient feeding was the only differential variable for the succeeding three years. The lowest boron level was that which was supplied as impurities in the C.P. salts and the lake water used as a water source. A medium boron level of 0.5 p.p.m. and a high of 2.0 p.p.m. were maintained as the other two treatments. Four trees received each treatment. Water was applied between nutrient feedings in amounts that induced leaching Further details of the method of culture are presented in a previous article (6).

Leaf samples were collected each year and analyzed for various major and minor elements. Trunk diameter measurements were made semi-annually. Fruit was allowed to develop during the third year and was analyzed for total soluble solids, ascorbic acid, and citric acid.

Results and Discussion

In general, excellent growth was made by all trees. The size attained was equal to or greater than identical trees growing in soil adjacent to the plots. All growth was nearly normal in appearance except that the low-boron trees showed mild deficiency symptoms in the foliage (4) during the fall months of the second year, and the high-boron trees showed mild toxicity symptoms of occasional tip burn and yellow spots (1) throughout the test period. These symptoms were more pronounced during 1948, when the mean total boron content in dry leaf samples was 386 p.p.m., than in 1949 and 1950 when it was about 265.