

## FROST PROTECTION

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*Observations on Wind Machines and Heaters in the Hills of Vista and Escondido Area*

In '47 the writer bought into one of the Banana Belt groves near Vista, and promptly acquired a lot of experience in growing frozen avocados. After the first freeze he began to look for a remedy. Heaters alone rarely ever did the trick, and the cost was tremendous.

Wind machines of the usual full rotation type commonly used, with or without heaters, were a dismal failure, as a rule, in our hill country. However, I found that this kind of a set-up did provide very fair protection, even without heaters, in the open, flat areas, in some instances, where enough actual horse power was used (100-150 plus). (Rated and actual horse power at the prop are horses of different color.)

It would seem that the full rotation type of machine operated in cold draws merely pushes the air back and forth with a maximum raise of 4 degrees, under certain favorable conditions. About the same effect was obtained with the oscillating type machine when installed, as most of them were, on the slope of the draws.

It seemed to me since the cold air drifted into our draws with a velocity of not more than 2 or 3 m.p.h. that it would be possible to locate a machine at the top of a draw and buck this cold drift. It can be easily demonstrated that a machine putting out 100-plus horse power will create a drift of 10 or more m.p.h. at 250 yards from the machine, if the oscillation of the machine is not over 45 degrees.

I tried to interest a wind machine manufacturer in making tests of this kind. Nothing doing. Said you can't blow air down hill. So I took a couple more freezes on our grove.

Two men in Escondido, Frank Etem and Al Phillips, figured the deal along the same lines as I had and went ahead and proved it up last year. I did not know these men at this time, unfortunately. They installed on the F. W. Socin avocado grove in Escondido (about 6 acres of 3 year old Fuertes) a 220 h.p. airplane type engine near the head of a draw.

The Socin place is located in a typical cold draw—similar draws nearby were exposed to 23 to 24 degree temperatures on several nights of last year's cold. The evidence of the temperatures was there on the trees for all to read at the end of January. Mr. Socin held his temperatures to a 30 degree minimum all through the cold nights, and there were several.

The machine was oscillated to hit both slopes of the draw. They used 30 to 50 heaters, banked out in front of the machine. A point to note is that Mr. Socin started his machine

when the temperature dropped to 32 degrees and did not shut down until 32 degrees had been established again in the morning.

This grove came through almost untouched. Some few weaklings from former cold were hit a bit, but here is the pay off—Mr. Socin had a balled nursery tree planted in September of last year, about 150 yards from the machine. There was not a leaf touched on this little two foot Fuerte. His entire orchard was covered with good live bloom after the cold nights ceased. Even the tender tips of new growth were intact. Mr. Socin's trees had been well frozen the two previous years, and the results this year (the coldest for Escondido) were simply astonishing. (The area of protection extended well beyond the six acres mentioned; probably this set-up could cover ten or twelve with more heaters added.)

I believe, and so do Phillips and Etem, that we have to revise our conception of the function of wind and heat outfits as applied to cold draws. We do not subscribe exclusively to the outdoor egg-beater school of thought regarding wind machines, though a certain amount of mixing of warm upper air and cold lower air does take place. We believe a larger part of their function is to blow the cold air out of the orchard and keep it out; heaters should be fired as necessary to maintain temperatures. Looks like 50 heaters to a machine does the trick.

We believe that in a draw as described, you can, with the machine and heaters, create an artificial ceiling, regardless of the height of the actual cold ceiling. In effect you make a blanket of warm air over the orchard with pressure behind it, blocking out the cold incoming drift.

Of course if we had to deal with a blizzard with a 20 plus m.p.h. drift, all bets would be off, and we would shut down and go home and moan. Such a condition has not turned up in the past three years, but there are more winters to come, and maybe we have not seen anything yet.

In the meantime this system should be given further trial in our cold spots—it looks very promising.