Mr. President, Ladies and Gentlemen:

While I have reason to question the good judgment of the committee in putting me on the program for a paper on this important subject, as there are others who are better qualified, yet as one who is vitally interested in the citrus industry, I shall not shirk my duty, and trust that what I may offer may be a help to some one engaged in the industry.

I have little that is new to offer, as the method here advocated to a greater or lesser degree is followed by a large number of the growers of the State.

Having been in the business for many years, and having met with a fair measure of success, I think I am justified in advising my fellow growers to seriously consider the method as here set forth.

What I may say applies to that character of soil known as the high pine land, and while it may apply successfully to other types of soil I am not advocating it for such, for my experience has been confined to the high pine land.

As you well know there is very little natural fertility in such soil, but it acts as a fine anchorage for the trees, and many of us prefer to give our trees just the food we wish them to assimilate. By so doing we think we make a superior quality of fruit. This superiority will be governed by the knowledge of the grower, and his practice in caring for his groves.

While the high pine land is deficient in plant food it has many fine qualities, among the most important being its resistance to drouth, as it is a well known fact that groves on such lands will not suffer nearly so much in a long continued drouth, as groves on heavier and lower lands. Such soil also is very easy of cultivation, and to keep in good mechanical condition.

We take it for granted some one may read these lines who has in mind the planting of a grove, so would advise the careful selecting of good ground and location. A soil with clay a few feet under the surface with good drainage is an ideal condition. If it is land that has never been cultivated, and I prefer such for a grove, there will likely be some native timber on it. The first important step is to completely clear the land of all trees, stumps and roots. If these are left in the grove to be removed later they will likely be for years an annoyance and a nuisance. Put the ground in thorough preparation by deep plowing and cultivation, then plant good strong thrifty trees in rows thirty feet apart, and twenty-five feet in the row. This may seem, while trees are small, like a waste of ground,
but in a few years you will see the advantage of being able to get through your grove with wagon and other farm implements, without damage to the out-hanging limbs.

You will not make much of a mistake if you confine your choice of varieties to the Pineapple and Valencia late oranges, and Silver Cluster, Walters or some other good sized and shaped grapefruit.

While an orange tree can be transplanted any month of the year, I prefer planting about the first to the fifteenth of January, always using a liberal quantity of water when planting; and unless you can water these young trees at intervals during the dry weeks that follow, until the rainy season opens, you had better not take the trouble to plant them, for you run the risk of losing some and stunting the balance.

When planting, incorporate a little fertilizer in the soil and use only a limited quantity the first year, increasing the quantity each year, using a good quality of orange tree fertilizer. For about three years keep the tree rows clean by frequent cultivation during the growing season, but avoid cultivating late in the fall and winter. Space between rows can be planted to any good cover crops to shade the ground and build up the soil.

For bearing groves I advise keeping the top soil from caking by frequent harrowing with Acme harrow. This, in the spring of the year while dry, should be constant, and after rains, harrow to conserve the moisture. By July or beginning of rainy season stop harrowing and let grass grow. Do not let the grass or weeds grow too rank under and near the trees, but keep it mowed down. If grove is in good condition and soil rich, you can cut and remove grass for hay; but if soil needs the vegetation, or is lacking in humus, better build the soil by leaving hay on the ground, and buy your hay or raise it from outside lands.

While one can raise trees for a few years and keep them in a fairly thrifty condition without fertilizer, by cultivation and raising leguminous crops to build up the soil, it is utterly impossible to make the trees fruit without a liberal application of a good fertilizer.

For young trees I prefer a fertilizer made up of from four to five per cent. ammonia, five to six per cent. phosphoric acid and six to eight per cent. potash, applied two or three times from spring up to September.

For bearing groves I prefer to give a fair application in February, before the swelling of the buds, of fertilizer made up of about 5 per cent. ammonia (half of which from nitrate of soda, the quicker acting, and half from sulphate of ammonia, the slower acting form), 6 per cent. phosphoric acid and 6 per cent. sulphate of potash.

In the latter part of May or first of June a liberal quantity of fertilizer with 2 per cent. sulphate of ammonia, 6 to 7 per cent. phosphoric acid and 10 to 12 per cent. sulphate of potash.

In the middle to last of November, my third and last application, a liberal quantity 2 to 4 per cent. sulphate of ammonia, 6 to 7 per cent. phosphoric acid and 10 to 12 per cent. sulphate of potash; the yearly quantity being about forty pounds to every 10 boxes of fruit.
The quantity of ammonia for each application will have to be governed by the condition and need of the trees.

While there is a growing tendency towards governing our insect enemies by introducing their natural enemies among them, yet this will not always accomplish the desired result.

I have kept the scale under good control by fungus and lady birds.

I have failed thus far to discover any natural enemy of the rust mite, and in order to have desirably bright fruit I spray three or four times during the season with sulphur solution.

Winter Haven, Fla.

E. S. Williams.

Mr. President, Ladies and Gentlemen:

If there ever was a case of "many men, many minds," I am sure it is in the handling of a citrus grove. In view of this fact, I'll merely treat the subject from my point of view, as I am sure we will have some discussions embodying views and methods vastly different from mine. In the handling of a citrus grove one must be governed by his own peculiar conditions as hardly the same conditions prevail in any two groves. Then, besides, we all have our little pet theories, which may possess more or less merit. The best place to start with this subject is with the raw land, which should be the best obtainable. Then be careful of each step in its development, to avoid, if possible, doing anything that it may cost you dearly to undo. The old adage of "an ounce of prevention" is equally applicable here. In clearing pine land, I clear off all the undergrowth, burn the saw palmetto roots, and save the ashes to be scattered over the ground later. Then I cut the pine trees, bore the stumps with an inch and a half augur, which has had the shank lengthened to about 3 1-2 feet over all, put in sufficient 60 per cent. dynamite to open up the stump well, then put fire in and burn the stump out, cutting up the logs and piling them on the burning stump, unless I have some other use for them. It pays to get the pine trees absolutely off the land, "lock, stock, and barrel." After burning the stump as best we can, men with grub hoes and axes take out the remaining roots down to a depth sufficient to allow a plow to run. I then line off the tree rows and windrow all remaining trash, such as pine tops, underbrush, palmetto leaves, etc., half way between the tree rows, and then break up the tree row with a turn plow having a good cutter on. I prefer a one-horse plow, as it cuts narrow furrows and consequently leaves ground in better shape. The best plow that I have ever found for this work is a Brinley No. 1, Prairie, with a "fine" cutter. It does fine work, is strong and light, and a good able bodied horse or mule can pull it very readily. Our land is rather low and compact, with clay subsoil, which holds water during the wet season, so we have to bed our trees, with water furrows between rows, leading to cross ditches; con-
sequently I throw two furrows together for the tree row, and continue turning dirt towards the two furrows till I get a strip about ten feet wide. This leaves the trash undisturbed on the unplowed middle. Then I stake off for the trees and set them, move the trash in between the trees, and finish plowing out the middle. I use a two horse disc harrow on all the plowing to pulverize and smooth up the ground. I mulch the trees at time of planting, and always put about 1 1-2 inches more dirt to the tree than should be there permanently when trees are set in winter, this helps retain the moisture through the spring drought, and at time of first working after the drought is over and tree is established, this surplus dirt is worked away, leaving the tree with the crown roots just covered. In preparing hammock land, I modify the above methods to suit the growth on the land. I leave, on an average, four or five palmetto trees to each orange tree, and gradually thin these out as trees get larger, and original supply of trash has rotted away. Live oaks, water oaks, etc., I top and girdle. When plowing the first time, I keep two men, with grub hoes and axes, following the plow, to remove all roots, etc., that had not been previously removed. In this way, at the next plowing, it should plow like old land. I find that young trees grow off much better and are much less apt to become hide bound where they have partial shade. In case of a hide bound tree, the point of a knife blade run the length of the trunk, splitting the bark, and a little extra feed, will usually effect a cure. As regards leaving palmetto trees in a grove, to be removed later, some persons raise the objection that they are difficult to get down without damage to the orange tree, after the orange tree has attained much size. This can be easily done in the following way. Take a ladder say 16 or 18 feet long, place against trunk of palmetto tree to be removed, on side opposite to which you wish the tree to fall. Take a rope (about 3-8 or 1-2 inch) and tie in a slip noose around the trunk of the tree as high above top of ladder as is convenient; and push it up the trunk of the tree as far as you can, with a pole having a fork or similar contrivance on top end, then have a person on the ground tighten on the rope. Then, with a short, one-man cross-cut saw, saw the tree as nearly off as is safe at a point that is convenient above the top of the ladder; then get down and remove the ladder, and with the rope the top can be pulled just where wanted, and very seldom will an orange tree ever be injured. The snag left standing will do no harm, but it can be easily cut down if it is desirable to get it out of the way. In setting trees, I have had fine results by thoroughly mixing 1 or 2 lbs. of fine ground steamed bone in the soil before setting the tree. Other than this I give the trees no fertilizer for a year, depending upon plenty of mulch and trash to furnish what they need for that time. Then I give them about 1 lb. each early in the spring and another pound each in the summer, and continue plowing till I get the land shaped up to suit, when all plowing is cut out. After that our dependence is on hoe working the trees in circles and using mowing machines once or twice per year, as occasion demands, on the unworked part. When the trees get large enough to shade-
the ground sufficiently to keep weeds and grass from choking them, we depend on the mowing machine entirely, and put part of the price of the extra labor saved into extra fertilizer. By this method we get along with less labor, have healthy trees and fruit of fine quality, and are troubled very little with rust mite. No doubt we shall have some able discussions later on the subjects of fertilizing and spraying, so I'll not attempt to discuss them. Of course no iron clad rules can be laid down for the care of a grove, as soils and conditions are so varied, but my general rule would be, put land in best possible shape when trees are very young, and cultivate just as little as possible thereafter. I am a great believer in humus, and think that one should get something growing to shade the ground as quickly as possible and later be converted into humus. As the trees get older and original supply is being exhausted, haul in trash, woods grass, etc., to take its place. When I mention muck, no doubt our worthy president and some others will smile, as I recently heard one of them allude to it as "harmless amusement," but we are using muck with most excellent results, though I must say that we have a fair supply of exceptional muck. I have seen lots of muck which I think I might allude to as harmless amusement, unless it had maiden cane in it, when I'd omit the "harmless." I believe there is a growing tendency towards less cultivation, but fear that it is still being much overdone in many citrus groves. People may criticise the apparent unkempt condition of your grove, but the knowledge of the extra size of your bank account will more than offset the stings of criticism, and after all, with citrus growers, as with all others, the money is what we are after. If, in starting a grove, one is seriously handicapped for lack of time or funds, good results can be secured by grubbing circles in which to set the tree, and then gradually breaking up the remaining ground, getting it all broken by the time the tree has been set two years. But, using what method you will, don't destroy any more humus-producing material than can possibly be helped,—the day will come when it will be sorely needed. If I were caring for a grove on very sandy soil, an Acme harrow would be the most severe tool that I'd put into it. As to varieties of citrus trees to set, confine yourself to few varieties, and those the very best suited to your locality.

We are confining our plantings almost entirely to Pineapple and Valencia Late oranges and a selected strain of common Florida grapefruit, budded on sour orange stock. I find that under usual conditions a good thrifty year old bud on a two year old stock gives the best satisfaction. Large trees suffer a much greater shock when transplanted, and may require more careful attention to get them well started off. Don't plant sour stocks in grove form, to be budded later. This is too slow and a stand of buds is too uncertain.

**DISCUSSION.**

Prof. Hume: We certainly ought to have a spirited discussion after this topic. Suppose you start the ball rolling, Mr. Hart. I think your ideas with regard to the use of ammonia are sufficient to get this discussion into full swing.
Mr. Hart: Mr. President, when you once get the convention to talking on this subject, I think there will be plenty said, because as a rule there is not time enough given to allow each one who wants to speak on it, time to do so.

I really haven't anything special in mind to say at this time. Just now, I would rather have a receptive mind and wait for some one else to say something about it.

Just a minute, though. One little matter I noticed in the papers that have just been presented, is to avoid cultivating in the spring. I cultivate early in the season pretty thoroughly with a Cutaway harrow, and later, when the drought is on, I use a weeder or what is practically a horse rake, running over the ground often.

When the rains begin, I let the grass and weeds grow, or plant legumes.

I apply my fertilizer in November and cultivate very lightly then, and so far as my experience goes, I have never seen any bad results. I believe that cultivation in the colder months will start the tree out sooner. I also think that the application of fertilizer at that time will retard it. When I put my fertilizer on in November, I like to have it worked into the soil a little; therefore I give it a slight cultivation; just enough to put it under the surface. I think that fertilization late in the season helps the root growth a great deal but does not materially hasten the top growth. Of course, it is not desirable to hasten the growth when there is danger of a cold spell.

Fertilizing in November, I think, counteracts the effect of the little cultivation necessary to work it into the surface, and there is no hastening of the growth or making the tree tender in the winter.

Mr. Brown: I do not quite understand Mr. Hart's theory that the fact of fertilizing will retard the growth of the tree.

Mr. Hart: You know that the root system of your trees grows freely in the winter. If you give them fertilizer in November, the root growth will be more vigorous. The top is not likely to start until the root growth about ceases. In that way, I think the fertilizing at that time rather retards than hastens the starting of the tops.

Mr. Brown: What is the composition of the fertilizer?

Mr. Hart: I give them my regular formula; that is, a first class orange tree fertilizer; about 4 per cent. ammonia, 6 per cent. available phosphoric acid and 10 to 12 per cent. potash.

Mr. Williams: What proportion of fertilizer do you give them in the fall as compared to the spring and summer application?

Mr. Hart: I don't fertilize in the spring until about the time the rains commence in the early summer. I do not think I fertilize as heavily as a great many do. The largest application that I ever made to any of my trees is twenty-four pounds in a year; twelve pounds at a time, two times a year. I give them pretty nearly the same each time. My land is good land and I do not think it requires as much fertilizer as pine land generally does. Mine is what is generally called gray hammock.

In addition to this, I give them an application of lime; and I have a man right now hauling in humus or leaf mold from
the hammock. About every two years I give the grove a good coating of leaves and trash.

Mr. Temple: Mr. Thompson in his paper spoke of spraying with the sulphur solution two or three times a year. Now, I think we all know Mr. Hart's position on spraying. Not trying to drag in the question of spraying or any one spray, I want to say that I happen to know from visual observation that Mr. Hart has no rust in his grove. I also know that Mr. Hart does not spray. Will Mr. Hart tell us how he gets bright fruit without spraying; whether by cultivation, fertilization or what? I would also like to ask in addition whether Mr. Thompson has used the sulphur or the sulphur and soda or sulphur and lime solutions, how often, and the results obtained from one as compared with the other; in other words, what I am trying to get at is what precaution to take to insure getting the most bright fruit.

Mr. Hart: Replying to Mr. Temple's question with regard to rust mite. I today heard it said that "citrus culture is not an exact science." I wish I had less reason to realize this truth.

I cannot attempt to say positively what action on my part or what element in the soil or condition of the atmosphere causes the results. I will say, though, that to my knowledge I have not shipped a genuine rusty orange this year; haven't had it to ship. I shipped a few that I marked russet oranges, but that rust was merely a manifestation of melanose, which gives it a rusty appearance. But not one orange, that I know of, has shown the result of the work of rust mite.

Years ago, one of my groves produced all russets, and they were such vigorous russets, or, rather, the rust was so vigorous, that the fruit was very small and black to such an extent that quite a portion of the crop I did not ship at all, and was much ashamed to ship the rest of it; but I have noticed that on that grove this year not a rusty orange showed up from any cause.

I have noticed that there is less rust on the hammock than on the pine land, especially where clean culture has been practiced; therefore, my practice has been to try to turn the soil into that as much like hammock soil as possible, raising grass, weeds, etc., and not taking them away from the land after they are cut, putting much humus into the soil, cultivating early in the season while the drought is on, stopping it when the rains come, then using only the scythe until November.

The results in my groves are there, and anyone can see them, but I cannot say positively any more than the rest of you just what has brought them about. When results are right, I hold to the methods that bring them.

Mr. Thompson: In regard to sulphur, I would say that I use very successfully and have used for two or three seasons, a solution or mixture of sulphur. First, I make a paste like that the paper hang-ers use to put paper on the wall. I have a regular formula for making it in large quantities. Then I take three gallons of that paste and mix in it seven pounds of Flowers of Sulphur. I use the Flowers because that is the lighter form. Then this whole mixture is stirred in fifty gallons of water. It mixes very readily,
and it is kept stirred up while it is being sprayed on the trees. It carries the sulphur for a long time. The paste makes it adhere to the foliage, and you can smell the sulphur after a rain on a warm day, long after you would think it had all washed off.

I have also used the lime and sulphur, the regular formula, but it is very disagreeable to handle. Then I have used the caustic soda, making up a stock solution of thirty pounds of sulphur and twenty of soda and using two quarts of this stock to fifty gallons of water.

However, the spray mixture I mentioned first is, in my opinion, just as good as any of the others, and much simpler to use.

I start to spray when the orange is very small; just about as big as the end of your finger, and I spray about three times during the season. I judge the time of spraying by the condition of rust on the orange. If the rust mite is increasing, I spray. Then I give a reasonable time to see what effect the spraying has had, and if I think the rust mite has not been checked enough, I spray again.

Mr. Mead: I am convinced that the treatment of the roots can have no effect whatever on the starting of the tree. Anyone who has noticed will find that the buds start earlier on the north side of an orange tree; the twigs and buds having been subjected to greater cold respond more quickly to the oncoming warmth of spring, but the ground and roots and cultivation have nothing to do with it, being alike for all sides of the tree.

Snow has been piled around fruit trees in the north, keeping the ground frozen for a month after the rest of the orchard had warmed up, but these trees blossomed with the rest; branches resting on or partly covered with snow, bloomed at both ends, while the cooled buds remained dormant.

I do not think that fertilizer or any other treatment of the ground that does not actually warm up the branches will have any effect on the time of starting in the spring.

Mr. Porcher: I have had quite considerable experience in spraying. I have put forth the most strenuous efforts in combating the rust mite. I have used all kinds of different sprays. I have used sulphur solution. I have used the dust application and have found that the application of the dust made absolutely no difference; the mites would crawl upwards dragging themselves by their four legs and dragging their tails behind them, so that they would leave a mark through the particles of sulphur. I have been seeking to do everything I could to exterminate the rust mite by natural enemies. I have seen some parts of the grove that seemed to be free from the rust mite without the aid of spraying, and a few feet away would be trees infested with the pest.

I have used humus in large quantities; over 1200 double horse loads were hauled this past season. I find that when you apply lime, as I do every three years, the rust mite is in excess. Where the ground is cultivated cleanly, it is absolutely impossible to control the rust mite with any spraying. Where we use the humus we find less of the rust mite. The only diff-
ficulty is that where you get a sufficient quantity of mulching and humus on the soil, you are apt to give your trees a little too much rich food. They are indulging in late suppers, lobster, champagne, and so forth. They are apt to get indigestion and get very sick, and you have trouble.

I have land that ranges from rich low hammock up to scrub and pine land, and some land that you gentlemen would turn your heads away from (if you didn't see the trees). Saw palmetto land, with hard pan. But on that same land I have grown some of the best trees I have. It is some of the most satisfactory land that I now have to handle.

I am today asking the question of this meeting, and want to bring out from Mr. Schnarr as to his spray, which he claims will control the rust mite. Scientifically, I think we can bring out from our professors that no oil spray has been known that will handle the rust mite. I have used the resin wash, whale oil soap, kerosene emulsion, etc., without effect. Sulphur seems to be the only thing that will control the rust mite at all.

We have also with us a gentleman representing an English firm which has made a big demonstration in supplying a sheep dip, and they have a spray which they call Cooper's V. I. which has done good work on the Mytilaspis citricola, or long scale and the red scale. It cleaned them out, and also the white fly in the larval and pupal stages were destroyed. Also, I could not find an egg that was not killed, although they do not claim that the spray will destroy the eggs. They go further, and say that the spray is a fungicide. I think it will probably handle the rust mite.

We begin to spray when the orange is the size of a small marble. We pay no attention to any regular time of spraying, but go ahead every three weeks and spray until we ship the fruit. We don't finish shipping, sometimes, until April, so you can see what that spraying means. Oftentimes the rust mite does not affect the fruit at all; it will seem to be thoroughly cleaned out; other times it will make its appearance early in the season and I hate to think about what a hard time we have to combat it.

Mr. Stevens: I would like to ask Mr. Thompson if he noticed any change in the texture of the rind of the orange in using the soda sulphur solution and the other sulphur solutions.

Mr. Thompson: I cannot say that I did.

Mr. Stevens: When the sulphur and soda solution was first put into general use, it was claimed that it improved the texture of the rind; made it thinner and of a finer texture. Possibly I deceived myself, but I thought it did, too. It seemed to make the rind smoother.

Mr. Thompson: I have never used so much of the lime and sulphur as the paste and sulphur. I cannot see any difference in the orange.

Mr. Tabor: I would like to ask Mr. Porcher what he has to sell his fruit for to cover the cost of spraying and of the sulphur.

Mr. Porcher: Mr. Tabor's question is bringing up a question that will come later. His point is well taken. The spraying when done ordinarily is much less expensive.
I have had to rig up two complete plants, and the expense is about $5.00 per acre. I have had to rig up two, so that when one is not working, the other one can be used. With us, we allow the trees to grow clear down to the ground and don’t trim the lower branches off to leave a clear space underneath as you people generally do. Treating the groves as you do, it simplifies the matter of spraying very much.

I use a two-horse team and the spraying apparatus is mounted on a platform and the man on the platform sprays the trees as the team moves. The lower branches of the trees are more often affected than the higher, especially with scale.

As to price, I am not alone in having to bear the cost and meeting a successful market for carefully sprayed fruit.

Mr. Warner: I have two different spraying outfits, also. One is made at Elmira and has a regular 2 1/2 horse power engine; the other is a marine engine in which I utilize the same class of pump. The two outfits are practically interchangeable.

The wagon has the body made in such a way that the wheels will cut under. The wagon turns easily and pulls very easily. One animal can handle it without difficulty.

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REPORT ON THE METHODS OF PICKING AND SHIPPING CITRUS FRUITS.

L. B. Skinner.

Mr. President and Fellow Members:

The fire this morning stopped me right in the midst of my paper. I thought I would go over it again, but I haven’t had time. I am sorry Dr. Inman could not stay and give you the benefit of his experience and observation. He says he never packed an orange in his life; therefore he knows exactly how it ought to be done.

The first thing in the field is the equipment of the picker. What shall we give him to pick in and what shall we give him to pick with? Now, until the Government sent their experts here, I did not know the danger of clipper cuts. I didn’t know what a clipper cut was until Mr. Tenney came into my grove about three years ago. We went through a box of the champion picker of the grove and we found about 40 per cent. of the fruit was