a good deal of that. It will be numbered, and so forth, and sent to an inspector in the field, who will make an appointment with you to go over your property.

For your information, anything under $15,000 will be acted on finally at Macon; anything above that, unless it is a cattle loan, will go to Washington. We are authorized to handle anything up to $100,000, but not on crop production or citrus.

Member: Do you make loans to corporations?
Mr. Pringle: Yes, provided they have a resident manager.

Member: What is the rate?
Mr. Pringle: Six and one-half per cent. You pay for the money only during the time you have it. They want to budget your money to you. You are asked to fill out a schedule as to when you want the money. They don't want to pay it all to you in a lump sum if it can be avoided, on account of the bank situation, and so on.

The loan is made on a box basis. They look to the production of the crop for cash returns. From that, they figure what the probable returns will be, and that will fix the top limit of your loan.

They use the price per box figures that are used by the Federal Intermediate Credit Bank, and that varies from 40 cents for grapefruit to 75 cents on Valencias.

Member: I had an idea three and one-half or four per cent would be the interest rate; six and one-half seems pretty high; doesn't seem right to me.

Mr. Pringle: You take that up with Senator Fletcher. In order to get the crop in this State it requires a mortgage on the grove, inasmuch as citrus is part of the land until cut. They have taken the position, and been so advised by Florida attorneys that that is necessary to secure them with a proper lien on the crop, and that requires an abstract or title guarantee.

Member: Suppose we secure a release of the mortgage holder?
Mr. Pringle: That's all right if you can secure a subordination agreement, and so long as they can get a first claim.

Member: You mean a first claim on the crop?
Mr. Pringle: That's right.

FLORIDA SOIL AND FERTILIZATION PROBLEMS

Robert P. Thornton, Tampa

The many and varied soil types, varieties of crops, and almost innumerable fertilization variables with which the grower in Florida has to contend, seem to make it highly essential that definite programs covering the at least general classifications of each of these problems be worked out and presented in order that growers might uniformly follow what has been determined as most productive practice. This is the primary work to which the Florida Agricultural Research Institute expects to devote its main interest and hopes to eventually solve for the benefit of the Agricultural interests of the State. It is impossible within the brief time allotted for this paper to do more than outline some of the principal problems and discuss them very briefly.

It is generally known that Florida soils are almost unlimited in type and characteristics and that they are generally classed as thin and nonfertile within themselves, and as a rule decidedly deficient in plant foods—especially the secondary plant foods and rare elements which are known to be absolutely necessary for agricultural production. Further, the facts that under our semitropical climatic conditions, oxidation and decomposition of organic matter proceeds at an extremely rapid rate, that our soils as a rule do not have a more or less impervious subsoil for retention of plant
foods, making leaching and loss of plant foods a matter of primary concern, leads to the necessity for the use of a fertilization program involving an expense, quality, and range of composition, which probably applies to no other section.

The facts brought out in the above paragraph, and primarily the fact that the greater percentage of our soils have very slight buffer capacity, develop the fact that our soils are extremely sensitive to any type of unbalanced fertilizer applications, and are extremely sensitive to any type of supplementary treatments involving a material or materials of a limited range of composition. As a result it seems from observation that the majority of our conditions of poor production may be laid to unbalanced assimilation of plant foods, resulting in toxic effects and malnutrition upon the plants. This paragraph refers not only to the three primary plant foods, but to the entire range of secondary plant foods and rare elements included in agricultural practice. Our soils range in pH value from extreme acidity on one side to extreme alkalinity on the other. The matter of developing fertilizer practice which would serve as the best corrective treatment for either extreme, as well as determining as far as possible the optimum pH value for soil types, crops, varieties, and root stock of Citrus trees, deserves intensive study and is of primary importance. A primary idea along this line is the determination of whether the solubility of the plant nutrients at certain points on the pH scale is of more importance than the effect of the pH value upon the biological activity of the soil.

It is known in a general way that different varieties of Citrus Trees have varied nutrition requirements both as to quantity and composition of fertilizers. This particular problem, however, is neither understood nor worked out to such a point that a known and uniform practice which might represent the highest point in profitable production is followed. The same thing applies to the varied nutritional requirements of the different Citrus root stocks.

Some work has been done upon supplementary use of the various so called rare elements and their application to Florida Agriculture. At the present time, however, it must be said that success along this line has been rather limited and is confined essentially to the use of Copper Sulphate for certain tree and plant conditions and for certain soil types, and to the successful use of Manganese Sulphate only upon the calcareous soil types. There are a few indications of very successful use of other so called rare elements, but at present time they could be called indications only. We know that these secondary plant foods and rare elements are essential and necessary for plant growth and that they are supplied to our soils, in fertilizers, with the so called rare elements supplied principally from organic materials. The matter of using these so called rare elements as supplementary applications seems to offer very great possibilities from the standpoint of large yields of high quality produce under certain conditions, and is a matter which seems important enough to warrant intensive study.

There is a great deal of interest at present in the use of Lime as a supplement in our fertilization programs. At the present time results from this practice have been favorable enough to show that Lime has a definite place in our program. We do not know definitely, however, either the best form of Lime to use, or a great deal about quantity for various conditions. As a result, a considerable number of unfavorable results have been noted from the use of Lime. It seems at the present time that Lime is a splendid means of controlling toxic absorption of other plant food elements in unbalanced soils or fertilization programs, but that excessive use of Lime results within itself in a toxic condition. It must also be recognized that Lime is a direct plant food, and as such is required in relatively large quantities by plants and trees. It is safe to say at this point that very little is definitely known about the long time effects of liberal applications of Lime, and that there is a possibility and probability that serious damage may result from unwise use of this material upon soils as sensitive to unbalancing as those found in Florida. A matter which has already been mentioned becomes of major importance in this paragraph—whether it is wise to apply Lime for the purpose of almost completely neutralizing soils, at the expense of solubility of soil nutrients. There is much evidence at present leading to the conclusion that this is unwise and dangerous practice. There is also much evidence
leading to the conclusion that Lime and all secondary plant food applications should be made from the viewpoint and practical application rate of supplying these secondaries at the rate needed rather than using the pH value as a scale. It is generally observed that treatments to correct low pH value have produced favorable results principally in those cases where the treatment carries essential secondary plant foods, and have not been generally successful where alkaline materials carrying no essential secondaries have been used.

There is a large amount of work necessary to determine the best practice in regard to time of application and composition of fertilizers in relation to securing early size and early maturity upon those varieties of Citrus fruit whose primary value depends upon these two points. There is unquestionably a direct relation between time of application and composition of fertilizers in relation to the two points mentioned above. If they could be worked out and followed upon a known definite best schedule it will undoubtedly mean increased profits to Citrus growers.

Another problem which has received little attention but which seems to be of primary importance is the relation of soil texture to profitable production. We undoubtedly have crops planted upon a great many soil types of such poor texture that it is impossible for the plant roots to properly absorb the plant nutrients. This brings up a great many agricultural problems which observation has shown can be improved only through supplementary applications designed to improve soil texture and soil physics.

It has not yet been definitely determined just what place the three general fertilizer classifications—namely; Physiologically Acid, Physiologically Neutral, and Physiologically Basic—have in our general agricultural practice, and in respect to special soil types. It is very probable that valuable information leading towards more economical and profitable production might be obtained by studies to develop the best use of these three fertilization types particularly in relation to Acid, Neutral and Alkaline Soils.

A very considerable amount of progress has been made within the last few years in the matter of fertilizer design. It has become rather general practice to approach this problem from the standpoint of the 100 per cent. composition of the finished goods, including a proper consideration of all the secondary plant foods and rare elements, instead of consideration of the primary plant foods only. A new and ever increasing fund of information covering the function and value of secondary plant foods and rare elements and their necessity and relation to profitable agricultural production has definitely shown that this angle of compounding and blending proper fertilizers is in the majority of cases of as much or more importance than consideration of the three primary plant foods. Constant investigation and research into the composition of the various fertilizer materials with respect to the percentage of secondaries and rare elements now permits improvements in quality of mixed fertilizers through selections of materials entering into fertilizers for specific crop and soil conditions far ahead of anything known a few years past. The potential benefits and profits expected to be gained from further research and practical application along this line seem to be vast. It seems safe to predict that, while State control laws now cover only Ammonia, Phosphoric Acid and Potash, the time is not far distant when this control will be extended to include a wide range of elements now receiving little consideration.

A study of Florida soil and fertilization problems would be incomplete without reference to fertilizer placement and its relation to profitable agricultural production. A considerable amount of information has been tabulated showing the extreme importance of placement in relation to quality and yield upon truck crops, and indications and observations lead to the conclusion that improper placement is costing the growers enormous sums of money annually. Placement upon Citrus has received less attention: there is undoubtedly a splendid field for study of placement upon Citrus especially in respect to securing special seasonal and crop responses, and in securing desired fruit sizes, maturity, and quality.

There has probably never been a time in the history of the State when it was more necessary to produce high quality crops than at present. There is undoubtedly a direct relation between fertilizer practice and all those points which make up what is called high quality in agricultural produce. It seems to be increasingly necessary to
give careful thought and study to a fertilization program which will result in the most marketable quality and flavor.

We must realize that the problem of producing quality crops and maintaining soil fertility is becoming more and more difficult. This is due to a variety of reasons, chief among which are the facts that the extension of our agricultural program means a continual increased use of the less fertile soils and soils less suited to production, that in a great many cases locations are selected with reference to geographical advantages rather than soil fertility, that continual removal and shipment of crops from our soil means continual removal of all the plant nutrients, and that in a great many cases our fertilization practice is not such as to furnish a continual renewed supply of the elements that make and maintain soil fertility.

In conclusion the principal headings of the subject matter are tabulated as follows:

1. Discussion of Florida Soils in General.
2. Studies of Soil Types and pH ranges in relation to Fertilization programs.
3. Studies of Fertilization programs and nutritional requirements of Citrus varieties and root stock.
5. Relation of Lime to our Fertilization program.
6. Time of application and composition of fertilizers in relation to size and early maturity.
7. Soil texture and its relation to production.
8. Studies of Basic, Acid, and neutral fertilizer mixtures and their proper place in respect to Soil types, PH range and seasonal applications.
9. Essentials of fertilizer mixture design.
10. Fertilizer placement.
11. Relation of fertilizer practice to flavor of Citrus fruit and vegetables and possibility of improvement of flavor through fertilization.
12. Reasons for ever increasing number of fertilization problems.


Mr. W. L. Drew: I would like to ask, if you don't use calcium carbonates, what form of lime would be used? I would like a little discussion along this line.

Mr. Thornton: As far as we know at present the principally used forms of lime are the carbonates, hydrates and calcium nitrates. The calcium nitrate is used principally as a regular fertilizer application. There are good points in favor of each. The more successful practice seems to be the use of a proper blend of the carbonates and hydrates somewhat as represented in good hardwood ashes. This subject has not been studied as fully as it should.

Mr. Ralph Compton: You remark that some bad results have been obtained from the use of Lime, will you please discuss this.

Mr. Thornton: I suppose practically everybody present is familiar with, or has heard about, the lime damage upon citrus groves which Florida suffered quite a number of years ago following very heavy applications of lime. I am not directly familiar with this particular case as I was not in Florida at that time. It is difficult if not impossible to discuss any exact tree condition or symptoms caused directly by lime damage. Such damage results in a generally weakened condition of the tree as would be the case in damage resulting from a great number of other causes. A full discussion of this subject would require a great deal more time than could be available at present.

Member: Following the excessive use of lime, is it not true that some of these soils are now better than those upon which no lime was used?

Mr. Thornton: After a period of years during which the soil composition and reaction has had an opportunity to readjust itself, some of the heavy limed soils are better.

Member: How can I make Valencias bloom with a full crop on the trees, fourteen years old, scattered bloom since February, Sulphate Ammonia applied in January?

Mr. Thornton: If you are referring to this season's crop, I am afraid you are too late to make Valencias bloom, as far as I know.

Member: What is the relation of Phosphate Rock to Soil Acidity?
Mr. Thornton: This question would involve a very long discussion. I am not a strong advocate of any serious consideration of materials as a general rule for the sole purpose of raising pH values. Heavy applications of ground phosphate rock, two or three tons to the acre, will sometimes raise the pH value in acid soils as much as one half of one point.

Member: What are the benefits of phosphate rock?

Mr. Thornton: This question would also involve a long discussion. One benefit which I personally consider primary has been outlined in my paper; that is material improvement of soil texture and soil physics upon certain types of soil. Ground phosphate rock has numerous other benefits and values in relation to different soil types.

Mr. W. L. Drew: Which is better to use, regular limestone or dolomitic limestone?

Mr. Thornton: The use of dolomitic limestone is becoming rather general, and there is some concern that it may probably become used in excessive quantities. We have very little indication as to maximum limits of magnesium which our soils could properly use, and a considerable amount of information to the effect that magnesium in more than the small quantities builds up a toxic soil condition. It is my opinion at present that one could easily go too far in the use of the dolomitic limestone upon a great many of our soil types.

THE CROTALARIAS AS COVER CROPS

Mr. F. M. O'Byrne: I have a grove, nine years old. When I planted the trees I planted Crotalaria in the grove. It grew to a height of six or seven feet; it made such a splendid growth that I decided not to cultivate it down in the Fall. That winter we had a little cold spell, and the cold settled into those alleys between the Crotalaria and nipped my trees very badly, convincing me I should have cut the Crotalaria down in the Fall. The following Fall I did cut down the Crotalaria. It grew two years, reached a height of seven or eight feet, so dense you could hardly drive a car through it. After I cut it down, the natal grass grew so rankly I have never been able to get as heavy a stand of Crotalaria on that ground again. I think the natal grass outgrew it.

I believe a heavy cover crop saves a good deal on the fertilizer bill, but I am also convinced that it makes your fertilizer problem a little more difficult. We have had a little difficulty from ammoniation in the grove. This cover crop I speak of was Crotalaria striata. We have grown two crops of Crotalaria spectabilis that were just as heavy, and it is better from the viewpoint of putting it down, as it has a pithy stem and is much more easily worked into the soil and not objectionable from pumpkin bugs. However, pumpkin bugs have not been quite such a problem since I followed the idea of cutting the Crotalaria down earlier in the Fall.

In those groves where we have grown Crotalaria spectabilis we seem to have the same difficulty about getting a heavy stand to follow a heavy stand the preceding year. It's hard to say just how much is due to weather conditions and how much due to the rank growth of natal grass, but we haven't been able to get them to repeat very satisfactorily.

This afternoon, we expect to go out on a motorcade to investigate some irrigation installation, and the first grove we will go to is the grove of Mr. John Curtis, of Lake Wales, in which he planted Crotalaria striata when he purchased the grove in 1929. The grove has not been cultivated since that time, and the Crotalaria is standing six feet high through the grove. This past summer he mowed down the Crotalaria one way, and you will notice in that grove that the natal grass is coming up very heavily, and I doubt seriously whether he