application of one pound of borax per tree caused no toxicity symptoms, but on one occasion mild symptoms were seen after applying 4 ounces per tree three times a year for several years. However, boron does leach quite readily from the soil, and it is necessary to replace it continually. One half to one pound of borax per tree a year is required to maintain 50 ppm of boron in the leaves.

Leaf Analyses from Alternate Bearing Trees

Since 1956, leaf samples have been collected at least three times a year from all the trees in the north row (late picked trees). A summary of the results is given in Table 3. Using the data in Table 1, the trees were classified as "high" yielding each year if they produced more than 150 pounds of fruit and "low" yielding if they produced less than 25 pounds. Analyses for trees with intermediate yields are not included in Table 3. In each case, the comparison is made with the crop that was on the tree at sampling time (except for 1959), and from March to June the comparison also is made with the preceding crop. When the comparisons are made with two crops, the result for one crop is generally the reverse of that for the other crop but varies somewhat because of some differences in the trees used for the comparison. These relations can be understood by studying Table 3.

The leaf analyses for the high and low bearing trees were tested by the "t" test with each analysis date taken as an independent experiment. The highly significant differences found in many cases are merely an indication that trees with a crop of fruit do not put out their new flush of leaves at the same time as trees with no fruit. Calcium and magnesium content increase with the age of the leaf while potassium, phosphorus, and nitrogen decrease. In the summers of 1956, 1957, and 1959, analyses for these constituents indicate that the trees carrying fruit had the oldest leaves, while in the summer of 1958 the reverse was true. These results were confirmed by visual observations of the times that new flushes of leaves appeared. The difference between 1958 and the other three years might be a result of the frost of February 5, 1958.

The differences in boron contents cannot be explained by the age of the leaves. In avocados, boron content normally decreases as the leaves become older, but the change is much less than occurs with some of the other elements. For example, in the comparison of the old and new leaves of 7/27/59, a 300 percent increase in calcium corresponds to about a 25 percent decrease in boron content. On other dates the maximum difference in the calcium content of the leaves between high and low yielding trees was about 20 percent. If this was caused by a difference in the age of the leaves, boron would be expected to decrease about $\frac{20 \times 25}{300}$ or 1.7 percent. In 1958, when highly significant differences were found between the high and low yielding trees, the low yielding trees had leaves with 30 percent less boron than the high yielding trees so a 1.7 percent change due to age of leaves would be unimportant. In the sample of 7/22/57 the boron content is higher in the older leaves which is the reverse of the normal effect of age. The same result is indicated on 6/4/59 and 7/27/59, although the differences in boron content are not statistically significant on those dates. Considering all the data, there seems to be considerable evidence that boron content is related to yield and alternate bearing but the results cannot be considered conclusive.

Because of the strong indication that boron content is related to alternate bearing, thirteen trees in the north row are now being treated with boron.

EFFECT OF PLACEMENT OF FERTILIZER AND LIME ON PECAN SEEDLINGS

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The demand for good quality pecan nursery stock for planting new groves as well as for home planting often has been greater than

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the supply, in recent years. Any factor that will decrease the time required to grow acceptable stock will benefit all concerned. The present procedure of producing nursery stock in Florida usually consists of planting the nuts in the winter and budding or grafting the young trees as soon as a good majority of them are large enough to work. The interval between planting and grafting is usually two to three years. The purpose of the experiment described in this paper was to study nutritional factors which would stimulate growth of the young seedlings and thereby decrease the time required to produce nursery stock.

Although many nursery trees are produced on well-drained soils, some nurserymen in Florida prefer soils that have mottled, heavy-textured layers at 14 to 24 inches. In such soils the tap root does not penetrate through the heavy-textured layer probably because of poor aeration, but the development of extensive lateral roots is encouraged (3). It is easier to retain a higher percentage of the roots when the root system is of this nature (4,5). The surface and immediate subsurface layers of these soils have a sand to sandy loam texture which is low in exchange capacity and consequently low in native fertility. On the average pecan nursery stock receives the equivalent of 500 pounds per acre of 8-8-8 and 200 pounds of NH_4NO_3 two or three times annually in bands beside the row. When lime is applied, it is broadcast on the surface. Because calcium, magnesium and phosphorus usually do not move down readily, the effects of these materials are limited largely to the surface six inches of soil. It was postulated that changing this practice to place fertilizer and lime throughout the rooting zone would encourage a more extensive root growth and hence produce a faster growing top.

Materials and Methods

The area used in the experiment consisted of Rex fine sand and Leon fine sand complex. The former has a very dark gray to gray sandy surface overlying light yellowish-brown, pale yellow or yellow loamy sands on mottled pale yellow, yellowish-red and gray sandy clays and sandy clay loams. It is moderately well drained to somewhat poorly drained. The latter is developed from thick beds of unconsolidated sand. It has black or dark brown organic hardpan beginning at 14 to 42 inches. It is somewhat poor to poorly drained.

Soil samples were taken to a depth of 18 inches and analyzed by profile for pH and exchangeable calcium, magnesium, phosphorus and potassium. Acid (pH 4.8) ammonium acetate was used as the extracting solution. Calcium and potassium were determined on the Beckman DU Flame photometer, phosphorus colorimetrically and magnesium colorimetrically using sodium polyacrylate (1).

The experiment consisted of six treatments. They were designed to compare the effect of fertilizer and/or lime placed in the subsoil with equivalent rates of fertilizer and lime on the surface and subsoiling alone. Dolomite and 4-12-12 fertilizer were applied at the rate of one ton and 1200 pounds per acre, respectively. Four replications of the treatments were laid out in randomized block design. Each plot consisted of three rows six feet apart and forty feet long. Treatments were made before planting with a Ford subsoiler having a fertilizer attachment. The equipment has been described (2) with one exception; an extra delivery tube was so arranged that fertilizer was released into the chisel opening at depths of 8 and 18 inches giving an irregular distribution of the applied materials in a vertical band starting at a depth of 10 inches and extending to a depth of 20 inches.

The treatments were made in February, 1956, about a month prior to planting the nuts. Fertilization after planting of the nuts was uniform, since these plots were included in a regular nursery. The number of plants in 20 feet of row were determined and the height above ground level measured in December, 1956. Similar data were obtained in September and December, 1957. The plants were grafted to the Stuart variety in January, 1958, and dug in the fall of 1958. At digging time they were inspected to determine the root characteristics.

Results and Discussion

Analytical data from soil profile samples taken before the experiment was established are presented in Table 1. These data confirm that the soil was much lower in fertility in the 6-12 inch and 12-18 inch depths than in the surface, especially in calcium, magnesium and potassium.

TABLE 1
CHEMICAL ANALYSES OF SOILS ON EXPERIMENTAL SITE

Depth	pH	CaO	lbs. per acre* MgO	P_2O_5	K_2O
0 - 6"	5.9	710	47	19	51
6 - 12"	5.1	42	25	19	7
12 - 18"	5.0	30	25	10	7

* ammonium acetate extractable

The effect of lime and fertilizer on the diameter of the trees at ground level is shown in Table 2. Since the field was replanted to give a stand approximately 6 inches apart in the row in the spring of 1957, trees less than 5 mm. were omitted from the measurements in order to eliminate the replants. The data in Table 2 show that by December, 1957, all treatments increased the diameter of trees over those in the checks, although not significantly. Dolomite plus fertilizer gave the highest values and placement at the 10 to 20 inch depth was better than on the surface. Dolomite in the subsoil was more important than fertilizer in increasing diameters of pecan seedlings.

TABLE 2
AVERAGE DIAMETER OF PECAN SEEDLINGS IN MM*
AS AFFECTED BY LIME AND FERTILIZER PLACEMENT

Treatment	Depth of Placement	Sampling Date Dec. 1956	Sept. 1957**	Dec. 1957**
Dolomite	10 to 20"	6.2	21.1	12.7
Fertilizer	10 to 20"	5.9	10.8	11.5
Fert. & Dolomite	10 to 20"	6.6	13.8	13.4
Fert. & Dolomite	surface	6.0	11.2	11.4
Subsoiled only	20"	6.0	11.2	11.2
Check	0	6.0	10.8	10.7

* 25.4 mm. equivalent to one inch.

** Seedlings under 5 mm. omitted to attempt to eliminate replants made in spring of 1957.

The stand data in Table 3 were also nonsignificant at the 5% level of probability. The increase in stand after December 1956 was due to replants. Some of them grew to diameters at ground level greater than 5 mm. and thus were included in the measurements reported. However, this did not amount to more than 4 per treatment. Stands appeared to be improved by placement of dolomite in the subsoil. Subsoiling alone seemed to reduce the stand, possibly because of moisture relations.

TABLE 3
AVERAGE STAND OF PECAN SEEDLINGS PER 20 FT. OF ROW AS AFFECTED BY LIME AND FERTILIZER PLACEMENT

Treatment	Depth of Placement	Dec. 1956	Sept. 1957*	Dec. 1957*	Ave.
Dolomite	10 to 20"	29	29	30	29
Fertilizer	10 to 20"	23	27	25	25
Fert. & Dolomite	10 to 20"	28	29	30	29
Fert. & Dolomite	surface	25	27	28	27
Subsoiled only	20"	25	21	24	23
Check	0	25	25	28	26

* Seedlings under 5 mm. omitted to attempt to eliminate replants made in spring of 1957.

TABLE 4
TOTAL DIAMETER IN MM. OF PECAN SEEDLINGS FROM 20 FT. OF ROW AS AFFECTED BY PLACEMENT OF LIME AND FERTILIZER

Treatment	Depth of Placement	Sampling Date Dec. 1956	Sept. 1957	Dec. 1957
Dolomite	10 to 20"	180	351	381
Fertilizer	10 to 20"	136	292	288
Fert. & Dolomite	10 to 20"	185	400	402
Fert. & Dolomite	surface	150	302	319
Subsoiled only	20"	150	235	269
Check	0	150	270	300
L. S. D. 5%*		40	86	80
L. S. D. 1%		N.S	115	106

* L. S. D. refers to statistical significance
N. S. indicates not significant

Fig. 1 Showing the stubby root system on pecan nursery stalk as a result of high water table.

Fig. 2 Surface fertilized tree on right has most of its roots near the surface while tree on the left has better distribution of roots as a result of fertilizer placed in the subsoil.

Since tree size and number of trees are important to the nurseryman, it follows that a measurement of response should include both. Table 4 contains data to show the effect of treatments on stand times diameter. Again those trees under 5 mm. in diameter in September and December, 1957, were omitted. Treatments were significant at the 5% level of probability at each sampling date. Placement of dolomite in the subsoil was better than the check and also better than application of equivalent amount of dolomite on the surface. Fertilizer placed in the subsoil was no better than the check.

Summary and Conclusions

An experiment was conducted on a flatwood soils with a mottled or heavy-textured layer starting at a depth of approximately 20 inches to determine the effect of lime and fertilizer placement in the subsoil as a means of improving the growth of pecan seedlings.

Dolomite lime improved the stand and diameters of the seedlings at ground level for three sampling dates. Although the average seedlings were not large enough at the end of one year for grafting or budding, practically all of them were large enough for grafting after two years growth.

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CONDITIONS AFFECTING COMMERCIAL MANGO PRODUCTION IN MARTIN COUNTY

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The rapid urbanization of the coastal area of southern Florida has raised land values — now above the agricultural uses value — and labor costs to the point where the commercial fruit grower will soon be forced from the warmer coastal area into the interior. This raises several problems the more immediate one being where to find locations suitable for these plantings. The question as to the suitability of lands in the interior of Martin County for commercial mango growing has been raised. This paper is an attempt to appraise conditions as they may affect such plantings.

In Martin County mango trees have been grown successfully for many years on the higher levels of better drained land within the warm coastal area, as in neighboring Palm Beach and Broward Counties where climatic