THE ORANGE INDUSTRY IN MISSISSIPPI

BY

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PREFACE

As a native of the state of Mississippi and one interested in the agricultural development of that commonwealth, I have spent my spare time during the past several years in a study of the evil results of the mono-culture of cotton and its probable removal as an existing condition.

In investigating other crops which may replace this plant I became interested in the relative importance of fruit crops, and particularly in the orange industry. Continued correspondence with agricultural experts in Mississippi on other subjects led me to attempt the compilation of all material available on this subject.

Experience gained while serving with the Mississippi Geological Survey of 1919 has proved invaluable in the preparation of this semi-bulletin. In addition, I am sincerely grateful to J. R. Hicks, Director of Agricultural Extension in Mississippi,

for material and assistance given me.

Data on the subject is quite limited, so that it has been necessary to get much of the material herein contained from various reliable sources, credit for which is fully acknowledged in the bibliography as well as in footnotes when even an indirect quotation is used.

Robert Lee Hinds, II.
May 15, 1924.

INTRODUCTION.

Mississippi is a state of varied and valuable resources. It is ideal for the farmer, stockman, fruit and vegetable grower. The lands are reasonable in price, productive and readily responsive to intelligent handling. It has a splendid public school system and as good facilities for agricultural training as any state in the Union.

Owing to a combination of circumstances, financial conditions in the state have been far from satisfactory since the conclusion of the World War, especially among the farming class; and in this class must fall the bulk of the population of Mississippi. Naturally, everyone is striving for a solution of this problem and many recommendations are being made and much advice is being given. No doubt all this is prompted by the best of intentions, but in many cases the fact is lost sight of that the present condition is due to a

large extent to the war; was inevitable and has occurred after every war in the history of the world. In the attempt to fix the blame and offer solutions, some rather reckless statements are being made; and incidentally, Mississippi is getting some rather bad advertising.

Because of the abnormal demand for cotton, due to the war, and the further fact that this has for half a century been the "money crop" of the South, Mississippi farmers were stimulated to plant too heavily during 1919, 1920 and 1921, to the neglect of other crops. This was a mistake, of course, but a natural one. The purchasing power of the world market suddenly collapsed and the price of cotton fell far below the cost of production. The prices of the commodities that the farmer had to buy did not drop in proportion; consequently, the farmers were left to stand a tremendous loss. The loss was only temporary, however, and as agricultural education is now spreading throughout the state, the people are well on the road to recovery and are building for the future on a firmer and saner basis than ever

before.

With the conviction that the continued mono-culture of cotton will permanently impoverish the state and its citizens, there has come the search for other cash crops to take its place. Among those which offer exceptional possibilities is the cultivation of oranges, especially the Satsuma orange.

It is hardly probable that Mississippi will ever attain a state of rivalry with California and Florida; but the industry is growing at a rapid rate in the southern end of the state. Hundreds of thousands of trees are being planted each year and a ready market pays well for the output. The industry is being promoted in every possible manner by the state department of Agriculture. Power spray rigs and power grading machines are being installed on a semi-cooperative cost basis; "and at the present rate Mississippi will equal or surpass Alabama, its nearest rival, in this industry within the next two years."[1]

[1] R. S. Wilson, "Agricultural Dev. in Miss.", p. 10.

EXPERIMENTS WITH CITRUS FRUITS IN MISSISSIPPI

The first orange grown in the state of Mississippi was plucked on October 12, 1907.[1] It was a Satsuma, and was grown on a plantation near Poplarville, Pearl River County. The tree bearing the fruit had been set out together with several others in 1904; and had never been given any protection from the cold nor from any insect pest nor plant disease. The authorities in charge of a nearby agricultural experiment station apparently realized the great potential value that the ability to grow Citrus fruit gave any soil, so it was not difficult, even as far back as 1907, for them to forsee the great possibilities for South Mississippi as a citrus section.

On January 8, 1908, four varieties of Citranges, furnished by the United States Department of Agriculture, were set out at this experiment station, McNeill. On the following thirty-first of December all these trees were living except two and about this time an additional planting was made of

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[1] J. J. Amacker, "Report of McNeill Station, Miss. Dept. of Agriculture, 1908," p. 2.

six varieties of lemons of one tree each with an equal number of Satsuma trees. No protection, except banking the lemons and Satsumas, was given any of these trees and one year from that time all the lemons were dead while all the Satsumas and Citranges were alive and growing nicely. Continuous observations have since been made on the Citranges and up to 1923 all trees, except as noted above, were still living. Only one of the varieties, the Morton S. P. I., seems to have any practical value. The other three varieties bloom and bear freely but the fruit is not edible, is generally poorly shaped, often splitting open on the tree; while the trees themselves, except for the very fragrant blossoms, are not attractive. The Morton is very ornamental, large and shapely, blooming and bearing over long periods of the year and developing a fruit that is large and well shaped and which makes a delightful ade or with sugar a good substitute for the grape fruit.

On the strength of this success with original plantings, the succeeding legislature of

the state of Mississippi was asked for and gave two hundred dollars for additional work with oranges; and in the fall of 1911 this money was spent in planting a little more than two acres of land largely in Satsumas. At that time the McNeill station was being operated on a very meagre support fund with only one scientifically trained man, the director in charge; and therefore, this experimental work with oranges may not have been as comprehensive as it should, nor the data kept as complete as would be desired. Too, the years immediately following the setting of this orchard were not such as to lend help to an experiment that necessarily had to extend over a long period of time. At all times the state legislature was debating the right of the experimental station to exist;[1] and in the end the station had to choose between its removal to a nearby center, Poplarville, or its probable abandonment entirely.

At the most critical time in the development of the recently planted orchard this change did

1 E. B. Ferris, "Report of Agricultural Com. of Miss.", 1910.

take place and seemingly only by chance were the authorities successful in getting a department of the Federal government to take over the old station ground and thus make possible the continuation of the work. The Satsuma orchard might still have met an ignominious end had not the new director in charge been a practical tree man. As it was, it took time for him to become impressed with the possibilities of this fruit and to give it protection against animals and insects. As a matter of record, the orchard up to that time had never come into profitable bearing due to age and to two most unfavorable years and no one had come to thoroughly appreciate the importance of the experiment.

At the time little was known by the local men about the best methods of orange production, fertilization, spacing, pruning, and the like; and the methods of procedure were based largely on common sense rather than on precedent. The real object was of course to determine whether these oranges could not be profitably grown in South Mississippi, but as many experimental features as conditions

would permit were injected into the work. An effort was made to determine if it were practical to grow the round oranges and grape fruit and, if so, the best varieties of the same; the cheapest and best Satsuma trees for planting; while later it was intended to include work with fertilizers, spraying, and such other things as time might prove to be necessary.

The ground selected for this work had been cleared in 1902 and a record had been kept of its history from the time of clearing up to the time of setting the oranges. In a soil survey[1] this land had been classified as Orangeburg Fine Sandy Loam, this being a sandy-loam surface soil underlaid by a sandy-clay subsoil of a deep red color. It was prepared as for any other crop and laid off into squares twenty feet apart, the land being level enough to plow in any direction without serious erosion. Trees were planted on December 31; and they were promptly banked to protect them against the cold. This practice was continued each

[1] Report of U. S. Bureau of Soils, 1902.

winter thereafter, the banks being reinforced later when severe cold spells were imminent. The main planting included twelve trees each of six varieties of round oranges. The balance of the orchard was planted to 172 Satsumas.

Early in the succeeding spring these trees were fertilized with a mixture of equal parts cottonseed meal and acid phosphate. This application of fertilizers was continued each year and increased as the trees grew older. Various crops were grown between the trees, such as Irish potatoes, cabbage, sweet potatoes, cowpeas and soy beans. Little pruning was done to the trees further than to keep dead limbs removed and occasionally to cut out branches that appeared too thick.

At the end of the first year many of the trees had died; but this high mortality was attributed principally to the length of time required for the trees to reach their destination by freight. The orchard was reset, chiefly with Satsumas, in November, 1912. About such cultivation was given

from year to year as was commonly practised with other fruit trees. The crops grown between kept the middles worked while the tree rows were kept clean with cultivators and hoes. The practice of growing soy beans in rows between the trees and grazing these off in the fall with hogs proved most satisfactory. The hogs never disturbed the fruit at all even though it hung on the trees in easy reach of their noses.

In 1913 a number of young oranges were found on the largest of the Satsuma trees which had been planted; but on no other tree in the orchard. In the fall of 1914 it was noted that a number of these trees had borne a few oranges. The greatest number gathered from any one tree that year was ten oranges. In September 1915 there came a severe gale which blew off a large part of the oranges and no attempt was made to keep records of the trees such as had been kept the year before, but it was noted that even with the number blown off there was a considerable increase over the number ripened the year before.

The round oranges had continued to die and in February of 1916 twelve Grape Fruit trees were set in the missing places of these round oranges. They were dead at the end of the year. In the fall of 1916 a fairly good crop of oranges were gathered notwithstanding the terrible July storm of that year which did so much damage to all crops in the South Mississippi section. About twenty-five half straps were sold this year at $1.50 each. The storm referred to blew all limbs and leaves from the plants, and all but blew the trees out of the ground. More than twelve inches of rain fell in thirty-six hours during this storm and streams rose to unheard of proportions. It speaks wonders for the Satsuma orange trees that they survived this storm and the hard winter that followed it. In the fall of 1917 about thirty half straps were sold from the orchard at $1.50; and this cannot be pretended as the figure representing even approximately the number of oranges borne by the trees, since the orchard had a public highway on one side and private roads used by the public on the two other sides.

The Mississippi legislature of 1918 authorized the removal of the station from McNeill to Polarville and all experimental work was moved also to the latter place. A new agent took charge of the general agricultural work at McNeill and for two years there was no record of the yield of the orange orchard. However, in 1920 the agent numbered each tree, or the place of each tree in the orchard, and began keeping individual records of their performances. As in previous years, it was found difficult to prevent pilfering; but these records show that in 1920 2888 oranges were gathered from the orchard with 187 as the largest number from any one tree. In 1921, 5,403 oranges were gathered from the orchard with 228 as the largest number from any one tree. In 1923, 35662 oranges were here produced with 1100 being the largest number plucked from a single tree.

From the time of setting through 1922 this orchard was never systematically sprayed and only twice was it sprayed at all and that time against the white fly. On the contrary, a peach orchard

set out several years later on an adjoining plot of land had been sprayed regularly for many years and had borne two crops, but after two years of neglect, it died completely from scale. This shows the comparative freedom of the Mississippi Satsuma orange tree from insect pests, and not as any argurement against spraying, for doubtless the trees would have done much better if they had been sprayed; while now there are perhaps many newly introduced troubles which were not apparent ten years ago.

In comparison with other orchards in California and Florida, the chief criticism of this orchard is that the trees are too small or have attained too little growth. This may have been caused by improper cultivation, or to a lack of proper kind and quantity of fertilizers. At any rate, the trees do not compare in size with a few trees planted soon after the experiment was introduced on nearby soil.

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This experimental work with oranges in Mississippi has clearly shown that the round oranges,

grape fruit and lemons are not sufficiently hardy to recommend for commercial plantings, though they are being grown for home use all over the Southern part of the state; the Citranges are exceptionally hardy and vigorous, but produce fruit of low quality; the Satsumas have been winter hardy, they produce satisfactory yields of fruit of high quality, and are increasing yearly in proportion to the amount of wood growth produced. Put out as a minor project with no previous work in this section to serve as a guide in its management, the orange industry was proved to be highly profitable by the experiment station, and this knowledge was immediately transmitted to the farmers of the district.

THE SATSUMA ORANGE

The Satsuma orange is a native to China and Japan, indications being that it first originated in Japan,[1] where there are bearing trees more than 300 years old. It belongs to the Mandarin group, of which the China Mandarin and Dancy Tangerine are also varieties. The Satsuma is superior to any of its group for cultivation in South Mississippi; the shipping qualities are good, it is ready for market ahead of oranges from competing sections, and has become very popular in the few consuming markets to which it has been shipped. It is very high in per cent of juice, while the distinctive blending of acid and sugar content give it a delightful and highly refreshing quality. In addition, it is practically seedless. The Satsuma and other varieties of the Mandarin group are sometimes called "Kid Glove Oranges" from the fact that the peeling can be removed so easily, and the sections separated, without the juice squirting in all directions. It is primarily a high class dessert fruit and is destined to become one of the

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1 En. Brit., "The Satsuma Orange."

leading, if not the most important citrus fruit on the market.

The Satsuma orange was first introduced into the United States in the Gulf Coast section of Mississippi about 1895. The industry has now grown until there are possibly more than 20,000 acres of this citrus fruit, with the bulk of the plantings still in their original setting, Mobile and Baldwin counties, Alabama.[1] With the opening of suitable land in South Mississippi, the Satsuma has gained rapidly in this state. The groves are now located mainly in Harrison, Jackson, Pearl River, Stone, Hancock and George counties,[2] at or near the following places: Ocean Springs, Biloxi, Gulfport, Long Beach, Pass Christian, Bay St. Louis, Carriere, McNeill, Poplarville, Lumberton, Lyman, Wortham, McHenry, Wiggins, Fruitland Park, and Lucedale. There are other scattered plantings, but the chief locations are those given. The largest commercial grove of bearing age at present is on the property of the Swan Plantation Company, two miles

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[1] F. B. Richardson, Press Circular on "The Satsuma Orange in Miss."

[2] ibid.

east of Lyman. This is a 6500 tree planting which has been given first class attention, and which made an exceptional yield in its fourth and fifth seasons, 1922 and 1923. At Carriere a large commercial development is in progress. Near McNeill, the site of the first experiment, 1000 acres have recently been purchased for the purpose of planting exclusively to the Satsuma. An extensive commercial development is under way at Hovey. The J. J. Scarborough twelve-year grove at Poplarville has been very successful, and the same is true of some recent plantings Lumberton. Probably the largest combined acreage of bearing trees in any one vicinity is near Wiggins, there being a total of at least 150 acres. The experience gained from these older plantings, where under correct practices wonderful yields have been secured, has given much encouragement for greatly increased acreage.

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The soils of the state of Mississippi are divided into several classes with the Gulf Coast Soil area occupying a narrow belt along the coast, and

consisting of two kinds of soils - fine sands and fine sandy loams.[1] The former occupy a belt adjacent to the shore and extending back from the shore from three to five miles. The loam soils border the sand soils in an irregular belt on the north, the width being about double that of the latter. The islands in the Mississippi Sound are also covered with the sand type of soil. The surface of the region is level and raised only a few feet above sea level. The upland fine, sandy loam of the region is easily tilled, is warm and is an excellent type of soil for fruit growing. The climate of the region is less variable than other parts of the State because the waters of the gulf modify the temperature. The mean temperature for the year is about 67° Fahrenheit.[1] The absolute minimum is about 1° Fahrenheit,[2] and the absolute maximum is about 100° Fahrenheit.[3] The annual rainfall is sixty inches; and the growing seasons are long.

These natural conditions are peculiarly suited to the cultivation of oranges, and as the best

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1 William A. Logan, "The Soils of Mississippi," p. 84
2 ibid
3 ibid

paying crop to be produced in this region, there is no reason why in the future it should not attain an important position in Mississippi agriculture.

GROVE MANAGEMENT AND REQUIREMENTS FOR COMMERCIAL PRODUCTION

In the last analysis the exact location of the grove site is the deciding factor in the establishment of a commercial orange grove. Considering the general locality the prospective investor will also be interested in a favorable climate as to healthfulness; good water; schools and churches; good transportation facilities; and the general freedom of the region from frost injury. If the general locality and the particular orchard site are both favorable, conditions are of course ideal. With reference to the climate prevailing in the six counties of Mississippi which lead in the production of oranages, the following is quoted from Bulletin XII by the United States Bureau of Soils: ".... extremes of both summer and winter being tempered by proximity to the Gulf of Mexico." This is especially noticeable in the summer, when winds from the south are delightfully cool. The summers as a whole are long but not oppresively

warm. The winters are mild and the few cold spells are always of very short duration. An important question in connection with the growth of oranges in this region is how far up from the Gulf Coast can the Satsuma be safely grown on a commercial scale. It may be said that the definite northen limit cannot be given with certainity. In fact, the districts where this citrus fruit has been grown for a number of years is the only basis on which to judge. The late G. A. Swan of Biloxi, one of the successful pioneers in Satsuma culture, stated a few years ago that "Satsuma trees will stand when absolutely healthy and perfectly dormant, a temperature of from twelve to fourteen without injury." In the Mississippi districts mentioned, the apparent limiting factors to successful commercial culture have been proper grove site, with good management in cultivation, fertilization, and spraying.

The grove site should certainly have good air drainage, which is natural to uplands unprotected by windbreaks. Windbreaks of trees surrounding table lands, or at the bottom of slopes, prevent air

circulation, and should be partially, if not totally removed. Grove sites with an elevation of twenty-five feet or more above the surrounding country are very desirable. In this connection, the variation in temperature at the base of a hill in mountainous country, and at different heights above, on a clear, still night is discussed in detail by an expert[1] as follows: "at the base of the hill, the lowest temperature during the night was twenty-five degrees; twenty-five feet above on the hillside, the minimum was thirty degrees; and fifty feet up, forty-four degrees. In addition, the twenty-five temperature lasted three hours, while the thirty degrees held for only a few minutes. At the base it was below freezing for a total of eleven hours; while twenty-five feet above the temperature was barely below thirty-two for a total of six hours."

As to soil requirements for a grove site, it may be said that in general most of the soil in the Satsuma belt which is suited to common agricultural crops is satisfactory for Satsuma culture.

[1] E. B. Ferris, "Farmers' Bulletin 1096", p. 13

Some growers claim that too light a soil is liable to start the trees into growth too early in the spring, though there is no experimental data regarding Satsumas to support this statement. The subsoil should certainly be substantial enough to be retentive of fertilizers, and there is an abundance of soil of this character in South Mississippi.

To summarize the requirements for a desirable grove site, good air drainage is especially important, combined with satisfactory soil drainage and a good agricultural soil which is retentive of fertilizers. If the requirements for a good grove site can be combined with a locality having good schools and churches, transportation facilities, an abundant supply of good water and favorable climate, the opportunity for success is highly favorable.

The Southern Section of Mississippi offers a peculiar combination of these features.

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In the cultivation of oranges, the preparation of the land is an important consideration.

If cut-over land is purchased the first work involved is the removal of stumps. The method most commonly employed at present is by burning. A good method observed recently[1] was to dig a hole two to three feet deep on an angle at one side of the tap root, and a second hole at an angle from the other side until it met the first one. This gives a V-shaped opening down by the side of the stump, with the bottom point of the V in contact with the tap root. Fire is started in the hole on the windward side of the V and the other hole acts as a flue, producing a draft. The tap root is burned through after which the remainder of the stump can be dragged out and used to kindle the next stump. After clearing the land of stumps, all slopes and rolling lands are turned to maintain the original fertility and to arrest soil erosion. The terraces and their outlet ditches may effect tree location, thus their construction precedes planting. Following this, the land is plowed six to eight inches deep, a tractor with disc plows being especially suitable for the work. After plowing, the land should be disced

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[1] F. B. Richardson, "Press Circular No. 17", p. 13.

thoroughly until the soil is well pulverized and settled. If the preparation of the soil is done thoroughly, the trees may be planted the first year on new land without waiting to crop the land one season.

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Commercial citrus fruit culture in Mississippi is and should be confined at present to the Satsuma Orange. Preliminary tests with round oranges, including some of the best Mediterranean varieties, have been encouraging - the trees have borne heavy crops of high quality fruit which ripens earlier than the same varieties in competing sections. Grape fruit has also done well; but it does not seem advisable at the present time to attempt to make commercial plantings in either the round orange or the grape fruit. From a commercial standpoint also, by concentrating all efforts, markets will also be more easily established and maintained.

There have been three varieties of Sat-

sumas grown in the Gulf Coast section: Owari, Ikeda and Zairai.[1] Of these the two former have proved most successful.[2] The Ikeda is nearly spherical in shape, while the Owari is flattened, with a depression at both the stem and blossomed ends. The Owari is two or three weeks earlier than the Ikeda and of better quality. In testing out other varieties, the cultivators have found the Wase very promising.[3]

While many Mississippi growers set their trees in December and January, February has been discovered to be the most successful time. In February the weather is usually more favorable, and the trees are ready to start into growth by the first of March or soon thereafter. The trees are set in squares and to a depth practically equal to that employed in nursing them.

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Continuous clean cultivation must be given the orange grove from early spring until October,

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[1] U. S. Anderson, "Press Circular No. 49, The Satsuma Industry."
[2] ibid
[3] ibid

the object being to carry the trees through to winter in a thrifty condition. Cultivation need not be any deeper than necessary to maintain a good soil mulch for the conservation of moisture. The double disc harrow with extensions and shields adapted to orchard work, and drawn by a tractor, has been found especially suitable to use in groves large enough to justify power equipment. Unless the winter cover crops have made an extremely heavy growth, this harrow will work it into the soil without the help of a plow. For a horse drawn cultivator, the spring tooth harrow will do satisfactory work. The number of cultivations will be determined by the frequency of rains, the object of the work being merely to maintain the soil mulch throughout the entire season.

The soils throughout the Satsuma Orange belt are greatly improved by the use of cover crops or animal manures. Since manures are difficult to obtain in sufficient quantity, cover crops are used extensively to increase the humus content of the soil. A cover crop is grown primarily for the ben-

efit of the trees and the hay from the crop should not be removed, but should be worked back into the soil. Cow peas or soy beans are ideal cover crops for this section. Such crops are planted in rows which can be cultivated until the cover crop takes the ground. In a young orange grove a space of six to eight feet is retained for each tree row. The cover crop may be planted in the latter part of June or through July. As soon as this crop is harvested, in groves of bearing age, or in October or November for young orchards, a winter crop of oats or rye is planted. In the following spring this is plowed under.

Unless land is very limited intercrops are not advisable. They interfere with the work of cross cultivation with the larger implements. In the case of small groves, however, and where cash crops are desired from the spaces between the tree rows, several truck crops may be used to advantage during the first two years: tomatoes, peppers, radishes, beets, carrots or beans.

As any other commercial crop, the Mississippi orange requires a certain amount of fertilization. Excessive applications of fertilizers have been found to be injurious to the trees; but scheduled of content and number of applications have long been worked out. The fertilizer best suited is that manufactured in fertilizer plants. The excessive use of barnyard manure tends to produce a thick-skinned, puffy fruit of inferior quality; and too much common nitrogen will cause the tree to make a sappy growth late in the season, thereby subjecting itself to frost injury. Nitrate of soda in a limited quantity is the most successful fertilizer; but excessive applications will cause the fruit to ripen late. A correct schedule calls for biennial applications of from three to ten pounds, the exact amount varying in proportion to the age, and condition of the tree.

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Spraying is an essential part of profitable citrus fruit production. In California, fumigation is also necessary and it is a costly process. Fumiga-

tion has never become necessary in Mississippi and probably never will, judging from the success attained by consistent spraying all through the Gulf Coast section.

The most important pests of the orange are the White Fly, the Chaff, Purple and Florida Red scales, the Rust Mite and the Red Spider. The caterpillar of the Orange Dog butterfly may also cause some damage to young trees by partial or complete defoliation, though with reasonable attention by the grower, this insect is easily kept under control. They are usually scattered over only a small per cent of the trees, so that hand picking is a practical means of control.

In common with all cultivated fruits, the Satsuma Orange is also subject to certain diseases which must be kept under control for best results. Citrus canker and citrus scab are of main importance at present; while many of the citrus troubles common to older sections have not been of much consequence in Mississippi.

The extent of infestation and infection of insects and diseases will of course govern the kind and frequency of preventive applications. In spraying prevention rather than cure is the object. For this reason it has been deemed economical to educate the prospective cultivator so that he may prevent the evils and so check all probability of their spreading into already established groves. The Satsuma Orange tree has been found to stand more neglect than probably any other commercial fruit plant, but continued practice of such neglect would of course mean failure.

Solutions of Bordeaux misture and Lime-Sulphur applied on a schedule of about five times a year prevent most of the dangerous insects from getting a foothold, while an occasional application of oil emulsion cleans up scale infections.

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Up until the present time, pruning of the orange trees has been in a certain measure neglected. This neglect has been due in part at least to the

fact that the industry is comparatively new and there is little knowledge on the subject; and to the fact that in the past the trees have borne large crops under adverse conditions, causing the grower to be more or less self-satisfied. With the rapid expansion of commercial plantings, however, strict requirements for profitable production of high grade fruit has demanded an improvement in all cultural methods. Even yet, there has not been found necessary any elaborate system of pruning such as is followed for most fruits; but still they are essential to the best success of the industry. The operations practiced may be roughly divided into three parts - shaping the tree; removal of dead, diseased and broken branches; and removal of suckers from the stocks.

The only method used for protecting the Satsuma trees in this section against cold is mounding. Soil is mounded up twelve inches high around the lower part of the tree as soon as it is set; and so in case of a frost severe enough to

kill the top of the tree, that protected will furnish new growth for the next season.

The trees are generally propagated by budding, Citrus Trifoliata being the stock used. Citrus Trifoliata is a desidous thoray bush or tree which sheds its leaves late in winter.[1] being different in this respect to most citrus plants which are evergreen. The small fruits are worthless for eating purposes. They are filled with seeds, which are left in the fruit until time to plant in the field. Some nurserymen plant the seed in beds, growing a small seeding by fall, which has to be transplanted and grown another season before budding. Experience has shown that if the seed is kept in the fruit until planting time it will yield a higher number of plants per pound.

[1] En. Brit., "Satsuma Orange".

HARVESTING AND MARKETING

As with all fruits the Satsuma orange must be handled carefully. Any operations which would result in punctures or bruises of the fruit must be avoided. The fruits should not be pulled from the tree, because this method followed by careless pickers results in breaking the skin at the stem end. Special orange clippers are used for cutting the fruit from the tree, and are so constructed that the stem is cut close to the fruit, thereby leaving no projecting stem for puncturing other fruits in the boxes or straps. While the period of harvesting the fruit usually extends over one or two months, it is possible to harvest the bulk of the crop in one picking. The full sugar content of the Satsuma variety is developed early in the ripening stage so that the quality of the fruit is not impaired if harvested before it is dead ripe.

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While the first stage in marketing a fruit

crop is generally considered to be giving the fruit the proper pack, it should be emphasized that the preparation of the fruit for market must start in the grove with proper cultivation, fertilization, spraying, and pruning for the production of clean, bright fruit of desirable size. This will obviously facilitate its marketing.

Mississippi Satsuma growers have been fortunate in being able to enlist the services of the Gulf Coast Citrus Exchange, an established marketing organization originated by the Citrus growers of Gulfport, Mississippi, in 1910. This exchange supervises the construction and equipment of cooperative packing houses, and the cooperative marketing of fruit from the entire Satsuma belt. In addition, the exchange advises on cultural methods, such as fertilization and spraying, and mixes its own fertilizers and spray materials for salo to the members of the exchange at cost. At present the most active branch of the exchange is the Harrison County Citrus Growers Association which has its packing house at Lyman. Another large packing house has just been

completed at Long Beach, and will open officially this year.

The oranges from the producing districts are handled by the packing house where they are properly graded, wrapped and packed under expert supervision. The central office of the exchange then directs the distribution of the fruit to the best markets. To show the extent of distribution that has been attained, it can be noted that one of the first cars from the packing house at Lyman in the fall of 1922 went to Montreal, Canada in good condition.

YIELDS, COSTS AND PROFITS

Because of the newness of the industry, information on these subjects is very limited. As in other businesses, some individuals make a very flattering success under favorable conditions and good management, while others make only fair profits. Some neglected groves, or groves on improper sites, have been operated at an actual loss. If the grove is properly situated, and given good management, the Satsuma compares favorably with any other fruit industry in the United States, present indications being that it will prove even more profitable. The trees are very prolific, the fruit is of superior quality and the first orange on the market, while the territory adapted to successful culture is quite limited. In well managed bearing groves which have come under observation there has been a crop each year, and this is the testimony of all growers consulted where all cultural conditions have been favorable. A national authority on citrus fruits made the statement recently that the Gulf Coast industry was organized

and being operated on a higher plain than any other citrus section in the United States, and that the Satsuma is destined to be a gold mine to the growers in the Gulf Coast Section.

The following yields and returns are given as an indication of what the orange industry is doing in Mississippi:

"In 1922, 6500 trees in their fourth season yielded 1975 boxes of marketable fruit. This is practically one-third box per tree, and on the basis of 70 trees per acre would be equivalent to 21 boxes per acre."

"One 4½ acre grove gave a return of $3500 with the average price of $3 per box. This is equivalent to a yield of 250 boxes per acre, and a gross income of $777 per acre."

"An 18 acre grove yielded 4000 boxes that sold for $3 to $5 each."

"Ten acres gave a return of $10,000 and the same grower on a small number of trees

produced a yield up to $3000 per acre."

Such examples do not prove that every grower can expect such returns, though a visit to bearing groves which have been given good care will convince any one that the Satsuma is very prolific.

....

As to costs, the following statements from a Mississippi grower are repeated:

"Trees will cost about 50 cents each, fertilizer five cents per tree for the first year, labor for setting 15 cents per tree.... At ten years the tree should get 30 pounds of fertilizer and produce 8 or 10 boxes. They will show a profit, or should, when three years old. It will cost $1.05 to pick, pack, and put in dealers' hands... Spraying and cultivation are essential..."

In contrast to these figures may be stated a general statement regarding the cost of

Citrus fruit production in California:

"Orchard costs in the production of oranges and lemons in Southern California are probably greater per acre of bearing orchard than are the costs of any other commercially grown fruit in the United States. During the past ten years growers have spent each year an average of $185.00 per acre in the production of oranges, exclusive of the cost of packing the fruit."[1]

In Florida conditions seem to be as follows:

"The annual cost of maintaining a grove in Florida after it reaches bearing age averages from $75 to $100 per acre. When all or most of the labor is performed by the grove owner the cash expenditure of starting and maintaining a grove may be reduced by a third or even more."[2]

It may be assumed from these statements that the cost of maintaining bearing groves of

[1] "American Fruit Growers Mag.", Feb., 1923.
[2] "Farmers' Bulletin 1122, p. 43.

oranges in Mississippi are less than in either of the two leading producing states in the United States.

CONCLUSION

At present there is an unusual amount of interest in the planting of oranges in Mississippi for commercial purposes as well as for home use. Not only is this true in the old established areas of the Gulf Coast section, but people all over the southern part of the state are becoming interested in the industry. Many developments are taking place, conspicuous among which is the preparation to set out one plot of 20,000 trees in Pearl River County this winter.

The various agricultural boards, bureaus, and experts of the state know little of the industry; but an attempt is being made to compile authentic data and special studies are being made in out of the state fields.

In this connection the question has arisen as to whether or not orange planting will be overdone in the state. A similar question has been asked concerning most of the commercial fruits now grown in the United States. Repeated booms once

supposedly threatened the apple industry; but though in 1920 the total production was 236,677,000 bushels,[1] the highest grade fruit still brought from forty to ninety cents per dozen. The packing of high-grade fruit, good business methods in distribution, with an increased population, took care of the greatly increased production. It does not seem possible that there can be an over-production of Satsuma oranges, the variety which is being pushed in Mississippi, when the following points are considered: first, the extent of territory in the United States adapted to commercial production is quite limited; second, the Satsuma is the first orange on the market; and finally, the superior quality of the fruit will stimulate a large and increasing demand.

At present only a few of the consuming markets in the United States are familiar with this fruit. The production centers are within easy reach of the largest consuming centers of the country, and with the distribution services of tho

[1] "U. S. D. A. Year - Book," 1921.

Gulf Coast Citrus Exchange in operation, it seems inevitable that there will be an unlimited, profitable demand for this high class dessert fruit at all times in the future.

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