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W. A. McRAE

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SUGAR CANE GROWING IN FLORIDA

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SUGAR CANE AND SYRUP MAKING.

By A. P. Spencer.

SOME IMPORTANT FACTS.

(1) Sugar-cane is successfully grown throughout Florida, though it only matures perfectly in Southern Florida.

(2) Any good agricultural soil in Florida that has sufficient drainage is capable of producing profitable crops of sugar-cane.

(3) Sufficient moisture is the controlling element in the production of sugar-cane, from its earliest growth.

(4) Ammonia and potash are especially needed in any fertilizer applied, while phosphoric acid is needed in lesser quantities.

(5) Cultivation should be frequent until the crop is well grown, but always with shallow-working implements.

(6) The longer the cane can stand without danger of frost, the higher will be the sucrose content, and the better the quality of syrup.

(7) Sugar-cane will give a better yield if the seed-cane has been selected for healthiness and maturity.

Sugar-cane is among the most certain of Florida crops. Crop failure for the State has never been reported. Sugar-cane has been grown more or less in almost every county in Florida, and with a degree of success on almost every grade of agricultural soil in the State. It must not be inferred that sugar-cane has no preference as to soil fertility, moisture, or physical condition of the soil. Success in growing this crop is governed by the methods adopted in each stage of its growth.

Sugar-cane is a tropical plant. The different varieties require more or less than twelve months without frost to reach full maturity. Certain varieties are propagated successfully and profitably as far as 100 miles north of the Gulf of Mexico. Below the twenty-seventh parallel, or the region around Manatee and Lake Okeechobee in Southern Florida, sugar-cane matures, forming long sprays of bloom called "arrows." In seasons with little or no frost, the cane may mature even north of this line. In all sections of the State it reaches a stage of maturity sufficient for making syrup or sugar.

Up to the sixties, large plantations of sugar-cane existed on the low hammock lands of Manatee, Volusia, and Citrus Counties. At this time the industry was perhaps the most important one in Florida. At the close of the war, these plantations were nearly abandoned. Some of this land was planted in orange groves. Since this period, little attention has been given to growing sugar-cane on a large scale, although nearly every county of the State produces more or less of it. At the present time the largest acreage is on the rolling high pinelands of West Florida.

Soil.

The greatest tonnage of canes per acre is usually produced on low rich hammocks where the drainage is good. However, it is still an open question what class of soil in Florida is best for producing syrup. The better grades of high pine land in West Florida are producing from fifteen to twenty-five tons of sugar-cane per acre, and a superior grade of syrup. We may conclude that any good agricultural soil in Florida that has sufficient drainage is capable of producing profitable crops of sugar-cane, if the crop is grown by methods suitable to the soil. The rolling pine lands are well adapted without further drainage. Flat-woods soils frequently require drainage to carry off

the surplus water that is usually present during the rainy season. The flat hammock lands and reclaimed marsh lands, for the most part, have usually artificial drainage to control the surplus water during the wet season. While sugar-cane is a heavy consumer of moisture, it must have an open soil with the water table below the feeding area of the roots. It is a vigorous plant, and succeeds well on any soil suitable for corn or other farm crops.

Soil-Preparation.

Soil intended for sugar-cane should be prepared as long in advance of the planting time as the previous crop will permit; before November 1 for fall planting, and not later than January 1 for winter planting. After the vegetable matter has been plowed under, the surface should be harrowed and pulverized two or three times before the land is laid off for planting. Soils that have not been plowed deeply and worked back into condition cannot conserve the moisture already in the soil, or absorb and store up the rainfall that occurs during the winter months. Sufficient moisture is the controlling element in the production of sugar-cane from its earliest growth. The conservation is one of the main things to look to in the prepara tion of the soil for growing sugar-cane.

The deeper the land can be plowed, the better for sugar-cane, because of the extensive root system and the long season the cane remains in the growing stage. Fields that have been in cultivation for a number of years will be benefited by subsoiling until a depth of sixteen or twenty inches is secured. This may be done with an ordinary subsoil plow, or by a scooter following in the furrow behind a turning plow in breaking. This gives additional depth to the seed-bed, and proves advantageous to the crop, in that it gives a large storage area for the moisture supply needed.

Rotation.

In rotation, sugar-cane may follow almost any of the ordinary farm crops, but preferably sweet potatoes, velvet beans, or other leguminous crops; the latter being especially desirable because of the liberal amounts of humus they add to the soil.

Because of its gross feeding tendencies and the large amounts of fertilizing elements it consumes in the making of a twenty-ton crop, it is not advisable that sugar-cane shall follow itself on the same land, unless where it is desirable to grow it from the "stubble" or "ratoons," and then not for more than three years in succession.

Fertilizers.

With the exception of the rich hammock lands, sugar-cane will require liberal applications of fertilizer. Ammonia and potash are especially needed in any fertilizer applied, while phosphoric acid is needed in lesser quantities. The richer the soil in humus and decaying organic matter, the less will be the need of heavy applications of ammonia. This is evidenced by the very heavy crops grown in the hammock lands of Southern Florida before the war, when commercial fertilizers were nearly unknown here. On high pine land a fertilizer analyzing 5 per cent. of ammonia, 4 per cent. of phosphoric acid, and 8 per cent. of potash, should be applied at the rate of 600 to 1,000 pounds per acre, ten days before planting. The ammonia should come from an organic source, because of the long season required by the crop for growing. If the crop appears uneven and yellow, and shows an unthrifty appearance, it will be advisable to give a second application of ammonia not later than August 1. This ammonia should be applied in the form of nitrate of soda at the rate of 200 pounds per acre, and broad-casted. It matters little in what form the potash or phosphoric acid

is applied, because of the gross feeding tendencies of the sugar-cane plant. It is, however, conceded by some growers that a better grade of syrup will be produced by using sulphate of potash, instead of muriate of potash or kainit. This, however, it still an open question.

Planting.

When ready to plant the crop, lay off the furrows six inches deep and six feet apart. In these furrows plant the canes, after cutting them in lengths of three or four joints each, lapping them in the furrow a few inches. Cover the canes with about three inches of soil. If they are covered too deeply in mid-winter the eyes will be slow in sprouting, and likely to make a less vigorous growth than if they sprouted readily. After the cane is well up, the furrow may be filled in to the level. This places the roots well below the surface, giving a better root system, and helps to prevent the canes from blowing over when the crop is about mature and top-heavy. Canes that are planted very shallow will often blow over and tangle during the heavy winds storms of October. A tangled cane patch requires more labor for cutting and harvesting than one which stands erect.

Cultivation.

The cultivation of sugar-cane is similar to that of corn. This cultivation should begin soon after the canes are planted, mainly to prevent the loss from evaporation that will occur during the spring months unless the surface soil is kept stirred. The first two or three cultivations may be done with the weeder or harrow, which may be run in any direction over the rows. After the canes are too high for the weeder to pass over, the one or two-horse cultivator, running shallow, is a good implement to use. Cultivation should be frequent until the crop is well

grown, but always with shallow-working implements. If the ground is allowed to become dry from lack of cultivation at any stage in the growth, the cane suffers. A maximum crop cannot be made unless the plants have an abundant supply of moisture. In all probability the rainfall will be sufficient between June 1 and September 1, but during this period the weeds and grass will get a good start and fill the land unless the cultivation is frequent. The most likely period for the cane to be injured from lack of moisture is between planting time and June 15. It is advisable to keep the cultivation up just as long as it is possible to go through the cane patch.

Harvesting.

The first operation in harvesting is stripping the canes. This should be done about the last week in October in West Florida, and two weeks later in Central Florida. By removing the dead leaves the sunlight is admitted to the ground, which is thought to hasten the ripening of the canes. As there is a large amount of work involved in handling one acre of sugar-cane, it is further advisable to have this stripping done early, so that there will be no delay when the grinding season begins. The longer the cane can stand without danger of frost, the higher will be the sucrose content, and the better the quality of syrup, as immature cane makes inferior syrup. Cutting should commence about November 15 in West Florida, and in Central Florida about ten days later. The tops are removed before the cane is cut. It is recommended to leave about one immature joint to every eight mature joints, because of the glucose contained in the immature stalk, which helps to prevent crystallization in the evaporation of the juice. After the cane is topped, it should then be cut as low as possible and put into rows, or on the wagon for hauling to the cane mill. In the event of approaching freezing weather it is well to cut all the

canes and cover them up with the tops to prevent them from freezing. A white frost does not injure sugar-cane, but checks its growth and hastens maturity. A freeze is apt to kill the buds or eyes, and so injure them for seed; but it does not injure the canes for syrup or sugar, unless they ferment in the meantime.

Seed-Cane.

Sugar-cane will give a better yield if the seed-cane has been selected for healthiness and maturity. While this is one of the most general crops in the State and has been grown for many years, yet comparatively little attention has been given to careful selection of seed-cane. The loss from inferior seed-cane comes in several ways. If immature and poorly developed canes are planted, the stand of canes is almost sure to be uneven. The poorer canes will have many immature eyes that will not germinate at all, and many more that will germinate slowly, so that in the next year's crop there will be several blank spaces and many short-jointed small canes. There is the possibility of putting diseased seed-canes in the bed, perhaps causing the entire bed to rot, or at least injuring the growing powers of even the best canes. The selection of proper seed-cane is of the greatest importance in the growing of sugar-cane. Seed-canes should have well-matured buds, and joints of medium length. If the joints are short, the cane is apt to be less vigorous in growth.

It will require upward of 1,800 whole canes to plant an acre. In filling the beds it would be a wise precaution to allow at least 2,500 canes for each acre to be planted, so that in case of a loss there will be a sufficient number left for planting. No canes should be bedded from any field where red rot is suspected or known to be present. This disease is described on a later page.

Time to Save Seed Cane.

It has been already stated that cane buds are injured

by a freeze. It is important that the seed-canes should be cut and bedded before a freeze is likely. This date would be in west Florida about November 20, and in middle Florida about ten days later. It is to be remembered, however, that the seed-cane is more likely to grow well if it is well matured and if the buds are large and well developed. So that it is advisable to allow the canes to stand as long as they are safe from frost.

Laying Down the Beds.

The bottom of the bed for the seed-cane should be about eight inches below the surface of the ground. The bed should be six feet wide. The seed-canes should be placed in this bed in even layers about four canes deep on the sides and a little deeper in the center, so as to give a rounded top to shed the water. Seed-canes should not be topped. Each layer in the beds should be about ten inches forward of the previous one, so that the tops will cover the joints of the lower layers. The beds should be made as uniform and even as possible, so that no canes will be left uncovered and no depressions occur in the bed to collect water during rains. It is well in all cases that the butts of the canes should touch the ground and the canes be moist when laid down. This will help to prevent the buds from drying out, and also prevent dry rot. "Immediately after a heavy rain is a good time to bed seed-cane." When the bed is filled, it should be covered with about two inches of soil as a protection against frost. A strip about two inches wide may be left open along the ridge the entire length of the bed to give ventilation, and one or two furrows thrown up with a plow on each side to drain the water away. Should water stand in the bed during the winter, even for a short time, the canes would probably ferment and the buds be destroyed. If the bed is located on a slope, there is little danger of water standing in it. It might be again emphasized that a lack of

moisture in the seed-bed will probably produce dry rot or drying out of the buds, causing them to germinate slowly if at all; while standing water in the seed-bed will destroy the buds and possibly destroy the cane entirely. If the stubble is to be bedded for seed, it is best to dig it up by the roots, and bed it with the root attached. It would not be wise, however, to bed stubble cane in this way in the same bed with seed-canes; although about the same protection against freezing, and the same precautions as to excess or lack of moisture are recommended.

Stubble or Ratoon Cane.

While it is generally considered that a better yield of cane will be secured if the canes are planted annually, it is nevertheless a common practice to use stubble or ratoons for seed-cane. Unless these ratoons have more care than is frequently given them, an uneven stand will result in the following year. This is due to many causes, most of which can be avoided. In the first place, ratoons should be cut very low. If they are cut high there will be fermentation and decay, which injures the buds. A practice that is adopted by the best cane growers is to run a light furrow along one side of the cane, and then turn the ratoons up-side-down in this furrow, throwing a light furrow on them. This gives a covering for protection during the winter and prevents decay of the stumps of the canes.

It is not considered a good practice to use ratoons for more than two years in succession. Those who do this seldom get as good yield in the third year as in the second year.

Varieties.

Little attention has been given to the varieties of sugar-cane in Florida. Nevertheless the best growers usually

select the light-colored canes because these produce a lighter colored syrup. It is fortunate that the light-colored canes usually produce as well as the red or purple canes.

In Louisiana the best results have been obtained from D. 74, which is a light-colored cane. It produces a larger tonnage of cane than other varieties in Louisiana. It is said to resist heavy winds, and to be altogether desirable. It is recommended by the Louisiana Experiment Station in preference to the purple or ribbon cane. A few farmers in Florida have, also, reported D. 74 to be one of the best canes for Florida. In Bulletin 129 of the Louisiana Experiment Station, the author speaks of it as follows: "In nearly all sections of Louisiana it has given heavier yields than the purple or ribbon canes. It is reported to be in tonnage 20 per cent. superior to either green or ribbon canes. In addition it is reported to contain a larger percentage of sugar in its juice." The richer in sugar a cane, the larger the amount of syrup that can be made from it. With the ordinary process of manufacture, this high percentage of sugar will cause crystallization in the syrup, but with the better methods, crystallization can be avoided in other ways.

Japanese Cane.

Japanese cane was introduced into Florida about 1889 from Louisiana. It makes an excellent grade of syrup, but is it not generally recommended for syrup-making. It is much harder to grind than other canes, and the juice is more difficult to extract. It usually has a lower yield of syrup. There are, however, exceptional cases when Japaneses cane has yielded as high as five hundred gallons of syrup per acre. The average yield of all canes in the State is less than three hundred gallons an acre. Where this exceptionally high yield was obtained, it was under very favorable conditions, and in these cases other canes

would probably have given still greater yields. Japanese cane will withstand ten degrees of frost, and is therefore a perennial, and can be grown several years in succession without replanting. Some growers claim it will not require replanting for an almost indefinite number of years, but experiments do not altogether bear this out. The test plots on the Experiment Station farm show a much greater yield on the newly planted plots than on stubble originally planted about six years ago. Japanese cane is not generally recommended for syrup-making, but has proved an excellent winter forage crop for live stock. Because of the extra labor involved in stripping the leaves, and because the hardness of the cane requires heavier mills to get as high a percentage of the juice, this cane is less desirable than the other sugar-canes for syrup-making.

Cane Grinding.

Most of the cane mills in Florida are of the small type, and are operated by horse power. They will not give a high extraction, and are not to be recommended, except where only a small amount of syrup is made. It must be remembered that the greater the extraction, that is, the larger amount of juice that is pressed out per ton of cane, the greater will be the amount of syrup per acre. Very few of the small mills extract more than fifty per cent. of the weight of the cane in juice, leaving 35 per cent. still in the cane. (Cane is composed on the average of 85 per cent. juice and 15 per cent. dry material.) To secure the full extraction, it is necessary to set the rolls so close that the pulp or bagasse when passed through the mill will be broken into short pieces apparently free from juice and so dry that they will burn readily. A well designed steam power mill, when properly set, will extract 75 per cent. of the weight of the cane in juice, leaving only 10 per cent. in the bagasse. The most powerful steam mills extract an amount of juice equal to about 80 per cent. of the

weight of the cane, or nearly all the sucrose in the cane. A large percentage of the sucrose is wasted on farms where light mills are employed.

When sugar-cane has been properly grown on a good quality of soil, a yield of twenty tons per acre may be expected. As high as thirty or thirty-five tons have been produced under exceptionally good conditions. The average yield for the State is perhaps fifteen tons. One ton of well matured sugar-cane will produce about twenty gallons of syrup at a density of 33 degrees Baume. The exact figures cannot be given, since analyses of Florida canes vary from 9 to 18 in percentage of cane-sugar in the juice.

Several firms manufacture cane mills of standard designs, and it would be well for those who contemplate buying new syrup-making equipment to investigate the tonnage capacity per day and horse-power required to operate the machinery, bearing in mind that the chief value of a mill lies in its power to extract the highest percentage of juice from the canes.

Evaporation of Juice.

As the juice comes from the mill, it contains large quantities of coarse materials that should be removed before it goes into the evaporating pans. Thorough straining at this particular stage is necessary in the manufacture of high-grade syrup. As the juice leaves the mill, it should pass through a close wire screen to remove the coarse particles and leaves. Below this would be a coarse cloth strainer to catch finer pieces, and then the juice should pass through coarse muslin. Just before going into the receiving tank it passes through a wooden blanket which catches most of the finest sediment. These filters should be stretched on hoops, and a number of them kept on hand so they can be frequently changed and cleaned, otherwise they will become clogged and prevent the juice

from passing through. Thorough straining before the juices enters the evaporating pans will not only reduce the amount of skimming, but also improve the quality of the syrup. The receiving tank for the strained juice should be large enough for a full run in the evaporating pans, so there may be no delay when evaporation begins. This receiving tank also acts as a settling tank between the process of straining and that of evaporation. For plants suited to handle from five to forty acres of cane, the evaporating pan with steam coils is recommended. The better pan evaporators are equipped with steam coils for evaporation, while the smaller outfits are of the furnace type with the pans immediately over the firebox. The steam coils are to be preferred because of the control in boiling the juice. These pans are manufactured for their special purpose and can be purchased complete from the manufacturer.

When the juice enters the first evaporating pan, it should boil up quickly. This throws up a large amount of sediment and scum, which must be removed with a skimmer. If this boiling is slow, a large amount of the sediment will rise to the surface and cannot be skimmed off; but will pass over into the second pan, from which it is more difficult to remove it because of the greater density of the juice in the second pan. In the first pan the juice is evaporated to a density of about 25 degrees Baume. In the second pan the evaporation continues until the density of the syrup is 33 or 34 degrees Baume. With larger plants the juice remains in the receiving tank for six hours or more, so that the sediment goes to the bottom. Then the juice is drawn from the top, over into the first evaporating pan. Most of the clarification takes place in the first evaporating pan. As the juice becomes of a greater density it will hold a large amount of the sediment in suspension. If not thoroughly clarified before leaving the first pan, it will be almost impossible to remove the finer particles when the juice has become more

concentrated in the second evaporating pan. A cloudy syrup results.

When the juice has been boiled to the required density, it should be run into the containers, and immediately sealed up. The secret in making syrup of a uniform grade and high quality is in the care exercised in securing proper straining and the proper density in each stage of evaporation. It is nearly impossible for anyone to determine the exact density without the use of a Baume spindle. This Baume spindle is a glass float with a graduated scale. The point to which it sinks into the liquid will indicate the density. A small quantity of syrup may be removed from the boiling mass and placed in a glass or tin, and the Baume spindle inserted. The heated syrup in which the instrument sinks to 33 or 34 degrees has been sufficiently boiled. This on cooling, will give a density of 37 or 38 Baume, which is the proper density for marketable syrup.

Fermentation in Syrup.

Fermentation in syrup is caused by molds, yeasts, or bacteria. The preservation of syrup consists in sterilizing it, which can be done by continuous boiling until all the mold spores or microbes which cause fermentation have been destroyed. This sterilization may be accomplished by heating it to 180 degrees Fahrenheit. Fermentation, however, will take place even though the syrup has been heated much above 180 degrees, unless the containers into which the syrup is placed have also been completely sterilized. It is practically impossible to thoroughly sterilize a barrel under the ordinary conditions around a small syrup plant. In most cases the fermentation that syrup undergoes after it has been standing three or four months in barrels is due to the condition of the barrel when the syrup is placed in it. For this reason, syrup placed in cans or bottles will usually

keep a longer period if the containers have been properly sterilized by thorough boiling before the syrup is placed in them. Under this condition, syrup will keep for an almost indefinite period if the cans are filled while the syrup is still hot, and are immediately sealed, to prevent further contamination from outside sources. Sterilization of both syrup and container is therefore the only means of preventing fermentation in cane-syrup. Furthermore, it should be borne in mind that cleanliness in manufacture, from the time the cane enters the mill until the syrup is placed in the container, is the main thing in keeping syrup sweet. The rollers of the mill should be washed with lime water when stopped for any length of time. The juice gutters and all surfaces over which the juice passes must also be thoroughly cleaned. The walls of the building and the surroundings should be kept clean. Where it is practicable, cold storage will facilitate the keeping of the syrup. Fermentation of syrup does not take place at low temperatures, so that if the syrup can be put in cold storage it should keep almost indefinitely. It is a mistaken idea that syrup is a readily perishable product. There should be no more difficulty in preserving it than there is with canned sweet potatoes, if it has been handled properly during the process of manufacture.

DISEASES OF SUGAR-CANE.

RED ROT OF SUGAR-CANE.

(H. S. Fawcett.)

The disease has characteristic marks inside the canes by which it may be recognized, but is difficult to recognize externally. It is therefore apt to be overlooked until it becomes so serious as to attract attention. When the diseased canes are still lengthwise the soft tissue of the internodes shows a reddish discoloration. In these red discolored areas are found white spots which shade off

into the red. These white spots are especially characteristic of Red Rot. As the disease advances the central portion of the stem gives way, forming a long straight cavity, in which is a whitish mold made up of fungus threads. The nodes and buds become first brown, and finally black. The hard outside of the stalk remains apparently unchanged. When the disease has not progressed so far as this, the canes may appear at first glance to be healthy; but when they are split length-wise the soft tissue in the internodes will show the beginnings of the disease as small reddish patches. Because it is so easily overlooked, the grower should keep a watch for it. There are other diseases that may cause reddening of the soft tissue, but if there are also white patches within the red areas, the disease may be pronounced Red Rot.

Although Red Rot is usually not noticed until the cane is cut for planting, it may be present during the summer. In some cases the fungus causing Red Rot may seriously check the growth of the plant during the summer, and redden the leaves and the soft tissue inside the canes, The fungus attacks the plant most easily through wounds or holes made by borers. It appears to get to the growing plant, however, mostly by means of the planted cuttings, and does not spread much through the air. Usually the injury is only slight during the growing season. At the bedding season, however, the fungus is present ready to cause serious damage to the dormant canes. It is at this time that the fungus grows, advances into the interior of the canes, and kills the buds. In the beds decay appears to start mostly at the ends of the canes, although it may also start at other places along the canes.

Means of Control.—1. Plant only healthy canes. In Hawaii and other places, it has been found that this disease may be easily and successfully controlled by planting only healthy canes that show no sign of discoloration. Any canes showing even the slightest discoloration of the interior should be discarded. It will be necessary, in

sections where the disease has become prevalent, to grind all the cane, and get seed-cane for planting from some other locality.

2. As an extra preventive the selected canes may be dipped in Bordeaux mixture just before they are planted. This will kill any fungus that may have gotten onto the cut ends or surfaces. A large wooden trough is convenient for holding the Bordeaux mixture while dipping. The formula, 5 pounds of copper sulphate, 5 pounds of lime, and 50 gallons of water, may be used. The cost is but slight.

3. Whenever possible plant the canes in the fall instead of bedding them. Planting the cane in the fall will give one an opportunity to discover the disease, if present, and will do away with danger from contamination in the bed.

4. Burn all the trash in the old bed, and all diseased cane.

INSECT ENEMIES OF SUGAR-CANE.

J. R. Watson.

THE CANE BORER.

The most serious enemy of cane is the borer (*Diatraea saccharalis*). In some parts of the State this is a serious pest. Luckily it is not generally distributed, and many localities are entirely free from it. It is very important for growers in such places to keep it out.

The borer is the caterpillar of a moth. The female moth lays her eggs on the foliage. The young caterpillars, hatching out, feed on the tender leaves for a few days, but soon enter the cane through a bud or "eye," thereby reducing the stand of cane. They spend their entire larval life in the cane, tunnelling up and down, stunting its growth, weakening it so that the wind may blow it over, reducing the sugar content, and making easy the

entrance of fungus diseases. Here they go into the pupa stage, to hatch out as small moths in a week or so, unless delayed by cold weather, in which event the pupae spend the winter in the cane.

Control is difficult once the borer becomes established in a field, hence we urge Florida growers to be very careful about introducing this pest into a community now free from it, as such a community has a great advantage over the infested one in the matter of cane-growing. A little carelessness in this respect now may cause, in a community, a loss of thousands of dollars in a few years. Dissemination is almost entirely through infested seed-cane, as the female flies only a few score feet. Planters should carefully inspect all seed-cane, and any canes exhibiting holes should be promptly burned.

Remedy.—Once introduced the best the grower can do is to reduce the numbers of hybernating larvae by burning the tops and rubbish as soon as sufficiently dried, cutting the canes low, and destroying shoots that start from the roots where cane is cut early. Plant in the fall from sound canes only. Rotation of crops must be practiced in infested fields.

THE ARMY WORM.

Sugar-cane is one of the favorite food plants of this caterpillar (also known as the Southern grass worm), which in some years occurs in destructive numbers. On cane it can readily be controlled by the arsenic compounds. Use a spray of three pounds of lead arsenate paste or one pound of zinc arsenite powder to fifty gallons of water, or dust the plants with the latter, using air-slaked lime as a filler.

DANGER IN IMPORTED CANE.

There are, in the West Indies, many serious enemies of

cane that have not yet been introduced into the United States, or which are rare here. Among them are the larger cane-borer, the weevil borer, frog-hoppers, root-borers, pink mealy bugs, and mites. For this reason introduction of West Indian cane for seed should be done, if at all, with the greatest care possible and the most rigid inspection. The Bureau of Entomology of the United States Department of Agriculture, recommends that such introduced canes be grown during the first year, at least, under the constant supervision of an entomologist.