Table 1 indicates the extent of the cane-sirup industry in terms of gallons produced, by States.

TABLE 1.—*Sugarcane sirup production by States*[1] *for certain years from 1899 to 1938*

State	1899	1909	1919	1929	1930	1937	1938[2]
	Gallons	*Gallons*	*Gallons*	*Gallons*	*Gallons*	*Gallons*	*Gallons*
Georgia	3, 226, 367	5, 533, 520	10, 640, 000	4, 785, 000	3, 640, 000	5, 425, 000	4, 389, 000
Louisiana	1, 552, 641	4, 125, 083	3, 672, 000	5, 773, 000	6, 208, 000	8, 210, 000	7, 395, 000
Alabama	2, 672, 438	3, 078, 531	8, 480, 000	2, 106, 000	2, 160, 000	3, 770, 000	2, 500, 000
Mississippi	1, 413, 219	2, 920, 519	6, 675, 000	3, 247, 000	1, 800, 000	4, 495, 000	4, 482, 000
Florida	1, 687, 452	2, 533, 096	4, 590, 000	1, 860, 000	1, 530, 000	1, 872, 000	2, 090, 000
Texas	888, 637	2, 246, 774	2, 421, 000	868, 000	852, 000	768, 000	875, 000
South Carolina	805, 064	881, 558	1, 369, 000	590, 000	590, 000	420, 000	380, 000
Arkansas	44, 819	286, 637	336, 000	106, 000	54, 000	175, 000	110, 000
North Carolina	1, 957	21, 677	(3)	(3)	(3)	(3)	(3)
Arizona	438	1, 040	(3)	(3)	(3)	(3)	(3)
New Mexico	(3)	5, 038	(3)	(3)	(3)	(3)	(3)
Oklahoma	(3)	56	(3)	(3)	(3)	(3)	(3)
Total	12, 293, 032	21, 633, 529	38, 183, 000	19, 335, 000	16, 834, 000	25, 135, 000	22, 221, 000

[1] The figures for 1899 and 1909 are from the Bureau of the Census, U.S. Department of Commerce; those for all other years are from the Bureau of Agricultural Economics, U.S. Department of Agriculture. The latter figures are more comprehensive in that they include reports from the small sirup makers.
[2] 1938 figures are preliminary and subject to revision.
[3] Figures not available.

Sirups are produced in considerable quantities from the saps of sorgo (sweet sorghum) and maple trees and from cornstarch by a chemical process. In addition, sugarcane molasses, which is a by-product in the manufacture of sugar, is used for similar sweetening purposes and in cooking. Comparison of the quantity of cane sirup produced in 1931 with that of other sirups and molasses used as human food in the United States is shown in the following tabulation:

	Gallons
Cane sirup[2]	14, 359, 000
Sorgo sirup[2]	17, 818, 000
Corn sirup and mixtures of corn and other sirup[3]	81, 686, 000
Maple sirup[2]	2, 186, 000
Maple sugar as sirup[2]	202, 000
Cane molasses (consumed as food)[2]	5, 168, 000
Total	121, 419, 000

The most direct competitors of sugarcane sirup are corn sirup, made by acid hydrolysis of cornstarch, and sorgo sirup, prepared by concentrating the crushed-out juices of stalks of sorgo in essentially the same manner as cane sirup is made from the juices of sugarcane stalks.

Sorgo is not sugarcane, yet the two names have often been confused. This confusion has arisen through the loose use of the term "cane" or even the term "sugarcane" to designate varieties of sorgo used in making sirup. Sorgo is raised from seed, while sugarcane, a distinctly different though closely related plant, is propagated commercially by means of "seed cane" or sections of the stalk. In the Tropics and even in southern Florida sugarcane occasionally produces seedstalks bearing true seeds. The seeds, however, are not suitable for use in growing ordinary commercial crops of cane. They are exceedingly small and germinate very poorly. The seedlings require a much longer time to develop into full-grown plants than do

[2] Reported by Bureau of Agricultural Economics, U.S. Department of Agriculture.
[3] Computed from preliminary figures reported by the Bureau of the Census, U.S. Department of Commerce.

the sprouts from "eyes" or buds on the seed cane. Moreover, the plants raised from true seeds do not come true to type and are usually inferior to the parent plant. However, the occasional production of seeds is useful to the plant breeder. It offers him the opportunity of selecting new types of sugarcane and has proved valuable in the United States in permitting the development of sugarcane varieties that resist diseases.

Within the last two decades an accidentally imported disease of sugarcane known as mosaic caused damage to the sugarcane industry estimated at over $100,000,000 before it was brought under control by substituting resistant varieties introduced or bred by the Bureau of Plant Industry of the United States Department of Agriculture. Complete reconstitution of the sugar industry has resulted from the use of the resistant varieties, with yields restored to normal. The new varieties occupied practically all of the 294,000 acres of land used for sugar production in 1938, and a rapid shift to the new varieties had taken place in the sirup belt extending from Florida to Texas.

VARIETIES OF SUGARCANE

Sugarcane varieties propagated vegetatively, that is, from seed cane or portions of the stalk, do not tend to run out or degenerate from planting in that fashion over long periods of time. It is a fact, however, that the popular old varieties are gradually disappearing from culture. The explanation lies in the prevalence of diseases of the sugarcane plant, particularly mosaic, to which these varieties are specially susceptible, so that with the spread of the diseases the old varieties give way to more resistant ones. Within the past decade the varieties that were the backbone of the industry have been almost completely supplanted over wide areas in the South. In isolated places, however, these old varieties continue to maintain favor with cane planters, mainly because the diseases have not penetrated to the localities where they are still grown.

For sirup making in the Southern States sugarcane should possess the following qualities: (1) Early maturity; (2) a large yield of stalks; (3) a high percentage yield of juice; (4) juice having a large proportion of solids, mostly sugar; (5) light-colored stalks (green or yellow) which do not impart a dark color to the sirup; (6) resistance to disease, both during growth and while in winter storage for spring planting; (7) good germinating and stooling qualities; (8) good ratooning qualities, that is, coming up freely from the stubble after the first year; (9) strong, erect habit of growth, not readily lodging in storms; and (10) a fairly soft stalk, relatively low in fiber. In addition, it is desirable for the sugarcane to have a measure of resistance to cold, so that it is not necessary to harvest and windrow all the cane immediately after the first moderate freeze in early winter.

Viewing the requirements as a whole, it is readily seen that a difficult task confronts the plant breeder in attempting to combine these desirable qualities in one plant. Such attempts have been made by the Department of Agriculture, however, with enough success to point the way to eventual development of varieties better suited to conditions in the present sirup area.

As already indicated, new varieties arise from sprouting the true seed of the cane tassel, and where tasseling occurs, as in southern Florida, an opportunity is provided for cross-pollinating and combining in the new seedlings the desirable qualities of different parental varieties. To incorporate resistance to disease (fig. 1), special adaptability to particular climatic and soil conditions, and other essential qualities, re-crossing is often necessary, and many thousands of seedlings must be produced and tested, requiring years of patient labor to find one that will outstandingly improve production. For

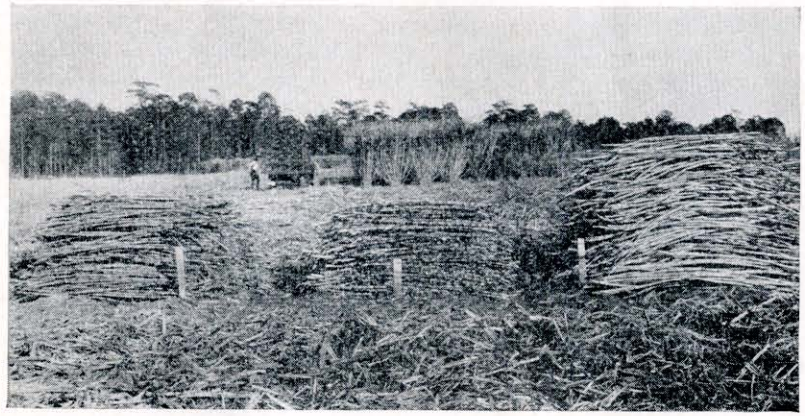

FIGURE 1.—A result of breeding for resistance to mosaic. At the center is the susceptible Louisiana Purple; on the left is P.O.J. 213, a hybrid resulting from crossing Louisiana Purple with Chunnee, a variety which resists or tolerates mosaic without evidence of great injury; on the right is C.P. 807, a descendent of P.O.J. 213, which is apparently immune to mosaic. The piles were harvested from plant-cane plots of equivalent size and treatment at Cairo, Ga., under conditions of severe mosaic prevalence.

this purpose the principal commercial and wild sugarcane types of the world have been assembled at the United States Sugar Plant Field Station at Canal Point, Fla.

Annually hundreds of new seedlings are sent for testing to the Department's sirup cane field station near Cairo, Ga. (representing the conditions of the eastern Gulf States), and to Houma, La. (typical of the Mississippi Delta and adjacent areas). If after several years of comparative testing, usually in cooperation with experiment stations of the various States and with farmers, a new variety is found to be definitely superior, planting material is increased cooperatively for distribution and rapid extension of the variety. Cayana and P.O.J. 213,[4] two foreign varieties, were distributed in 1915 and 1919, respectively, while C.P. 807, distributed in 1931, came from the Canal Point (Fla.) station. As shown later, these new varieties have materially increased the acre yields in the eastern Gulf States.

GROUPING OF VARIETIES

Particular varieties will be grouped in accordance with botanical relationship for the purpose of this discussion. The observant cane planter familiar with many varieties will readily perceive that some have points of similarity and fall naturally into groups. These groups are known to the botanist as species. It is desirable for the cane planter to be able to distinguish between these groups or species, because in general the varieties within a species have characteristics in common that are of practical importance in commercial cane growing. Such characteristics may be hardness of stalks, tendency of leaves to adhere to the stalks as dry fodder, resistance to certain diseases, prolific tillering or production of a large number of stalks per stool, etc. Examples of such characteristics or qualities possessed by the members of one species but not possessed by members of other species are numerous, and, as frequently they are significant in field operations, it is worth while for the farmer to be sufficiently well informed about them to enable him to judge whether a variety of a particular group or species will fit his requirement.

There are five species of sugarcane of economic importance in the sugar and sirup industries and each species is divided into numerous varieties. The common names of these species groups are (1) noble canes, (2) Chinese canes, (3) canes of northern India, (4) small wild canes, and (5) large wild canes. The names suggest some peculiarity of the varieties in the species or the supposed geographic origin. "Noble", for example, refers to the large size and aristocratic appearance of the varieties in the first group, while canes of northern India indicate that these particular varieties are presumed to be indigenous to the northern Provinces of British India. Crossing of varieties belonging to different species is possible, and the resulting hybrids for convenient reference may be designated "interspecific hybrids."[5]

NOBLE CANES

Varieties of the noble canes of the species (*Saccharum officinarum* L.) are distinguished mainly by relatively thick stalks and broad leaves, the latter separating freely from the stalk in cane approaching full size so that the stalk is exposed. Internodes are relatively short and frequently barrel-shaped. Usually the stalk is highly colored. A wide range of color, extending from dark purple, almost black, to light cream color, and including brilliant shades of red, yellow, and green, and striped combinations of these colors, is found among the hundreds of varieties of this species. Typically the canes in this group are soft, having a lower percentage of fiber than varieties in the other species. The varieties of this group that deserve mention because of popularity for sirup production in the past or because they are still grown for that purpose in isolated places are the following:

LOUISIANA PURPLE

Louisiana purple (also called Home Purple or Red) has been heretofore the most extensively grown variety of *Saccharum officinarum* in the principal sirup sections of this country. It is a purplish-red variety with somewhat barrel-shaped internodes, and owes its popularity primarily to the fact that it matures early and yields a sirup of excellent quality. Because of its early maturity the percentage of sugar (sucrose) in the juice is relatively high and that of the invert sugar is relatively low. Consequently sugar tends to crystallize from sirup which is boiled thick. The flavor of sirup from Louisiana Purple cane is

[4] Many varieties of sugarcane are commonly designated by letters or other abbreviations indicating the origin of the seedling cane. The meaning of such designations of the varieties mentioned throughout this circular are as follows: C.P.=Canal Point (Fla.) where seedlings are bred by the U.S. Department of Agriculture; P.O.J.=Proefstation Oost Java seedlings; P.O.J. 36-M=Mingka selection of P.O.J. 36; D.=Demerara; Co=Coimbatore (India).

[5] The popular classification of sugarcane varieties herein is based on work not yet completed by the Division of Sugar Plant Investigations, Bureau of Plant Industry, and is purely tentative. Recent work by investigators in Java indicates that further subdivision of species may be necessary.

milder than that from many other varieties. The sirup has a tendency to be dark red, partly because of the coloring matter in the cane rind. Stubbling qualities are fair, and in the absence of disease the yields are good. Unfortunately, this variety is subject to great injury by mosaic, a recently introduced virus disease, and yields of cane have fallen off greatly in recent years because of its susceptibility to this disease. Louisiana Purple is not recommended for planting, and except in isolated places where the disease has not yet penetrated, farmers are strongly urged to replace it with disease-resistant varieties. In the centers of sirup-cane production, where sirup is made for the market, Louisiana Purple is almost certain to produce disastrously low yields.

LOUISIANA STRIPED

Louisiana Striped (also called Red Ribbon or Ribbon cane) is a purple and green striped variety which was almost as extensively grown as Louisiana Purple in some important centers of production. In central and southern Florida the Ribbon cane found more favor than Louisiana Purple. Because of the lighter color of the rind the sirup from this variety is a shade lighter than that from Louisiana Purple. Almost everything that has been said respecting Louisiana Purple applies equally to Ribbon, and because of its susceptibility to mosaic and other diseases extension of plantings anywhere is not recommended. (See table 2.)

CRYSTALINA

Crystalina (known also as White or White Transparent) is closely related to Ribbon, being a sport or color mutation of that variety. It makes a sirup decidedly lighter in color. The stalk is light green or yellow, sometimes flamed with pink. This variety is just as susceptible to mosaic as Ribbon and it is not recommended for planting.

D-74

D-74 (Demerara 74) is a seedling of Crystalina, that is, it arose from a true seed of the foregoing variety, and not from an "eye" or bud of the stalk. The stalk color is green, changing to yellowish green. As it grows in the United States, it is distinguished from all varieties of *Saccharum officinarum* by its exceedingly erect habit of growth, both stalk and leaves being typically upright. This variety resists being blown down by the wind more than other varieties of the group. D-74 has been popular in the sirup-making sections of Louisiana, giving higher yields than Louisiana Purple or Ribbon. In addition, its juice contains higher percentages of sugar than most other varieties and the yield of sirup is correspondingly greater. It meets the requirement of early maturity but unfortunately is susceptible to mosaic and is greatly injured by that disease and by root rot. For that reason planting of D-74 is hazardous and extension of its culture is not recommended.

HOME GREEN

Home Green (commonly called Green in Georgia and Florida, Caña Blanca, Otaheite, and Bourbon in the Tropics) is grown extensively for sirup in central and southern Florida. The large thick stalk is light green in color and very soft. Because of softness of the stalk it is used to some extent for chewing or eating in Georgia, and many people plant a few rows of it in gardens for this purpose. It makes a pretty, bright sirup of fine flavor. This variety is notorious for inability to withstand adverse conditions, and ratoons poorly except in rich or virgin soil. Drought affects it greatly, and it is the most susceptible to mosaic, root rot, and red rot of all varieties mentioned.

GREEN RIBBON

Green Ribbon (commonly known as "Simpson" in Florida) has a yellow and green striped stalk, but is identical in all other respects with Home Green, which is a sport or color variant of Green Ribbon. When first grown in virgin soil the cane is very impressive, and, because of its attractive appearance, there is a tendency to plant it. However, because of its susceptibility to disease, it is economically unsound to do so, especially in the established centers of commercial sirup production where cane diseases have accumulated.

CHINESE CANES

All varieties of Chinese canes (*Saccharum sinense* Roxb.) are easily distinguished from varieties of the foregoing group belonging to the species of *S. officinarum*. They are tall growing, but the stalk is not so thick and is less colorful, all varieties in this country being of a dull-green color. The stalks are harder on the average, having a higher percentage of fiber, and typically the joints are enlarged or swollen so that the portion of the stalk between joints is spindle-shaped. The leaves are more narrow and the leaf sheaths adhere to the stalks for a longer period, so that the stalk does not become exposed naturally, as is the case with varieties of *S. officinarum*. They ratoon especially well and it is possible to grow a longer succession of crops without replanting. In general, this group of varieties is much more resistant to diseases than the preceding group. Under present conditions they are more important than the varieties of *S. officinarum* for the sirup industry, and several varieties, which because of superiority or usage in the sirup areas are noteworthy, will be described briefly.

JAPANESE

Japanese (Zwinga, Japanese Fodder cane) is the name by which a representative of the Chinese cane group, long known in this country, has been designated. It is very slender, hard, and green colored, hardy and prolific, and stools abundantly, thus giving a good stand even with thin planting. It ratoons especially well, and for that reason many crops can be cut over a period of years without replanting. The leaves, which are very narrow, clasp the stalk tenaciously, which adds greatly to the expense of preparing the cane for the mill. The hard, almost woody character of stalks increases the cost of milling by requiring stronger mills and more power. In addition, there is a low yield of juice per ton of cane, and the juice is deficient in sugar and total solids. It is highly resistant, possibly immune, to mosaic. In spite of disease resistance, low cost of planting, good ratooning qualities, and large yield of cane per acre even under adverse conditions, the good qualities of this variety do not compensate for its disadvantages when better disease-resistant varieties are available.

CAYANA

Cayana (Cayana 10) (pl. 1) is larger than Japanese, with greater diameter of stalk, but otherwise resembles it rather strikingly. The black blotches shown in the illustration are caused by a superficial "sooty mould" associated with many varieties of sugarcane. Cayana germinates well and less planting material (seed cane) is required per acre than for the varieties of the species *Saccharum officinarum*. The chances for 3 or 4 successful ratoon crops are considered to be about as good as those for 2 ratoon crops of such varieties as Louisiana Purple when no disease is present and immeasurably better under the conditions of disease prevalence in the sirup sections today. At present Cayana far surpasses such varieties as Louisiana Purple, Ribbon, and Home Green in yield, due to its great resistance to mosaic, root rot, and other diseases. (See table 2.) The juice contains a relatively high proportion of invert sugar, yielding a sirup with less tendency to crystallize when boiled to high density. The green color of stalk makes the sirup lighter than that from a deeper-colored cane, such as Louisiana Purple. Although Cayana has the defects enumerated for Japanese, they are less pronounced. Its good qualities make up for the undesirable ones. Where it is expedient to economize on cost of production at a slight sacrifice of quality of product, or necessary to utilize lands somewhat deficient in fertility, the prospects of realizing something on the crop is better with Cayana than with almost any other available variety. The labor of stripping and topping Cayana is about double that for the "self-cleaning" varieties of the species *S. officinarum*. However, economies in planting, which comprise (1) a more modest requirement in amount of seed cane, and (2) less frequent demand for replanting, together with less cultivation cost due to earlier closing of the rows, more than make up for increased harvesting costs.

UBA

Uba is almost identical with Cayana. Only the most precise, comparative tests in replicated experiments reveal any differences whatever. Statistical studies show a slight advantage in favor of Cayana. It is noteworthy that many varieties of *Saccharum sinense* that have been imported and studied by the Bureau of Plant Industry resemble each other so closely that it is impossible for the layman to tell them apart, and even the expert botanist must be assisted by cultural studies of performance in distinguishing them.

CANES OF NORTHERN INDIA

The third group of sugarcane varieties, clearly distinguished in botanical characteristics from the two groups already discussed, is included in the species *Saccharum barberi* Jeswiet, the canes of northern India. These varieties, as such, are not used for sirup production in the United States, but because they have been used in breeding and enter into the make-up of hybrid varieties now important in North America (which will be described under Interspecific Hybrids) a brief summary of their history and characteristics is inserted.

All varieties of *S. barberi* so far as is known originated in northern India. Although as a group they are easy to distinguish from the two species already described, they are not homogeneous, and botanically it may later be necessary further to subdivide *S. barberi* into two or more species. Roughly they are more slender canes than those of *S. sinense* and enlarged joints are not so prominent in them. The internode, or portion of the stem between joints, is very long and cylindrical, not spindle shaped, as in *S. sinense*. Mostly the stalk color is white, ivory, or grayish green, frequently flamed with reddish or pinkish tints. Parallel, pencil lines of corky texture are often found extending longitudinally on the stalk. Leaves are more narrow and shorter than in varieties of *S. sinense*, and do not cling to the stalk as dead fodder to the same extent in plants approaching full growth. Practically all of the crude sugar produced in India is made from these varieties, which may number up to 100 separate kinds. Only one variety, Chunnee, will be listed here because of its significance in the local sirup industry.

CHUNNEE

Chunnee is a thin cane, with long cylindrical internodes and joints not enlarged. It is green, covered with bluish-white bloom or wax, later becoming flamed with red or reddish brown. It is susceptible to mosaic, but in contrast to most varieties of *Saccharum officinarum*, Chunnee is not greatly injured when infected with that disease. It is that fact coupled with somewhat greater tolerance of low temperatures that makes the variety important in connection with the sirup industry. Chunnee is one of the parents of a group of interspecific hybrids, several of which are valuable as sirup canes in the United States.

SMALL WILD CANES

The fourth species, *Saccharum spontaneum* L., which comprises the small wild canes, will be described even more briefly than the others, as it is of importance in the United States only in attempting to improve sugarcane by breeding. All varieties of this species are wild plants found in northern Africa, anterior, central, and southeastern Asia and adjacent islands. The stalk, in most cases, is about lead-pencil size, green in color, with long, straight-sided internodes and small buds at the joints. They cross freely with cultivated sugarcane. Observations and experiments indicate that some are entirely immune to mosaic. Some are resistant to cold and grow rapidly at low temperatures. Many hybrid varieties resulting from crossing these wild forms with *S. officinarum* have become immensely important in the sugar industry because of disease and cold resistance, and a number of such hybrids produced by the Bureau of Plant Industry are under test for sirup qualities.

LARGE WILD CANES

For the sake of completeness mention will be made of another wild species, *Saccharum robustum* Jeswiet, which includes the large wild canes recently discovered in Papua and the New Hebrides by explorers from the Bureau of Plant Industry. It is of interest because of the great size and vigor of all varieties found thus far. These plants reach a height of 30 feet when growing naturally along watercourses, with fairly thick, strong, woody stalks, green, yellow, or red in color, and long underground stems or rhizomes. They are deficient in sugar and high in fiber, but it has been found possible to cross them with varieties of *S. officinarum*, and, like varieties of *S. spontaneum*, they are being used at the cane-breeding station of the Bureau of Plant Industry in attempts to improve our sugar and sirup canes.

MISCELLANEOUS HYBRIDS (INTERSPECIFIC HYBRIDS)

Some of the most important canes now available for sirup production in the United States have resulted from crossing varieties of one species with those of another species. Thousands of varieties have been produced in that way. Exacting tests in comparison with standard varieties are necessary to determine whether they are superior. The varieties described here are those which have been sufficiently tested and proved of value for sirup.

CO. 290

Co. 290 (pl. 1) is a green cane with a blush of reddish purple. From a distance it appears blue because of the wax layer. The habit of growth is erect with usually straight stalks, which are generally longer and larger in diameter than those of Cayana, P.O.J. 213, or C.P. 807. It is relatively late maturing and somewhat susceptible to drought and freezing injury. The lower portions of the stalk have a relatively high concentration of sugar. The fiber content is low and the ratooning qualities will almost equal those of C.P. 29/116. This cane strips easily.

C.P. 29/116

C.P. 29/116 (pl. 1) has an erect habit of growth and generally straight stalks, which are about as long and large in diameter as those of Co. 290 and are green to greenish yellow, taking on a darker yellow where exposed to the sun. Like Co. 290, this variety has a low fiber content and good ratooning qualities. The leaves strip readily.

P.O.J. 213

P.O.J. 213 (pl. 1), a cross between Louisiana Purple (*Saccharum officinarum*) and Chunnee (*S. barberi*), is a red or purplish-red variety with canes of medium thickness, characterized by good stooling qualities, rapid growth, early maturity, and fancy quality of sirup. The internodes are long and have straight parallel sides. It is resistant to mosaic or, more properly, tolerant of mosaic, as it takes the disease readily but is not severely injured when infected. Yields of cane and sirup from plant-cane crops of P.O.J. 213 about parallel those from Cayana, but yields from ratoon crops are slightly inferior. (See table 2.) The

250707°—40——2

ratoon crops are, however, fairly good, and as many as three profitable crops may be expected normally from one planting of P.O.J. 213 on fertile soils. It is well adapted to culture on the light soils of southern Georgia and northern Florida and is already well established there and in Louisiana. The stalks are soft and can be milled with ease in the small mills in common use. There is a somewhat higher percentage of sucrose in the juice than in the corresponding juice of Cayana, and the purple rind imparts a darker color to the sirup. The good flavor fully compensates for the somewhat darker color of the product. P.O.J. 213 is subject to considerable lodging in storms, and brittleness of the upper joints results in frequent breaking off and losing part of the cane in the field or in transporting it to the mill. When lodging occurs from storms or overfertilization the upper part of the stalk is frequently crooked in characteristic fashion, bending at each successive joint in about the same degree, so that the whole becomes as the arc of a circle. The buds of banked seed cane are easily injured, and in spring-planting operations the seed cane must be handled carefully. Germination of seed cane in low wet lands tends to be slow and faulty, usually resulting in poor stands in these spots. This is sometimes due to red rot beginning in the banks. It is a variety that requires attention to good, careful practices, but when such attention is given excellent results are attainable.

P.O.J. 36-M

P.O.J. 36-M (36-M) (pl. 1), a cross between Ribbon cane (*Saccharum officinarum*) and Chunnee (*S. barberi*), has a gray-green base color overlaid or flamed with rose or purple, sometimes with faint longitudinal stripes of lighter color. It is readily distinguished from P.O.J. 213 by the straighter stalks of slightly greater diameter and more erect habit of growth, and from Louisiana Purple by the straight-sided internodes, relatively longer and thinner with no tendency to be barrel-shaped. Characters further distinguishing P.O.J. 36-M from P.O.J. 213 are the less pronounced groove above the eye and the lighter green color of the leaves. In the alluvial soils of Louisiana P.O.J. 36-M makes an excellent sirup of lighter color than the other mosaic-resistant varieties thus far released. The cane is relatively soft and is easily milled. Better results are obtained on the light soils of Louisiana than on the so-called "black lands," which tend to produce darker sirup. A point in favor of P.O.J. 36-M (true also of P.O.J. 213 and Cayana) is that when cut and left in the field for some time in warm, dry weather inversion of sucrose is initiated in the cane which tends to prevent crystallization of sugar in sirup made from it, while on the other hand Louisiana Purple, Ribbon, and D-74 can hardly develop any invertase at all under the same conditions.

C.P. 807

C.P. 807 (pl. 1) is of parentages similar to the preceding variety but selected from the second generation of seedlings after the original cross. It is a green cane with stalks of medium thickness and somewhat spreading habit of growth. It stools prolifically. Yields of plant cane and sirup over a period of several years average 10 to 15 percent higher than Cayana or P.O.J. 213. C.P. 807 is very resistant to mosaic and may be immune, as no authentic cases of the disease have been recorded for the variety. Germination of seed cane is unusually good and ratoon crops show up well. The tough fibrous nature of the rind gives a somewhat deceptive impression of hardness, and although the percentage of fiber is relatively high, the stalks of C.P. 807 can be milled without difficulty in the small mills. The spreading growth and ease of stripping the loose trash or leaves from the stalk are advantages in the harvesting operations. As in the case of P.O.J. 213, this variety is subject to severe lodging when strong windstorms occur, and during rainy harvest seasons the upper joints tend to become brittle and break off in handling. Juices have a high average sucrose content and high percentage of purity. The sirup produced is of good flavor and intermediate in color between Cayana and P.O.J. 213. In spite of a few faults C.P. 807 gives promise of becoming a leading variety in the sirup industry.

OTHER VARIETIES

In addition to the sugarcane varieties briefly described herein the Bureau of Plant Industry has imported or produced by crossing a large number of varieties of potential value to the sirup farmers of the South. Because of the difficulty that would be experienced by

the average planter in distinguishing between such closely related plants and the danger of confusion, it is the policy of the Bureau to limit numbers by releasing for commercial planting only those varieties that have been proved by exacting tests to be superior to varieties already grown in the South. Experience has shown that premature release of inadequately tested varieties is costly to the industry. It is characteristic of many newly imported varieties or newly produced seedlings that they make a better appearance at first than subsequently. This is partly due to the fact that they are free of the local pests and diseases in the beginning and exposure to these enemies requires a fairly long period of years. This is especially true of diseases that are intermittent in intensity or make their appearance at irregular periods in the form of epidemics. A fair comparison of varieties can therefore be made only after a reasonably long and intensive period of experimental testing, and the policy of precaution in releasing varieties is justified.

VARIETIES RECOMMENDED FOR SIRUP PRODUCTION

Summarizing the discussion of varieties now grown or obtainable for sirup production, all of those listed under Noble Canes are of doubtful value because of the prevalence of mosaic and red rot, to which they are extremely susceptible. Only under special conditions of remoteness from the established sirup centers where the disease has not yet penetrated can they be grown profitably. In the eastern Gulf States they have been superseded by C.P. 29/116, Co. 290, P.O.J. 213, C.P. 807, and Cayana. The variety C.P. 31/511, recently released for commercial cultivation, has found acceptance for chewing. P.O.J. 36-M has proved most satisfactory as a sirup cane on the light, sandy soils of the Mississippi Delta and adjacent areas, and is recommended for planting in Louisiana on soils of that type.

Table 2 gives the average performance of the varieties recommended for the eastern area in contrast with two of the best of the old varieties, Louisiana Striped and Louisiana Purple, and may be taken as a guide to results that may be expected under present conditions.

TABLE 2.—*Yields of five varieties representing the average of tests at Cairo, Ga.*

Test and variety	Yield of cane per acre	Yield of sirup per acre	Sirup per ton of cane
	Tons	*Gallons*	*Gallons*
Plant-cane tests in 1938:			
C.P. 29/116	28.82	639.6	22.2
Co. 290	27.54	604.7	22.0
P.O.J. 213	17.78	374.8	21.1
Plant-cane tests in 1937:			
C.P. 29/116	30.88	574.1	18.6
Co. 290	27.59	530.6	19.2
P.O.J. 213	21.43	369.0	17.2
First stubble-cane tests in 1937:			
C.P. 29/116	27.11	549.7	20.3
Co. 290	20.16	406.6	20.2
P.O.J. 213	13.00	237.4	18.3
Tests during previous years: [1]			
Plant cane, Louisiana Striped	12.55	259.1	20.6
Plant cane, Louisiana Purple	14.60	292.3	20.0
First-stubble, Louisiana Striped	7.14	129.9	18.2
First-stubble, Louisiana Purple	8.54	162.3	19.0

[1] Tests discontinued.

The Department of Agriculture has no seed cane of any of the varieties for free distribution. However, seed cane of all of these

varieties is available from the usual commercial sources. C.P. 29/116, Co. 290, C.P. 31/511, Cayana, P.O.J. 213, C.P. 807, and P.O.J. 36-M are in commercial production and can be obtained from farmers in practically every sirup-producing center of importance.

SELECTION OF SUGARCANE LAND

As sugarcane is a tropical plant, grown in the United States somewhat beyond its natural climatic zone, it is more sensitive to climatic conditions here than in the Tropics. The crop requires a uniformly high temperature, ample sunshine, and a large and constant supply of moisture to keep the plants growing rapidly during the crop season, which should extend for a period of 8 months or more. These requirements restrict profitable culture of sugarcane to a definitely limited area (fig. 2). Within this area sugarcane is grown on a variety of soils, but because it is a gross feeding crop, making heavy

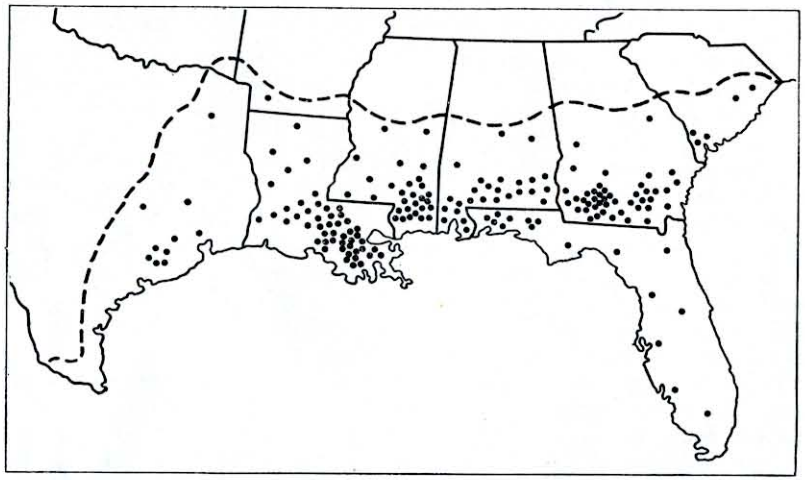

FIGURE 2.—Successful sugarcane culture for sirup production is restricted to the area below the broken line shown in the map. The geographic concentration of the industry within this area is indicated by dots, each of which represents 100,000 gallons of sirup produced in 1932.

demands upon the soil for moisture and plant food, the soils must possess definite characteristics for successful cane culture. Only the best soils in the area indicated can be used to advantage. They must be well supplied with mineral and other required plant food and humus. They must retain moisture well, but it is imperative that they be naturally well drained or drained by means of inexpensive systems of ditches. It is important that the texture of the soil permit rapid prolific root growth and allow thorough cultivation. In the eastern part of the area alluvial soils along streams, depressed areas where the soils are dark, and the more fertile uplands are used successfully for cane. It is generally known that a lighter-colored and better-quality sirup is produced from cane grown on light-textured, well-drained, sandy loam and fine sandy loam. In Louisiana Sharkey clay in its better-drained phases is extensively used for sugarcane growing, but for sirup production silt loam, silty clay loam, and fine sandy loam are preferable.

LIGHT SANDY LANDS AND HEAVY CLAY LANDS

The expense of keeping up the fertility on light sandy lands is prohibitive and, in the absence of frequent and adequate rainfall, the crop suffers quickly and seriously from drought. On the other hand, heavy clay lands do not warm up early enough in the spring, do not drain properly, and cannot be kept in a state of cultivation necessary for best results.

The prospective sugarcane planter in the eastern Gulf States where sand predominates in the soils must seek a soil with a relatively high percentage of silt and clay or, in their stead, a liberal supply of humus to enable it to retain moisture and plant food and to produce good crops. In these sections, where very sandy soils predominate, the rolling clay hills or the so-called "hammocks" are sought, or, where such lands are not available, the drained bayheads and shallow ponds are utilized. It is doubtful, however, whether the humus-sand soils which lack silt and clay completely will continue productive through a long series of years under ordinary farm methods, which tend to deplete the humus supply. With such soils expensive means of replenishing the humus must be employed, and only under exceptional circumstances will the value of the cane crop justify the cost.

The flat piny-woods sand areas with neither clay nor silt and with only very small quantities of humus which occur so extensively near the southern Atlantic and eastern Gulf coasts are unsuitable for the culture of sugarcane. Such land, when plentifully supplied with water, frequently produces fairly good crops for a few years while it is new and contains a good supply of humus, but satisfactory yields are rarely secured throughout any long period of years. Land of this kind can be made to produce further crops of sugarcane by treatment to restore the humus and plant food, but the continuous need for such treatment involves too great expense to make it profitable.

Where clay predominates in the soil, as in the alluvial bottoms along the lower Mississippi River, lands containing a relatively high percentage of silt and sand are found more suitable for sugarcane culture. These are usually found adjacent to the river and to the numerous bayous. Clay soils lying farther back from these streams, and frequently adjoining swamps, are less suitable, as they are generally too stiff to permit being kept in the most favorable state of cultivation and usually do not warm up early enough in the spring for early growth of the cane. Such soils are more suitable when they contain considerable humus or vegetable matter, but in general heavy, impervious clay soils are unsuitable for satisfactory culture of sugarcane.

PEAT SOILS

Peat soils, provided they have a high percentage of mineral matter and are well drained, will produce large yields of cane, and with a long, favorable season, as in southern Florida, the cane will contain satisfactory percentages of sugar. It is questionable whether peat soils that contain a very low percentage of mineral matter, and that are, therefore, deficient in natural plant food, can be used successfully for sugarcane culture even if well drained. One disadvantage of any peat land is that it affords such poor anchorage for the roots

Paintings by James F. Brewer.

Six sugarcane varieties now grown for sirup production. (All about four-fifths natural size.)