should be eliminated as a measure tending to reduce beetle population. In some sugarcane areas there is a gradual shift to early fall or summer planting, and because of the larger number of shoots the following spring from such plantings there is proportionately less beetle injury and better stands result.

SUPPLIES AND EQUIPMENT REQUIRED FOR GROWING CANE AND MAKING SIRUP

The implements required for field work are for the most part the same as those required for other field crops, with the addition of cane knives and stripping tools.

Certain supplies, some of which are peculiar to the production of cane and sirup, are also needed. The following represents an estimate of the requirements per acre for a plant-cane crop yielding 18 to 25 tons of cane, or 360 to 500 gallons of sirup, per acre, based upon experience in southern Georgia:

Seed cane; 1,500 to 3,000 stalks, depending upon average length of the stalks and rate of planting. (See p. 24.) Seed cane is usually grown on the same farm, the yield from one tenth of an acre ordinarily sufficing for planting 1 acre or more.

Commercial fertilizer; 1,000 to 1,500 pounds complete fertilizer mixture. (See p. 15.)

Barnyard manure; from none up to 10 tons. The application of barnyard manure permits of a corresponding reduction in the quantities of commercial fertilizer needed for the crop.

Fuel for operating the sirup evaporators; approximately 1 cord of wood for each 100 gallons of sirup made or 3 to 5 cords to make sirup from cane from 1 acre. This estimate should be increased by approximately one half cord where steam evaporators are used and the mill operated by steam power.

Fuel for a gasoline or kerosene engine for operating a mill; 20 to 30 gallons. A gasoline engine suitable for operating a mill with a capacity of 10 tons of cane per 10-hour day would consume approximately 12 gallons of gasoline per day, or approximately 24 gallons for a yield of 20 tons of cane per acre. In many instances small mills are operated by animal power.

Containers for the sirup; 11 to 15 barrels, with a capacity of 33 gallons each, or 8 to 10 barrels with a capacity of 50 gallons each. If the sirup is to be packed in cans, 70 to 95 cases, each case containing six 10-pound cans, twelve 5-pound cans, or twenty-four 2½-pound cans.

The cost of a sirup-making outfit, including cane mill, sirup evaporator, and suitable shelter varies from about $150 for the simplest small-scale type to several thousands of dollars for a large-scale type equipped with a large-capacity mill operated by means of a large gasoline, kerosene, or steam engine, multiple direct-fired, open-pan sirup evaporators or multiple open-pan steam evaporators, suitable piping and valves, large capacity juice and sirup tanks, and hoists for unloading and handling the cane.

The sirup producer who grows from 1 to 3 acres of cane finds it economical to use a small animal-power cane mill with a capacity of 3 to 5 tons of cane per day and a 10-foot pan evaporator having a capacity of 75 to 100 gallons of sirup per day of 12 hours (fig. 15). A mill of this type is wasteful in that it does not afford a high extraction of juice from the cane, but the initial cost of such equipment is low and the cost of upkeep very little. The cost of an outfit of this type in 1932, including a simple shed for the evaporator, was around $150.

Sirup producers who grow from 5 to 10 acres of cane generally use a power-driven mill with a capacity of 10 or 12 tons of cane per day and a pan evaporator with a capacity of 200 or more gallons of sirup per day of 12 hours. The cost of an outfit of this capacity varies from one locality to another and from year to year, but the approximate cost in 1932 was about as follows:

3-roll cane mill of standard make	$250
Gasoline or kerosene engine of about 8 horsepower	200
Pan evaporator of galvanized iron, 15 feet long and about 42 inches wide, equipped with baffle plates and skimming troughs	21
Materials (approximately 2,500 bricks, 2 barrels of lime, sand, grate, juice tanks, juice pipe and valves, sirup-collecting tank, belt for cane mill, and miscellaneous small items) and labor for constructing the furnace and installing the evaporator	150
Material for shelter and cost of labor for construction	100
Total	721

FIGURE 15.—Sirup-making outfit of type widely used by farmers who grow from 1 to 3 acres of cane. An outfit of this type has a capacity of 75 to 100 gallons of sirup per day and costs $150 to $200. The cost of larger capacity outfits equipped with power-driven cane mills is proportionately greater.

LABOR AND WORK-ANIMAL REQUIREMENTS

The labor and work-animal requirements, together with supplies, fixed charges like taxes and interest, and depreciation of equipment go to make up the costs of production, which must be balanced against receipts to determine whether the operation has resulted in profit or loss.

Cost of producing the succession of plant and stubble crops from a single planting and the profits therefrom cannot well be considered separately by individual crop years. It is obvious that there would be no stubble crop without a preceding plant-cane crop and, therefore, the planting costs should really be distributed through the whole period instead of being charged to the plant-cane crop alone.

In working out a system of cropping to determine the number of stubble crops that may be profitably made, the grower needs to be on guard against drawing general conclusions from the operations for a single year, but should be guided by the average of results for all crops harvested from the initial planting. Nevertheless, his elements of cost and his crop receipts are figured each year to serve as the basis for calculating the average results.

Considering first the plant-cane crop, the record of labor and work-animal requirements in table 3 may be helpful to the inexperienced planter in arriving at an estimate of these requirements. It is based on field operations in southern Georgia by a farmer cultivating 35 to 50 acres of cane each year, and on sirup making by representative farmers with small power mills and continuous-stream evaporators with capacities of about 200 gallons per day of 12 hours.

TABLE 3.—*Labor and mule requirements, per acre of plant cane grown, in sugarcane growing and sirup making*

Operation	Labor		Mules
	Men	Women	
	Days	*Days*	*Days*
Breaking the land, 1 man and 3 mules with a disk plow breaking 2 acres a day	0.5		1.5
Harrowing	.2		.6
Laying off, marking, and opening the furrows	.5		.8
Planting the cane, with a force sufficient to plant 6 acres a day, including getting the cane out of the banks, stripping it, cutting it into short lengths, and trimming off diseased portions (2 men and 22 women); hauling the cane (4 men and 8 mules); hauling fertilizer (1 man and 2 mules); distributing the fertilizer and covering the cane (2 men and 2 mules); dropping the cane into the furrows (6 women); a total of 9 men, 28 women, and 12 mules to plant 6 acres per day, hence per acre	1.5	4.7	2.0
Hoeing twice by hand		2.0	
Cultivating 6 times (1 man and 1 mule covering 3 acres a day for each cultivation)	2.0		2.0
Second distribution of fertilizer	.3		.4
Harvesting, including stripping, topping, and cutting	6.0	12.0	
Hauling to mill, assuming a haul averaging three-fourths of a mile, 1 man and 2 mules hauling 8 loads (about 10 tons) a day, and a yield of about 22 tons per acre	2.2		4.4
Total days' work to produce the plant-cane crop, delivered at the mill	13.2	18.7	11.7
Grinding the cane and boiling the sirup (a crew of 4 men, including 1 expert sirup boiler, making about 200 gallons a day)	9.6		
Total days' work to produce the crop and make it into sirup	22.8	18.7	11.7

From this report it appears that about 13.2 days' work of men, 18.7 days' work of women, and 11.7 days' work of mules were required to produce 1 acre of plant-cane crop, and that it would require about 9.6 additional days' work of the men to make it into sirup on a small outfit. If mules are used in place of the engine to do the grinding, it would require at least two mules continually, or about 4.8 additional days' work of mules per acre of plant cane put through the mill. For the old varieties of cane, such as Louisiana Purple, Louisiana Striped, D-74, and Simpson, which were formerly grown for sirup production, and the C.P. 29/116, now popular, the harvesting requirements would be about one-half of those here stated, which are based upon the slender-stalk variety, Cayana, which is now widely grown throughout the sirup-producing States. Harvesting

requirements for the varieties Co. 290, C.P. 807, and P.O.J. 213, the culture of which has greatly increased subsequent to 1930, would be intermediate.

The foregoing report of labor which this farmer required for the field operations does not include the time of the overseers. He employed two overseers on the cane crop continuously during planting, and irregularly at other times.

A material saving in labor for grinding the cane and manufacturing the sirup can be effected when sirup manufacture is carried on upon a large scale, though in the case of large outfits necessitating the hauling of cane for longer distances, such saving may be offset to some extent by the increased cost of hauling.

In the case of stubble crops the expense of breaking land and preparing the seed bed and cost of seed cane and planting is omitted. The saving is offset to some extent by the small amount of work involved in wrapping the stubble for winter protection if the grower follows this practice, and in off-barring and removing excess soil in the spring. The cost of these operations is small compared with the cost of establishing a plant-cane crop. In addition, the actual outlay for harvesting, hauling, and sirup making on an acre basis is reduced in nearly the same proportion as the yield and, therefore, the investment during the stubble crop year is considerably less. It must be borne in mind that receipts will probably be less and such saving in per acre cost must be recognized as deceptive, especially if the yield has fallen off considerably. The lower the yield of cane the higher will be the cost per ton, and this principle, carefully applied, will determine whether an additional stubble crop should be grown or whether the investment in a new plant-cane crop is justified. The most carefully planned sirup farm operation is no less subject to risk than farm operations in general, due to weather hazards, fluctuation in the price of sirup, and other factors, and growers can only make judicious use of the facts brought out in records and apply them in making decisions as to continuation of stubble crops.

These considerations emphasize the advantage of growing varieties of cane that may be expected to give high returns because of high-yielding stubble crops, thus avoiding the great expense of frequent replanting. As already mentioned, Cayana, P.O.J. 213, C.P. 807, C.P. 29/116, and Co. 290, when grown under favorable conditions, with attention to the plant-food needs, will afford profitable first- and second-year stubble crops and frequently more, but under present conditions the varieties subject to great injury from the recently introduced diseases gives disastrously low yields even as first-year stubble.

MARKETING THE SIRUP

Considerable quantities of the cane sirup produced annually are packed in cans or bottles by the producers and sold direct for local consumption or to local dealers in food products, but the greater part is packed in barrels and sold to dealers, jobbers, or concerns engaged in the sirup-packing business. It is usually marketed within a few weeks to 2 months after having been produced and is sold at prevailing market prices which vary slightly, depending upon its density, color, flavor, and appearance, the best grades of sirup com-