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The editor of this monthly left on the 31st on a vacation trip of six weeks to Puget Sound, British Columbia, expecting to return about the middle of October via San Francisco.

Pineapples sent from Queensland to Vancouver per steamship Miowera sold from $1.25 to $4.00 per dozen, according to their condition.

The Ewa Sugar Plantation, on this island, which has just closed its year's work with an output of 7,725 tons of sugar, uses only artesian water for irrigation and all other purposes, no other fresh water being obtainable.

Most of the mills have finished grinding, and the exports of sugar naturally drop off. The mills in Kau, Hawaii, and in the Waimea district on Kauai, where the cane does not tassel, generally keep on grinding throughout the year.

Hawaiian imports into San Francisco for the first six months of 1893, amounted to nearly seven millions of dollars ($6,974,471)—an increase over the previous year's trade of about one-sixth—and Hawaii stands far ahead of every other nation in exportations to California.

Larger crops have been obtained this year from several of our sugar plantations than ever before, owing to exceptionally fine weather, and better facilities for grinding. The following are the reported yields (in tons) of the plantations named: Makee Sugar Co. 7,650, Ewa Plantation 7.725, Kahuku 4,000, Paia and Hamakuapoko 10,000, Makaweli (above) 13,500, Onomea Sugar Co. 7,000, Spreckelsville 11,000.

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HAWAII'S CONSERVATORY OF POLYNESIAN RELICS, ANCIENT AND MODERN.

The Bishop Museum has been re-opened after a short closure and may be visited on Fridays from 9 o'clock till 12 M., and on Saturdays from 2 till 5 P. M. The spacious addition to the building now in course of erection, will add largely to its attractions and to its capacity for displaying the rapidly-increasing collection of Polynesian curiosities, which are being gathered from various quarters. Some twenty-five years ago, a naturalist named Andrew Garratt, spent many years in voyaging from group to group in this vast ocean, searching for new specimens, to procure which he had unlimited means provided, making Honolulu his headquarters. In these excursions he obtained from foreigners and natives at the various places he visited thousands of new and till then unknown specimens of fishes, mollusks, and other zoological inhabitants of this ocean. When he finally got his treasures together, it was found that the collection made nearly a shipload, and almost as precious as gold dust. But these thousands of rare and hitherto unknown and curious dwellers of the unvisited islands and ocean depths of the Pacific, were all carefully named, classified and numbered by him, with such scientific accuracy, that his list has become a standard for reference by scientific men abroad.

Not long ago Mr. Garratt died, and his vast and very valuable collection was offered for sale to the various wealthy public and private museums and universities of Europe and America. Much interest was shown by scientists, and many offers were made to obtain it, but it remained for our townsman, Hon. Chas. R. Bishop, the trustee of the museum, to secure this, the largest and rarest collection of its class in the world for the Bernice Bishop Museum, now rising into prominence in our mid-ocean archipelago.

The new structure above referred to as an addition to the present museum, is partly to accommodate these treasures, and when placed within its walls, the Bishop Museum of Honolulu will stand without a rival, as it will have thousands of the only specimens ever obtained from ocean depths. This fact alone will attract scientific travelers from every country, and make the institution famous throughout the world. We congratulate Mr. Bishop and the citizens of Honolulu and Hawaii in the acquisition of this great prize.

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EARLY AND LATE CANE GRINDING.

Hawaiian plantations are supposed to be among the best equipped of any, yet planters have still much to learn regarding cane and sugar. There are two important things to be studied—(1), how to obtain the largest yield, and (2), the best method of extracting sugar, so as to secure the best returns.

A yield of four tons per acre where two were the former average from the same land, shows better cultivation and better millwork. If, by combined skill in the field and in the mill, the same field returns six tons per acre, it is worth while to ascertain the cause of this large increase.

Field work as well as millwork have improved greatly during the past few years, but there are some points in both departments which need more attention. Among these is the question,—when should the cane be ground ? Some will answer—"when it is ripe, of course." And this is just the point we aim at. Cane is not ripe when it tassels. At this time the stalk ceases to grow, in order to devote all its strength to maturing seeds, sending up rapidly an arrow covered with tassels, in which the seeds are secreted. During this period it draws from the soil and showers an extra supply of water, in fact saturates its stalk from root to top with moisture. Then follows a period during which the cane ripens, and the juice grows stronger and richer, attaining its best strength and richness in March, April and May, and at higher levels in June, when it begins to depreciate by souring, until on the lower lands it is unfit for milling after July. These periods of course, vary considerably according to weather, locality and elevation.

Some years ago the owner of a plantation directed his manager to start the mill on the first of November, for reasons stated. The manager suggested that it would not be wise to do so, as the cane was then tasseling, the juice watery, and but little sugar would be obtained. The order had to be obeyed, the cane was cut in bloom and the mill started, with the juice standing about 6 deg. Baume. When the result was announced, an order came to stop work and begin again December 1, when the juice stood at 7 deg., and the crop was rapidly taken off, the strength of the juice gradually rising till it reached 9 deg. in February. The outcome of sugar was not up to expectations, owing to the early start and the early finish; and it is said that after that year's experience, the manager was allowed to use his own judgment in regard to the best time to commence grinding, which usually should not be before January 1, unless the density of the juice warrants it.

But the reply may be made that sometimes it is absolutely necessary to commence grinding in December in order to allow the rattoons to mature for the following crop. There are exceptions to every rule, and the manager is the best judge as to what should be done under the circumstances, and if, aided by the help of a good chemist, he finds that better returns will result from an early starting of the mill, he should act accordingly. And this is just where the advantage of careful study and experience comes in.

On the other hand, there is danger of the harvesting being prolonged too late, when the crop turns out to be very heavy, and the capacity of the mill is unable to meet the emergency. Cane will generally keep in good condition till June, but later than this there is risk of its souring and depreciating in value. To illustrate this, we have obtained some statistics, kept on one of the plantations during the present season:

In the laboratory of the chemist, 150 tests were made in June, and the same number on another field in July, with the following result:

	Brix.	Sucrose.	Glucose.	Purity.	Glucose per 100 Sucrose.
June	20.64	17.92	0.63	86.9	3.51
July	21.54	17.46	2.09	81.1	11.96

To render the comparison fairer, it is necessary to reduce all data to the same basis of dry substance. This can be done by recalculating the second line (July) to the same Brix. as the first (June.)

	Brix.	Sucrose.	Glucose.	Purity.	Glucose Ratio.
1.	20.64	17.92	0.63	86.9	3.51
2.	20.64	16.73	2.00	81.1	11.96
		– 1.19	+ 1.37		

This shows a heavy loss, caused by the cane "souring" or inversion, amounting in this case to 7.25 per cent. of the sucrose in the juice in June. Consequently for each 100 tons of sugar in June there was a loss of 7.25 tons in July, which means a loss per acre of 1196 pounds of merchantable sugar, in round numbers *a half ton per acre.*

These figures show the necessity of finishing the grinding before the cane begins to dry up and sour, which in some seasons may be earlier, in others later. According to the statistics given, the loss on a field of one hundred acres ground in July would be 119,600 pounds, or nearly sixty tons, worth at present quotations $4,500.

Enlarged mill capacity would remedy this loss, but that cannot always be had. Diligence in every branch of the field and mill work, and "pushing it for all it is worth," are the most effective remedies, and these every manager can control.

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OUR FORTUNATE ISLES.

The remarkable exemption of the Hawaiian Islands from the destructive hurricanes which so frequently sweep over the island groups in the southern and western sections of the Pacific Ocean has often been spoken of. These hurricanes occur occasionally a thousand miles to the north, the east the south and the west, but the vicinity of this group has been peculiarly exempt for the last hundred years, or since foreigners have resided on them, and for how much longer time is not known. It would be an interesting study to investigate the cause of this exemption, and whether the trade winds and ocean streams which sweep around from the Arctic, along the western American coast, and thence to westward, past this group, are the chief factors in counteracting and checking the progress of the hurricanes or cyclones which periodically rage with great destruction through the East Indian Seas as well as across the Southern Pacific.

Scarcely a mail arrives that does not bring reports of destructive storms in some quarter of this broad ocean, or in the West Indian group, or in the newly peopled territories and States of America. The loss of life in some of these storms is very considerable, while that of buildings and crops is reckoned by the millions. Man's ingenuity has found nothing to counteract or even lessen the amount of loss from this source, nor is it probable that it ever will. Dwellers in Hawaii may well be thankful that the location of this group is such that it is shielded by the same laws of temperature of the air and ocean which result elsewhere in disaster and ruin.

Since writing the above, knowing that Rev. S. E. Bishop has for years made meteorology a study, we requested him to give his views on the subject, which he has done very satisfactorily in the following article on

THE CLIMATE OF THE HAWAIIAN ISLANDS.

These Islands enjoy, for their tropical latitude, an exceptional coolness. The climate may be called sub-tropical, the sweltering heats of tropical lands being unknown. At the same time the temperature is remarkably uniform, free either from extremes or from rapid changes. Probably there is no other spot on the globe so equally temperate. The mercury creeps up and down an almost unvarying daily range between a winter minimum and maximum of 52 deg. and 75 deg., and in summer of 70 deg. and 88 deg.

The maximum temperature for 1891 in Honolulu was	89 deg.
Minimum temperature for 1891 in Honolulu was	54 deg.
Maximum of coldest week in winter	73 deg.
Highest minimum of the year	72 deg.
Maximum daily range of the year	22 deg.
Average weekly maximum from July 1st to Oct. 1st	86 deg.

There are no rapid or sudden changes of temperature. "Cold waves" and "hot waves" are quite unknown. These islands are remote from continental masses, with their heated deserts and icy tundras to disturb the equilibrium of the atmosphere. Several thousand miles of ocean surround them on every side.

This maintains a constant uniformity of temperature in the atmosphere.

CAUSE OF THE COOLNESS OF THE CLIMATE.—The ocean temperature of the Hawaiian Islands is exceptionally cool for the latitude. This is chiefly owing to their lying within the south-westerly sweep of the cold return current of the great Kuro-siwo or Gulf Stream of the Pacific, which returns to the tropics by way of Alaska and Oregon, driving cold fogs ashore at San Francisco. This current often lands saw logs and uprooted trees from the Columbia River upon the windward shores of these islands. In its course of two thousand or more of miles from the Coast, it has not had time to absorb any great heat, and reaches us at a temperature of from 60 deg. to 75 deg.. averaging at least ten degrees less than the ocean waters of the West Indies or of the South and West Pacific. Thus Hawaii shares very fully the same influence that so effectually tempers the summer heat of Los Angeles and San Diego. Our climate is Californian, not Polynesian. This close affinity of climate with that of the Pacific Coast naturally allies us with that coast, and forms an important factor in the present question of annexation. It renders these Islands a fitting habitat for the white race, unlike almost all other lands within the tropics.

DRYNESS OF THE HAWAIIAN CLIMATE.—The climate of this group is rather dry. Large portions of the islands present an arid, sun-burned aspect, unlike the deep. unbroken verdure of Jamaica or Tahiti, where the reeking atmosphere perpetually exudes the moisture which it distils from the warm seas. There it is hard to keep cool ; there is little evaporation from the body into the air already surcharged with moisture. In the dry air of Honolulu one can easily keep cool while in the shade.

The cool ocean around Hawaii parts with little vapor, and the cool trade winds lack capacity for heavy loads of moisture. Hence, there is little rain from them, except on the windward extremes of the islands. There, although the cool trades are undercharged with moisture, yet when they strike the mountains and are forced upwards the air is rarefied in ascending, and becomes unable to carry what vapor it has. The moisture is precipatated upon the mountain in dense cloud-banks, and falls in copious showers, reaching back to the shores.

The leeward sides of the islands get little of this rain and remain dry, depending upon irrigation for their agriculture. In the winter months, however, there are occasional storms from the south-west, attended with copious rains, and known as "Kona storms." After such rains the westerly slopes and shores are for a season clothed in verdure.

HURRICANES UNKNOWN IN HAWAII.—The South and West Pacific Islands share fully in the cyclones and hurricanes common in tropic latitudes. A hurricane or destructive gale is unknown in the Hawaiian Group. There are, of course, localities where, in heavy gales, the wind may draw down a ravine or around a mountain spur with destructive violence. Gales of any severity are infrequent. Hardly once in a year does a ship need to close-reef topsails. Thunderstorms are rare. It is over eighteen years since lightning struck house or tree in the vicinity of Honolulu.

The exemption of this part of the ocean from great atmospheric disturbances may probably be attributed to the low temperature of the sea and air in connection with the remoteness of any glaciated regions. A very contrary condition may be observed in the South Pacific Islands, where the ocean is very warm, while within a little over two thousand miles spreads the continental glacier of the Antarctic. Extremes of heat and cold so near each other breed war in the atmosphere and generate cyclones. The true Pacific is here around Hawaii, where hurricanes never come.

The Hawaiian Islands thus enjoy a climate exempt from great heats, from severe tempests and from malarial districts. It is a climate in which the white man freely labors out of doors. It is eminently healthy, and healing to diseased lungs. Sanitary locations of exceptional excellence abound on the shores and on the lofty mountain sides. The miasms and fevers of marshy tropical lands are unknown. These statements may sound improbable to strangers. All residents are familiar with these facts. As shown above, this excellent climate is owing to our location within the cold ocean-current from the Oregon Coast.

S. E. BISHOP.

CORRESPONDENCE AND SELECTIONS.

THE STORY OF HAWAII'S DEPARTED FORESTS, VERDURE AND RAINS.

EDITOR PLANTERS' MONTHLY:

On the Mahukona side of Hawaii, one can travel for miles near the sea, through evidences of comparatively recent human habitation, and find no human inhabitant. Innumerable enclosures that stand side by side like village lots, are said to have contained not long since, each a house and family. History tells of a dense population here. But it has melted away, as though a deluge had swept them and their belongings from the earth. Nothing remains but the stone fences; and even these are fast being levelled, and their constituent rocks scattered over the desolate waste.

And the wonder is,—not why people went, nor where they went, but why they ever came to build their homes in this barren place.

To look at this stony desert, it seems incredible that not so very many years ago, there were trees growing here, and meadow land, and welling springs of water and vines and flowers and fruits. Not a spot of bloom, and not a stump of forest tree remains—nothing but the brown earth and the rocks. A mile up the hillside, there is grass brown at first, and by degrees changing into green; and miles away on the distant hills, a suspicion, perhaps, of foliage. But here there remains but the shadow of the substance that has disappeared. Men come and go at their own sweet will as the world well knows. But, what volcanic disaster, what whirling tempest, fell upon the forest and the meadow life, and robbed the fruitful earth of its mantle of green?

The destruction began so insidiously, it was hardly noticed at first. Herds began to multiply upon the hills. Cattle and goats browsed upon the tender leaves of young plants in the forest glades. As old trees died, there were none to grow up in their places. Fire sometimes followed in the cattle's track. The water from the springs in the forest depths, was suck up by the bare and thirsty soil, miles before it reached the sea. The rainfall ceased. The foliage of the lowlands withered. And the land that once was fitted to be the abode of man, became a desert waste.

For all the purposes of desolation, the patient plodding cow, aided and abetted by man, has proved herself more dangerous than the elemental forces of nature. On the average, each year, she can sweep through five acres of forest land more destructively than a cyclone. What wonder that the agricultural Egyptians fell foul of the pastoral Hebrews, and set them to making bricks without straw upon the lands their herds had laid waste!

In the plantation district the trees have been cleared away, that cane might be planted. And vast quantities of wood have been used for fuel. The time was when cane juice was boiled into sugar in open train over wood fires. So all the low land has been shorn of its trees, and the forest belt in these more fertile parts is each year becoming more distant.

All through North Kohala near the sea, the rainfall is not only much less than in former years, but it is also capricious. Its coming is so very uncertain that its uncertainty has become proverbial. Streams that once ran all the year, now run only for a few months or even weeks. Other streams that start promisingly from the distant hills dry up and disappear long before they reach the sea.

There may be cosmic influences that disturb the rainfall from time to time. But there seems no doubt that the rapid destruction of the forests has been the main cause of our lack of moisture. And the work of destruction is still going on. The cattle and other animals still continue their desolating inroads upon the timbered lands and the forest belt is still retreating.

Here and there a land owner is making a tentative experiment in the planting of a little grove of trees. And here and there a rancher is making some effort to fence in and save the timber still remaining. But unless the Government will offer some assistance, or at least, systematize the work, the damage will undoubtedly increase as the years roll on.

J. BARNETT.

Kohala, August, 1893.

CRYSTALLIZATION IN MOVEMENT.

ABSTRACT FROM A REPORT BY M. DESSIN, PARIS, IN THE "BULLETIN DE L'ASSOCIATION DES CHEMISTES."

[TRANSLATED FOR THE HONOLULU PLANTERS' MONTHLY.]

Applied to the first massecuite, this process consists in putting the massecuite from the vacuum pan in large various shaped crystallizers in which it is kept moving for several hours. A certain amount of molasses from a previous strike is added to give the mass that fluidity necessary for thorough stirring. This stirring is done by a strong mechanical stirrer which revolves from one to one and a half times a minute. The crystallizers are furnished with a double wall in order to maintain a certain temperature at the beginning and to cool it towards the end. The duration of crystallization is from eight to eighteen hours, after which the mass is centrifugaled as usual. Authorities differ regarding the most favorable temperature conditions to obtain a complete crystallization of the extractible sugar in the first massecuite. Lower temperatures seem to prevail, but the question is not definitely settled by crystallization in movement.

Various reasons are adduced to explain the augmentation in yield by the various processes in use; some attribute it to the re-solution of the small crystals in the hot syrup, and the consequent growth and the enlargement during cooling of the already present large crystals; others think it due simply to the greater facility with which the massecuite is centrifugaled and to the more energetic and rapid action of the wash whether steam or liquid, used during centrifugaling.

One fact which *a priori* would strenghten the last idea is that the results obtained without an envelope about the crystallizor are the same as those obtained with crystallizors having an envelope.

Below are results obtained in various factories:

AB—(Belgic) Process Stammer-Bock, consisting of cylindrical crystallizers completely closed, and furnished with a double wall to regulate the temperature by means of low pressure steam or cold water. The massecuite, with the addition of 33 per cent. of first molasses, is put into the tanks at a temperature of about 75 deg. C, and after from 16 to 18 hours, is gradually cooled to 30 deg. when it is dried off. By the ordinary way with small coolers, 100 kilos of sugar had been obtained per hectolitre of massecuite; by the new process 106 kilos or an increase of 6 per cent.

AS—Crystallizors are large troughlike tanks without double walls, 15 per cent. molasses added to massecuite and dried ten hours later; obtain an increase of 5 per cent. over the small cooler method.

AC—Crystallizors same form as above but with double walls; 7 per cent. of molasses added; centrifugaled after ten hours the temperature having been brought down to 25 to 28 deg. C, an increase of 4 per cent. gained.

AO—Crystallizors same form as above but without double walls. Massecuite falls directly into the vessel, where there is added 50 per cent. of molasses from the preceding strikes, but previously boiled to string proof. Centrifugaled after eight to ten hours, an increase over small coolers of 6 per cent.

We might also add to these two other factories which have crystallization in movement, but which claim no increase in yield, although there is a decrease in labor.

In conclusion it may be said that the increase in rendement from crystallization in movement is from 4 to 6 per cent. of 89 to 91 test sugar. In the case of production of white sugar it would be lower.

Crystallization in movement applied to the second massecuite seems advantageous, especially when a nucleus of crystal sugar is added. An increase of 25 to 30 per cent. has been claimed, but this seems exaggerated. The period of crystallization varies from 36 to 72 hours, but it is dependent on the richness of the product and the quantity of sugar added.

H. P. D.

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The cottony cushion scale, it is said, is again at work among the shade trees in the city, as may be noticed on the samang or monkey-pod trees. A different insect has destroyed the larger part of the citrous trees in and around the city.

DIFFUSION.—REPORT OF M. BOUCHON TO THE SUGAR CONGRESS HELD IN PARIS FEBRUARY 8 AND 9, 1893.

[Translated and Abstracted for the Honolulu PLANTERS' MONTHLY from the "Bulletin de l'Association des Chemestes"—July].

What profile should be adopted for a diffuseur ? What is the influence of the profile on the circulation, on the extraction and on the working capacity of a battery ?

The writer is convinced that all the advantages lie with a cell of large diameter and limited height ; he essays to prove the statement by facts and by reasoning, and thus is led to seek some method of defining the relative value of batteries. It is evident that the value of a battery is directly proportional to several elements, "that it produces in a given time the most work with the lowest cubical contents, and that it gives the best extraction with the lowest dilution." By dividing, then, the daily tonnage by the product of the contents into the extraction into the number of hectolitres drawn per 100 kilog. of chips (the dilution practically), we obtain a coefficient which will show the comparative industrial value of a battery. Now this coefficient, as may be seen from the following table (which relates to factories only whereof the data is absolute), varies sensibly with the ratio of the length to the diameter of the cell, since it descends from the figure 4.00 for a battery of which the length of a cell is 0.79 of the diameter, even to 2.35 for a battery of which the cell length is 1.78 times the diameter. As all the factories included draw sensibly the same volume of juice per 100 kilog. of chips that element does not figure in the table.

Factory.	Ratio of Diameter to length of cell	Number and Capacity of the Cells.	Average Daily Work.	Average Sucrose in Waste Chips.	Proporti'nal Value of the Battery.
	9	N x C.	T.	E.	N. C. E.
A	0.72	14 x 19	300 tons.	0.28	4.00
B	0.93	14 x 33	380 "	0.25	3.28
C	1.10	14 x 25	320 ".	0.32	2.85
D	1.3	16 x 30	350 "	0.30	2.43
E	1.78	12 x 38	300 "	0.28	2.35

Experience then shows us that the industrial rendement of a battery increases as the ratio between diameter and length of cell decreases.

Consider two batteries, A and B, of the same total capacity; but suppose that A has a section double to that of B. For the circulation of an equal volume of juice the vertical displacement of juice in the first will be one-half that in the second, the resistance being the same in each case, for the same surface one would be able to work twice as fast—but that would be, of course, at the expense of the extraction, since the time of contact would be thereby diminished if we did not profit by this easy circulation and secure a finer chip which would be more rapidly extracted, and which would pack closer in the cell, thus giving a greater capacity.

In diminishing, then, progressively the size of the chip, which would be no inconvenience so long as it is neatly cut, we find in battery A as good an extraction as with slow circulation in battery B, and at the same time the work of battery A would be greater because the cells hold more chips and the draw is made more rapidly. Not only would the work be faster when good working prevailed, but the danger of a choked cell would be less when there were delays of any kind; such a *contretemps* is more to be feared with a long cell than with a short one.

H. P. D.

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A CLUSTER PUMALO—A CITROUS FRUIT.

A correspondent writing to one of the Southern California papers, has the following relative to a fruit, which has been here for years, and is known as the shaddock.

About forty years ago a new variety of citrous fruit was brought from Sicily to Florida and planted in a few door-yards. A few years later some were shipped to the Northern cities and a demand sprang up so rapidly that single fruit sold at 25 cents each. Many of the fruit weigh two pounds each, the average size being twenty to twenty-two ounces, which sell the more readily, differing from the orange in this respect.

The demand is constantly increasing and much faster than the supply. A few trees have been planted in California, show that they do as well as in Florida. Returns from New York show that this fruit sold for 10 to 12 cents each. They ripen about March one to fifteen in Florida and are good until July. In Southern California they will ripen fully two months later and be at their best when such refreshing fruit is in demand during the warm weather. Very little budding has been done with this fruit yet, most all of it being raised from the seed, the fruit ranging nearly alike. Some experiments are being made in crossing it with the orange and in time a strictly seedless pumalo may be obtained, however, the original is good enough for most any one. The æsthetic are fond of it as a breakfast dish or appetizer. The dyspeptic claim to have received great help and even wonderful cures from it. The fruit, if eaten at the proper time, is almost a sure cure for malaria and kidney trouble. One generally has to acquire a taste of it, but when once acquired the appetite is great. Many like the flavor at first. When fully ripe the color on the rind is a chrome yellow. The leaves of the tree are much like the orange although larger, more waxy and a darker green when fully matured. It is a very rapid grower, one-third larger than the seedling orange at the same age, a profuse bloomer and very fragrant.

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PINEAPPLES IN FLORIDA.

[CORRESPONDENCE FLORIDA AGRICULTURALIST.]

Pineapple culture in Florida is in its infancy, and is certainly worthy of more attention than it now receives.

The growing of this delicious fruit in the open air is limited to the extreme southern portion of the peninsula, and even there damaging frosts are liable to occur.

There are thousands grown on the "Florida Keys," which the planters depend upon exclusively as their living. Being better protected there than on the main land, makes this industry a certainty.

Pine culture can be made a success on a large scale in South Florida, by the selection of proper land and location.

The pineapple plant bears the second year from the time of planting, and continues fruiting each succeeding year, usually giving five crops, the plant occupying the ground seven years; at the end of that time the field is plowed up, the land allowed one year's rest, then well fertilized and replanted. The pineapple plant bears fuit but once, then dies, suckers sprouting from the base of the old plant, usually one, sometimes two, three, and four; when there is more than one the others are cut off and planted the same as slips, leaving the remaing sucker to do the fruiting the next year.

Suckers are sometimes expected to fruit in one year from the time they are planted, but it is uncertain to expect any, and when fruit does show, it is usually small and unmarketable. Slips which grow from the stalk at the base of the apple, are the favorite for propagation, requiring less labor to prepare for planting, and producing a field of plants, which at bearing age, are regular in size.

The usual method of preparing the soil is to grub the land and free the same of all stumps, burn the brush in small piles, and scatter the ashes well over the ground; after smoothing the land, mark it off in squares, and we are ready to plant. There is more or less difference of opinion as to the proper distance apart for planting; at one time eighteen inches each way was thought sufficient; now, twenty-two by twenty-four inches is the favorite distance.

I favor planting 3x3 feet, firmly relieving that the result will be a better yield, and apples of larger size. Some claim that by setting plants more than two feet, the weight of the apple is liable to topple the plant, thereby causing sun scald on the fruit, but, I argue, why not take some trouble to prevent it by staking the plant, when the extra labor will be amply paid for by the superior fruit which will be produced?

The pineapple plant and the air plant seem to bear some relation, but at the same time the pineapple plant needs a rich, high, dry soil, and like any crop amply repays the owner for fertilizing and thorough cultivation, keeping the weeds down and the ground mellow at all times. The principal fertilizer used in this section is cotton-seed meal, although ground bone, commercial manures and chemicals have been experimented with; but more time is needed to note results. Cotton-seed meal shows a greater improvement than anything else that has been used up to the present time.

I have never noted any benefits from mulching, and think the plants are better off without it, as neither wet or dry weather seems to affect them, and in fact, I know of no enemy except frost.

Pineapple shipments generally begin in this section about

June 1st, and extend until September, sometimes later, as the crop does not at all perfect at the same time.

We ship in slatted box (having partition in center) usually holding seventy-five pines.

About August we begin gathering "slips" from the old plants, so as to get new fields growing before cold weather.

There are quite a number of varieties of pineapples, and nearly all can be readily distinguished, either by their foliage or fruit.

The variety usually cultivated is the "Scarlet," or Red Spanish, and I believe that called the "West India" is the same. The fruit is of quite good size, plump, sweet, juicy, of good flavor. It is the finest shipper we have. The plant propagates slips and suckers freely, is of vigorous growth, having leaves which are somewhat thorny.

Of the fancy varieties, the Egyptian Queen stands at the head, it being truly the queen of pineapples; fruit of more slender shape than the "Scarlet," but of good size, apple of a deep golden yellow both inside and out, of an exquisite strawberry flavor, flesh very tender, including core, extremely juicy; the eyes are small and deeply set, differing from those of any other pineapple that I am acquainted with; foliage very attractive, and plant vigorous—the best variety we have for propagating slips and suckers.

The Sugar Loaf is another superior pineapple, of sugary sweetness, pleasant flavor, flesh very tender, fruit quite juicy, plants not so vigorous as others, but in every way a desirable acquisition.

The "Trinidad" and Egyptian Queen, many mistakenly say, are the same—no mistake could be more apparent; while the "Trinidad" grows to an enormous size, the Egyptian Queen is small beside it; both fruit and foliage are distinct.

The "Trinidad" is not of fine quality, but rather coarse in texture, and juice with little or no flavor, fruit quite attractive and selling mostly on account of its size.

The Ripley Queen is, strictly speaking, a fancy variety of little value for field culture, but for the green house it is truly an acquisition, being handsome both in foliage and fruit, apple somewhat small, eyes curiously marked with bright red, plant equally as curious.

The varieties untested in this section are Charlotte Rothchild, Lady Beatrice, Lampton, and Monserrat, all distributed by the Department of Agriculture.

Pineapple culture in this section has proved highly remunerative, and as I have previously mentioned, this industry is young, and we have considerable knowledge yet to gain concerning the raising of this desirable fruit.

There are now under cultivation, at Eden, some 300,000 plants, and every year new fields being planted swells the amount considerably.

The shipments are beginning to assume vast proportions, and at no distant date Eden will be known as one of the largest pineapple producing sections in the United States.—*Florida Argosy.*

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RECENT AGRICULTURAL INVENTIONS.

[CORRESPONDENCE OF THE INDEPENDENT.]

In the past generation the invention of the mowing and reaping machines, the grain drill and the power threshing machines, marked a great advance in agriculture; but the present generation surpasses the former in the number of labor-saving inventions applied to agriculture. By these inventions some of the operations of the farmer have been revolutionized, and the whole tendency has been to lessen the manual labor of farming and, at the same time, to increase the mental effort required to attain success. These inventions tend greatly to increase the productive power of the earth, and to promote the comfort and happiness of the whole rural population.

It may be profitable and of interest to glance at some of the more striking of these recent inventions.

The barbed wire fence is a revolutionary invention. It came at a time when the cost of fencing material was well-nigh prohibitive. It has greatly lessened one of the heavy expenses of farming in all portions of our country. Barbed wire is here to stay, unless displayed by plain wire. We will never go back to wooden fences.

Potato planters, diggers and sorters are of very recent date, but also revolutionary. They remove at once the chief elements of expense from an increasingly important and profitable farm crop. These machines have now reached a degree of perfection which makes them indispensable to every farmer who raises any considerable quantity of potatoes. Potato sorters of several kinds now rapidly perform what was formerly a slow and unpleasant work, while, within a year or two, a machine for cutting seed potatoes has been produced, and is now meeting with success.

The self-binding grain reapers belong to the present generation. They have had much to do with decreasing the price of wheat, for their introduction has greatly lessened the cost of its production. Their price now places them within the reach of every American farmer. These machines yet need an additional invention which will enable them to use the straw they are cutting for bands, and thus free the farmers from the clutches of the twine trusts.

Machines for loading hay are now often seen and work well. A combined horse-rake and hay-tedder is in use and is a success. The harpoon hayforks are a great improvement over the old drag-forks, which have been utterly superseded. There are very good manure-spreaders on the market but no manure-loader. Fodder-cutting machines have been greatly improved by the addition of the *slicing* attachment which adds greatly to the value of the cut product. Until recently there seems to have been no advances made on cultivators and harrows over the introduction of iron teeth to take the place of wooden ones. But we now have wheeled cultivators, spring-toothed, disk, cutaway and other forms of harrow, all of which are intended to make the ground more friable, and to form a better seed bed. There is no doubt at all that very great advances have been made in recent years in harrows and cultivators. Progressive farmers can now harrow the soil while *riding* under an *awning* completely protecting them from the sun. An invention of the past season enables the operator *instantly* to change the width of the cultivator, thus adapting it to any crop in a moment. For the garden we now have wheel hoes and weeders of numerous patterns, all enabling *one man* to do the work of many men.

The spraying apparatuses for applying insecticides and fungicides to fruit trees and vines are all of recent date, and are working a revolution in fruit growing. Through these machines it is possible for the fruit grower of to-day to place upon the market *perfect specimens* of fruit, at least free from insect ravages. Now, for the first time, man has in his hands the means successfully to combat his insect foes which, for thousands of years, he has feared and has been unable to resist.

For the dairy there have appeared a number or valuable inventions, some of the more recent ones being completely revolutionary. The *lactometer* for determining the weight of the ~~milk, the *Cooley* and other creameries for properly cooling~~ milk and removing from it the animal odors, are known to progressive farmers. Most farmers have also some knowledge of the *Centrifugal cream separators* which have been on the market, and much used in creameries for the past six or more years. These separators are, in brief, rapidly revolving basins into which fresh milk slowly trickles. The difference in weight between the cream and the milk causes them to part company in the separator and then flow off into different receptacles. The advantages of the separator are: 1st. It furnishes more cream and, hence, also, more butter than can be obtained by the old method of allowing the cream to rise. 2d. The whole volume of milk after the removal of the cream is sweet, and of more value for feeding purposes than the sour milk and buttermilk of the old methods. The separator also removes all dirt and fibrin from the cream, and thus gives a more healthful butter. 3d. The butter, being made from fresh milk before it has had time to absorb any foul odors or substances, is of the best quality. The cream separator is a Sweedish invention, but manufactured in the United States. Within a year, separators to be run by hand have been introduced, so that this useful invention can now be used in the smallest dairies.

Recently there has been invented a machine for extracting the butter *directly from the fresh milk.* This is one of those wonderful inventions to be likened to the mowing machine, the roller process in flour making, or the application of steam and electricity to mechanical purposes. The principle on which this machine operates is based largely upon the cream separator already described. In external appearance the extractor closely resembles the separator, and consists of a basin capable of being rapidly revolved. The revolution drives the heavier skim milk to the circumference of the basin, while the cream gravitates to the center of the same, and is made to overflow into a separate interior basin. In this interior basin is suspended a "cream disturber," which, being made to revolve by the rapidly moving cream, causes the butter globules to be liberated and to flow off in a tube provided for the purpose. The invention of the extractor promises results so revolutionary that we may enlarge upon the advantages and the changes likely to result from its general introduction. We quote from a recent report of the Pennsylvania State Board of Agriculture:

"*First.* It saves all the trouble and expense of keeping the cream before it can be churned; and every dairyman knows how closely the process of acidification and the changing of temperature must be watched in ripening the cream.

"*Second.* The delicate operation of churning is avoided. The extractor turns out a uniform granulated butter, requires no skill in handling, the yield and quality depending entirely on the richness of the milk,

"*Third.* The skim milk is necessarily sweet and free from film and dirt. Containing all the caseine, etc., is suitable for cheesemaking.

"*Fourth.* The butter requires but little washing and is easily worked. It necessarily keeps well, as no opportunity is given the milk to become tainted.

"*Fifth.* The yield of butter is the greasest possible from a given quantity of milk.

"*Sixth.* Smaller and less expensive dairy buildings will be needed, and the required utensils will be few and simple. It will only be necessary in sparsely settled locations to have one central butter factory where all the butter can be worked, salted and packed, having extractors in smaller buildings scattered about the neighborhood. The butter need only be extracted at these little factories and sent to the central factory. The farmer may wait only a short time while the butter is extracted from his milk, can then take home his skim milk, and, having seen his butter weighed, be paid the exact amount in accordance.

"*Seventh.* The extractor thus removes one of the greatest obstacles to co-operative dairies by crediting each farmer with the exact amount of butter which his milk contains."

Machines to indicate the amount of fat in milk have been invented, and are in general use. They entirely supserede the lactometer, and place in the hands of every producer and dealer in milk a quick and reliable means of detecting the exact quantity of fat in any given sample of milk. By the use of this instrument producers can determine the value of the milk of any individual cow, and dealers can determine the quality of the milk received from each producer.

Following the invention of the cream and butter extractors, there is announced a Swedish invention of a process of reducing the sweet milk left after the extraction of cream or butter to a *solid form*, so that it can be again fed to the cow or used for human food. Should this last prove practical, it will also be a revolutionary invention. This new production has been called Lactoserine. The use of *sealed bottles* for marketing fresh milk is a great advance, and promises much in places where a first-class product can be paid for; and in the same direction is the process of *sterilizing milk*, whereby it is made free from disease germs and fit for infant food in warm weather. Recent bacteriological investigations have shown that minute living organisms have much to do with the changes which take place in milk, butter and cheese. It is entirely possible that bacteria, to produce any given flavor of butter or cheese, may soon be on the market as a regular dairy supply.

In the line of dairy inventions we must not forget the *silo*, which, within a few years only, has found favor with American farmers. This in the hands of some progressive men, enables them to more than double the number of cattle kept, without any increase of cost. Milking machines of several patterns have been announced, but there are none in successful operation.

The cares of the beekeeper have been lightened by the invention of the honey extractor, the queen cage, the drone trap, artificial comb foundation, wax extractors, and the round section box.

The labors of the chemist have been fruitful for the farmer. Commercial fertilizers have been improved and cheapened until they are beginning to take the place of barnyard manure, the latest triumph in this direction being the extraction of phosphoric acid from the slag wastes of our own furnaces, no less than three million tons of this product, according to one report, being used in Germany alone last year. The chemist has also discovered numerous poisons which destroy insect pests and blights and molds. The extraction of oil from cotton seed has been a source of great additional wealth to the nation. It is a grand triumph of inventive genius and chemical science. No field of research now promises more to the farmer than those experiments which proceed in the chemical laboratories of the land.

Fruit growers have been benefited by the invention of convenient, light and cheap packages in which to ship and to display the fruit, by the discoveries of chemicals which destroy insects and fungus growths when applied by spraying machines, by the perfection of the cold-storage process, and by the invention of practical evaporating machines, by means of which fruit may be readily and healthfully preserved for future use. Improvements in the canning of fruit have also operated to the advantage of the fruit grower.

The farmer has also been benefited by the inventions which have greatly cheapened the cost of all wagons and vehicles used on the farm and road. Road-mending machines of numerous patterns cheapen his taxes and give him much better roads than were possible in a former generation, while the *stone-crusher* produces for him that finest of all roads for driving, the Telford. Within the present generation, the *traction engine* has come into use on some farms, but mainly in drawing the steam threshers from point to point. All the smaller tools of the farm, as hoes, forks, shovels, picks, etc., etc., have been made lighter and stronger, so as to be most convenient to the user.

There are yet needed, a corn-cutting machine, to cut corn as the mowing machine cuts grass, a husking machine, a self-binder, which will use straw and not twine, a milking machine, a manure-loading machine, a machine to pick berries and all small fruits, a cotton picker, some contrivance to combat untimely frost, a cheapening of electric railroads, so that these may tap every village and possibly every farm, and last named, but not least, an automatic machine to do the drudgery of the farm-house.

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HAWAIIAN KONA COFFEE.

Those who are familiar with the taste and delicious aroma of this coffee, when properly made for the table, need not to be told of its excellence; but as an encouragement to those who are engaged in the pioneer enterprises of growing Hawaiian coffee on a large scale for export, such testimonials as the following are calculated to re-assure them in their very laudable efforts. The gentlemen whose names are attached to the letters have been engaged in the coffee trade for many years, and are familiar with the product of every country, and for this reason their opinion is unimpeachable. The letters were addressed to Dr. M. E. Grossman, of this city, who is largely interested in one or more of the new Hilo and Puna coffee estates on Hawaii :

SAN FRANCISCO, July 5th, 1883.

DEAR SIR : Referring to the two samples of Sandwich Islands coffee (peaberry and flat bean) I think I safely voice the sentiment of all who tested them with me in pronouncing it to be one of the best coffees ever exhibited here within my knowledge.

With proper cultivation and preparation there is no doubt in my mind but that it is destined to rank among the best coffees which the world produces.

Very truly yours,

C. E. BICKFORD.

SAN FRANCISCO, July 5th, 1893.

DEAR SIR : We have given the sample of coffee you submitted to us a thorough trial, and find it of excellent quality. We compared it with Java, Kona, Costa Rica and Guatemala coffees, and in our judgment it is much superior to any of them. However, the Kona we have in stock is not of very good quality, which perhaps accounts for the difference in flavor, which we found to be very much in favor of your sample.

Should you put on the market coffee equal in style and flavor to the sample submitted, we do not hesitate to say that you will undoubtedly obtain a price of from one to two cents per pound more than the best Guatemala and Costa Rica coffees. It is somewhat difficult to say now what price (compared with other coffees) could be obtained for Island coffees, as there has never been sufficient quantity of them on the market to establish a demand or value. Very soon, however, after Hawaiian coffees are prepared for exportation in good merchantable condition, they will take their place among other fine coffees and demand a price equivalent to their merits, which we believe to be of high grade.

Yours truly,

J. A. FOLGER & Co.

THE BRAZIL COFFEE CROP.

The receipts of coffee in Rio and Santos, for the trade year ending June 30, compared with preceding years as follows:

	Rio bags.	Santos bags.	Total bags.
1892–93	2,989,000	3,213,000	6,202,000
1891–92	3,722,000	3,675,000	7,397,000
1890–91	2,413,000	2,945,000	5,358,000
1889–90	2,389,000	1,871,000	4,260,000
1888–89	4,189,000	2,938,000	6,827,000
1887–88	1,912,000	1,121,000	3,033,000
1886–87	3,497,000	2,581,000	6,078,000

Here we have a decrease in receipts at Rio and Santos in 1892–94, as compared with 1891–92, of 1,195,000 bags, a deficit of over 10 per cent. of the world's coffee requirements.

The average annual receipts at the two ports of Brazil for five years were 6,008,800 bags, so that the crop of 1892–93 was a full average.

The exports from Rio and Santos for the year ending June 30 and the preceding four years were as follows:

		To U. S.	To Europe.	Total Exports.
1892–93	Rio	1,972,000	953,000	6,295,000
	Santos	1,102,000	2,268,000	
1891–92	Rio	2,556,000	1,148,000	7,267,000
	Santos	997,000	2,556,000	
1890–91	Rio	1,556,000	750,000	5,537,000
	Santos	798,000	2,253,000	
1889–90	Rio	1,767,000	724,000	4,570,000
	Santos	512,000	1,567,000	
1888–89	Rio	2,332,000	1,542,000	6,431,000
	Santos	533,000	2,014,000	

The above shows average yearly exports for five years of 6,020,000 bags, which is 275,000 bags below the exports of 1892-93.

Brazil furnishes about 54½ per cent, of the world's requirement of coffee, taking the average exports for five years as a basis of computation.

It is apparent that any decrease in the Brazil supply below a crop permitting of minimum exports of 6,000,000 bags, or 54½ per cent. of the world's total supply, means high prices until other producing countries extend their area under coffee to an extent great enough to produce and export an average of at least one-half of the world's requirements—unless Brazil has other years of exceptional yield, as in 1891–92, when the receipts at Rio and Santos went 1,388,200 bags beyond the yearly average.

Coffee culture is being pushed in Mexico, Central America and the United States of Colombia, but new plantations have not yet reached a point where they are able to push exports abreast of Brazil; and until that time is reached, high prices must rule. Consumption has not increased since 1886 as much as it should, in view of the increase in population and the prosperous condition of the United States. It requires the stimulus of low prices and exceptional prosperity to advance coffee consumption in the old time ratio of about 9 per cent. per annum.—*American Grocer.*

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Here is something for men who use machinery to think about: "Power" says that the cost for fuel of the new Washington Mill at Lawrence, Mass., has been reduced to $35,000 per annum, against $96,000 spent by the old corporation before the reorganization of the plant. This saving of $61,000 per annum would have been equivalent to four per cent. on the capital of the old company. The production of the new company is about the same as that of the old. This is a practical demonstration of what can be done by putting efficient machinery appliances, properly designed for the work which they are to do, and putting them in charge of a man who knows how to get the best results out of them.

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FIELD EXPERIMENTS, WITH SUGAR CANE, ON CALUMET PLANTATION, PATTERSON, LA.

BY HUBERT EDSON, CHEMIST.

During the year 1889 it was decided to inaugurate a series of investigations under the direction of the laboratory which might, in some way, benefit the agricultural interests of the plantation, as these were undoubtedly falling far behind the progress made in the factory.

Difficulties were forseen from the beginning in attempting on a sugar plantation, where the main object of the year is raising and manufacturing a crop, to carry on any systematic experiments in the field. These difficulties, while not all apparent at the time, were so certain to be encountered that the experiments were begun on a very limited scale, with the idea that they could be enlarged as soon as the demands of the work and the means of meeting these demands were developed.

There was also, in all the work undertaken, to be some immediate promise of success or the particular line of experimentation which did not give it was to be dropped. This idea, undoubtedly, was in a great degree unscientific, and may have prevented some work which would have proven of great benefit, but under the conditions existing here it was undoubtedly the wisest plan to adopt. Any other course would have had the result of evolving an experiment station pure and simple, which, with the multiplicity of other interests to be regarded at Calumet, would be an impossibility. Neither the laboratory nor the other departments of the plantation which would be involved could possibly spare the time from their other imperative duties that the proper conduct of an experiment station would entail.

The idea, then, of some benefit occurring in a reasonable time is the one which it has been the endeavor to keep distinctly in view in all the work, and in some cases experiments which give almost certain promise of ultimate success may be discontinued to give place to others whose benefits seem not so far distant. The Sugar Experiment Station in this State happily does away with the necessity for this detailed experimentation by private enterprise, as it should undertake everything which gives any promise of ultimate success and carry its experiments for such a length of time that either their uselessness is clearly established or their benefits made sufficiently apparent to warrant their adoption in practical usage.

In this work undertaken here it was not meant to confine experimentation simply to the field proper, but anything done in the sugar-house, laboratory, or field, which might prove of benefit in increasing the amount of cane grown on a given area and the sugar which this cane would contain, was to be included. That there is some way to make decided advances in cane agriculture no one who has given the subject any consideration can well doubt. That the discovery of this means is not remote is by far more uncertain. Beet growers, some of them uneducated in everything save farming, discuss with judgment and knowledge the proper cultivation, fertilizations and varieties adapted to their different soils, and as proof of their ability to discuss these things they are supported in their statements by the fact that they produce a plant remarkable for its sugar content, which is evidence that can in no way be gainsaid. This knowledge of theirs was secured for them by long and laborious experimentation, both in field and laboratory, with a plant originally low in sucrose. This experimentation, too, is in continuance at the present time and gives every promise of further advancement.

Sorghum, too, in systematic experiments conducted by the United States Department of Agriculture and the private enterprise of this plantation, has made a progress that is almost startling. It may be, and probably is, that sugar cane is a much more difficult plant to educate because of its bud propagation, but this does not indicate the uselessness of experimentation with it, even if the promise of success is thus rendered more remote.

Experiments also are necessary in different parts of the sugar belt of this State, because different soils and conditions are met with here in comparatively short distances from each other to a degree that only alluvial formations on such a grand scale as those of the lower Mississippi valley can furnish. The fact that nearly every tropical cane-producing country has its own favorite variety and method of cultivation, is unimpeachable testimony that the plant is susceptible to its environments; and Louisiana, with prairie, bottom, and upland soils, its regions so surrounded by water as to be practically free from frost and those which are absolutely certain to be visited with freezing weather, with all the intermediate conditions, gives unmistakable evidence that a more varied experimentation is necessary than can be secured by one or two experiment stations. This experimentation can, at the present time, be accomplished only by individual planters. While very complete and extended experiment may be conducted by the Sugar Experiment and Baton Rouge Stations, the results of these experiments must, in most cases, be quantitatively confirmed in different parts of the State, relying on the general methods pointed out by the stations as a *guide only* in pursuing investigations pertinent to the different sections.

These preliminary remarks have been thought necessary so as to call attention to the difficulties which have to be encountered in such work as this, and at the same time to show the great necessity for it, in order that if all is not gained which is hoped for, the need of such investigation will be so apparent that discouragement will not come till hope of any aid being rendered in a reasonable time has likewise vanished.

The first line of experiments undertaken was with different varieties of cane. These varieties were secured from the Sugar Experiment Station which was then located at Kenner, Louisiana. There were received in all eighteen varieties, three of which furnished enough seed to plant plats of considerable size, the other lots consisting of but three canes each. All of the canes received were badly riddled by the tropical cane borer, and seemingly were very poor material for seed. The three varieties, Tibbo Merd, Bamboo and Cavengerie had been grown at the Station for three years previous to the time seed from them was sent to Calumet.

The countries from which these varieties were imported, are as follows: Tibbo Merd, East Indies; Bamboo, Cuba; Cavengerie, Marquesas Islands; Crystallina, Cuba; Pupuha, Sandwich Islands; Bourbon, Antigua; Portier, Cuba; Ohia, Sandwich Islands; Honuaula, Sandwich Islands; Loucier, Marquesas Islands; Uwala, Sandwich Islands; Kokea, Sandwich Islands; Altamattie, Australia; Lahaina, Sandwich Islands; Otaheite, Trinidad.

There is doubt about the origin of some of these, as I find what seems to me to be contradictory statements in regard to them in publications of the Station. However, their source is of little consequence, and is given only as a matter of interest.

Below are given the analyses of these varieties at the end of their first season's growth at Calumet. They were all planted in December of 1889, at about the same time as the plantation Purple, with which they are compared. The sampling of the plats was done at regular intervals, every plat being sampled on the same day and by the same person. This plan reduces the error in sampling to a great degree, and gave analyses that are as comparable, on the whole, as could be desired. Fifteen of the plats were so small that if the analyses had been extended over as great a period for them as for the others, there would not have been enough cane left for further planting in case a variety gave promise of becoming valuable.

VARIETIES.—*Plant Cane.—1890.*

Analyses of	Date	Solids	Sucrose	Purity	Glucose	Glucose Ratio
PLANTATION PURPLE.	Oct. 17	14.02	10.3	73.48	2.88	27.96
	Oct. 24	14.52	11.1	76.45	2.16	19.46
	Oct. 31	13.96	10.4	74.50	2.38	22.88
	Nov. 7	14.63	11.15	76.21	2.06	17.58
	Nov. 14	15.06	12.8	84.99	1.20	9.38
	Nov. 21	14.99	12.4	82.72	1.43	11.53
	Means.	14.53	11.38	78.32	2.02	17.75
RED CAVENGERIE	Oct. 17	10.01	3.9	38.96	4.46	114.36
	Oct. 24	11.21	5.15	48.58	4.69	91.07
	Oct. 31	10.95	5.0	45.45	4.52	90.40
	Nov. 7	11.71	6.75	57.65	3.31	52.51
	Nov. 14	11.85	6.85	57.80	2.46	35.91
	Nov. 21	13.22	8.50	64.30	1.90	22.35
	Means.	11.49	6.03	52.48	3.56	59.04
BAMBOO.	Oct. 17	12.71	7.90	62.16	3.34	42.28
	Oct. 24	13.82	9.20	66.57	3.20	34.78
	Oct. 31	13.93	9.50	68.20	3.02	32.98
	Nov. 7	14.70	11.1	75.51	2.13	19.19
	Nov. 14	15.03	11.5	76.52	1.34	11.65
	Nov. 21	15.13	11.85	78.32	1.92	16.20
	Means.	14.25	10.18	71.44	2.49	24.46
PORTIER.	Nov. 7	13.62	8.15	59.84	2.44	29.97
	Nov. 14	13.89	9.05	65.15	2.53	27.95
	Means.	13.76	8.60	62.50	2.49	28.96
LOUCIER.	Nov. 7	12.69	7.35	57.92	1.81	24.63
	Nov. 14	13.53	8.50	62.82	3.10	36.47
	Means.	13.11	7.93	60.48	2.46	31.02
LAHAINA.	Nov. 7	13.09	8.65	66.08	2.30	26.59
	Nov. 14	14.15	7.55	53.36	1.90	25.17
	Means.	13.62	8.10	59.10	2.10	25.93
UWALA.	Nov. 7	14.05	10.25	72.95	1.81	17.65
	Nov. 14	14.93	11.40	76.36	1.86	16.31
	Means.	14.49	10.83	74.74	1.84	16.99

VARIETIES.—*Plant Cane.—1890.—Continued.*

Analyses of	Date	Solids	Sucrose	Purity	Glucose	Glucose Ratio
TIBBO MERD.	Oct. 17	13.52	9.25	68.42	2.76	29.84
	Oct. 24	15.63	12.30	78.69	2.18	17.72
	Oct. 31	14.87	11.2	75.32	2.25	20.09
	Nov. 7	14.73	11.4	77.39	1.88	16.49
	Nov. 14	14.96	12.15	81.22	1.60	13.17
	Nov. 21	15 73	13.5	85.82	1.43	11.53
	Means.	14.91	11.63	78.00	2.02	17.37
CRYSTALLINA.	Nov. 7	13.62	10.0	73.42	2.05	20.50
	Nov. 14	14.16	11.0	77.68	2.00	18.18
	Means.	13.89	10.5	75.52	2.03	19.33
BOURBON.	Nov. 7	14.73	10.6	71.96	2.16	20.38
	Nov. 14	14.70	11.55	78.57	2.21	19.13
	Means.	14.72	11.08	75.27	2.18	19.67
AINAKEA.	Nov. 7	12.18	6.65	54.60	2.44	36.70
	Nov. 14	13.35	7.80	58.43	2.72	34.87
	Means.	12.77	7.23	56 62	2.58	35.68
KANIO.	Nov. 7	11.98	6.3	54.17	1.81	28.73
	Nov. 14	12.85	7.55	58.75	1.60	21.19
	Means.	12.42	6.93	55.80	1.71	24.68
MANULETE.	Nov. 7	12.62	7.3	57.84	2.60	35.61
	Nov. 14	13.15	7.95	60.45	3.50	44.02
	Means.	12.88	7.63	59.08	3.05	39.98
HONUAULA.	Nov. 7	12.82	7.75	60.45	2.34	30.32
	Nov. 14	11.89	6 99	58.03	2.56	37.10
	Means.	12.36	7.33	59.30	2.45	33.42
ALTAMATTIE.	Nov. 7	11.68	6.75	57.79	2.67	39.56
	Nov. 14	12.49	7.45	59.73	2.23	29.93
	Means.	12.09	7 10	58.73	2.45	33.10
OHIA.	Nov. 7	10.91	5.25	48.12	2.23	42.47
	Nov. 14	12.69	7.30	57.52	2.37	32.47
	Means.	11.80	6.28	53.22	2.30	36.62
KOKEA.	Nov. 7	12.18	7.0	57.47	2.37	33.85
	Nov. 14	12.89	7.9	61.28	3.50	44.30
	Means.	12.54	7.45	59.41	2.94	39.46
PUPUHA.	Nov. 7	15.53	12.2	78.56	1.87	15.33
	Nov. 14	16.10	12.75	79.19	1.73	13.57
	Means.	15.82	12.48	78.89	1.80	14.42
OTAHEITE.	Nov. 7	13.89	9.65	69.48	2.44	25.28
	Nov. 14	14.53	10.15	69.86	1.94	19.02
	Means.	14.21	9.90	69.69	2.19	22.12

After a careful study of these analyses, eight varieties which it was thought possessed some characteristic of value were chosen for further experimentation. These were Cavengerie, Tibbo Merd, Bamboo, Crystallina, Bourbon, Pupuha, Otaheite and Uwala. The Cavengerie was selected for its splendid physical qualities, it being perfectly upright, suckering immensely, and crushing easily in the mill; its sucrose quality is very low. The varieties discarded were so treated, not because some of them did not give promise of success, but because in each case this success seemed so remote that further experimentation with them did not lie within the plan of work decided upon here.

A few notes made during the time of growth are given on the varieties selected. For a better understanding of these notes it must be remembered that a very severe freeze the first of March, 1890, killed all the cane on the plantation to about two inches below the surface of the ground.

CAVENGERIE :—March 20.—Of the three large plats, viz.: Tibbo Merd, Bamboo and Cavengerie, this seemed to have withstood the freeze best. Suckering phenomenal, but up to July cane very small as compared to Purple by the side of it. After July it seemed to gain steadily till in November it was a very large and handsome cane, standing remarkably erect.

BAMBOO :—An extraordinary cane for suckering ; very sprangly in its younger growth, but in November not at all tangled. Medium size and having the characteristic appearance its name implies.

TIBBO MERD :—This variety did not give nearly the amount of suckers as the two previous ones, nor even as many as the Purple. In even steady growth, however, it surpassed all the imported canes, keeping pace the whole season with the plantation cane. Throughout the season it gave every appearance of a cane suited to the climate here. In November size of stalk medium in diameter and very tall but badly tangled, the latter quality being against its otherwise favorable record.

CRYSTALLINA :—Nine stalks of this variety before freeze, one of which was killed; afterward two more appeared, making in all ten mother stalks from which twenty-nine suckers started and twenty-one came to maturity, or a little over two per mother stalk. Suckering began first week in May and continued till after first of July. Cane medium size when cut, having good growth earlier part of the season which gradually lessened toward the end.

BOURBON :—None of this variety killed by freeze, and nine mother stalks reached maturity from which forty-one suckers started, twenty-seven maturing, or three to each mother stalk. Suckering began about April 24th, continuing into July, but not nearly so rapid in growth as suckers on the plantation Purple. Cane of medium size at time of harvesting.

PUPUHA :—No canes killed by freeze and five mother stalks maturing which started twenty-five suckers and lost four by the time of harvest, making a little over four suckers matured to each mother stalk. Suckering began last week in March and continued into July. Canes rather backward in early growth but large in November. Sheaths and leaves very prickly.

OTAHEITE :—No canes killed by freeze, and six mother stalks came to maturity, giving thirty-three suckers, eighteen of which matured, making three per mother stalk. Several of the stalks of this variety had been cut down by negroes for eating, so the total number of stalks is not in reality the number that came to maturity. Suckering began last week in March and continued into July. Early growth not as rapid as plantation cane, but stalks in November very large and handsome.

UWALA :—No cane killed by freeze, and nine stalks reached maturity which gave thirty-two suckers, thirty coming to maturity, or over four per mother stalk. Suckering did not begin till first week in May. Canes as in nearly all other plats surpassed in early growth by the plantation cane. In November, however, the stalks had become quite large.

No tests of tonnage were made both on account of the poor seed, which did not give a good stand, and because when these tests should have been made there was not time to spare from the sugar-house work to make them.

These notes and analyses undoubtedly point out the Tibbo Merd and Pupuha as the most promising of the varieties here. The latter shows to a greater advantage than the former, though the comparison is not absolutely definite because the analyses of the Tibbo Merd extended over a much longer period. In all the plats of which the number of stalks were recorded the Pupuha is equaled only by the Uwala in the number of suckers as compared with the mother stalks, and is surpassed by this same cane in the proportion of suckers started which lived. It began suckering, too, as early as any of the plats, which would indicate its adaptability to Louisiana. The most serious objection to this variety seemed, after one year's cultivation, to be in the fact that the leaves and sheaths while green were extremely prickly. This would prove of great annoyance to cane cutters and might even be the cause of its disuse, though all other qualities were favorable.

The Tibbo Merd, while not suckering as profusely as the Pupuha, was an even steady grower, matured most of its stalks once started, and seemed particularly well adapted, for an imported cane, to its surroundings. It, however, had the fault of tangling badly after it reached considerable height, but while this is a serious objection, it would not prevent its cultivation should it continue to give as good returns as during the present year.

The analyses of both these varieties are superior to that of the Purple grown immediately adjoining them.

The Cavengerie, though continued in the experiment plats, is not, in my opinion, worthy of further trial, as the time seems too remote when it can become an available sugar producer under the conditions existing here.

The other varieties continued give such evidence of becoming valuable that it is thought worth while to give them further trial.

It is a matter of considerable interest to note the number of suckers which started but never came to maturity. With one variety 65.9 per cent. of the total number were so lost and the least percentage was 6.6. These were not willfully destroyed, either, but could be found standing from ten to thirty inches high and entirely withered at the time the other canes were harvested. The fact suggests the probable advisability of selecting varieties in which a great proportion of the number of suckers live to maturity. The mother stalk is undoubtedly hindered in growth at the time of suckering, and it certainly is not advisable to waste its vitality then on canes which will die in a short while when this vitality would otherwise be expended in furthering the growth of stalks from which some return would be secured. Probably the only means of preventing this wastage is by the propagation of varieties that do not possess the fault in great measure, though it may be that the amount of cane planted is the most important factor. It would also be well, perhaps, to remark here that none of the 1890 plats received the care in cultivation that was given to the plantation cane with which they are compared. They were not plowed so often, and in one instance the cross drains were left unopened during a period of heavy rains. This, of course, in some measure, detracted from the value of the experiments and is consequently to be deplored.

The best four varieties in point of sugar content for this year were, in the order named, Pupuha, Tibbo Merd, Bourbon and Uwala. The Pupuha contained 224.6 pounds of pure sugar per ton of cane and the Tibbo Merd 209.3 pounds as against 204.8 in the Purple. All the other imported varieties were inferior to the plantation cane.

The cane from the eight varieties, previously indicated as selected for further experimentation, was planted during the latter part of November, 1890, and furnished the plant cane of the season of 1891.

1891 STUBBLE FROM 1890 PLANT CANE.

VARIETIES.—*Stubble Cane.—1891.*

ANALYSES OF	Number of Canes.	Date.	Solids.	Sucrose.	Purity.
Plantation Purple	....	Nov. 24	17.6	16.3	92.6
Red Cavengerie	....	Nov. 24	14.2	10.2	71.8
Bamboo	....	Nov. 24	15.3	13.1	85.6
Tibbo Merd	....	Nov. 24	16.6	14.8	89.2
Crystallina	21	Nov. 24	16.9	15.4	91.1
Bourbon	24	Nov. 24	16.1	13.8	85.7
Pupuha	30	Nov. 24	17.8	16.2	91.0
Otaheite	25	Nov. 24	15.5	13.8	90.2
Uwala	30	....	....	....	....

The stubble of the plantation cane is chemically better than that of any of the foreign varieties. Of these last the Pupuha has again asserted its superiority, and is almost as good as the plantation cane, containing 291.6 pounds of sugar per ton, against 293.4 pounds in the Purple. And the five original mother canes of Pupuha which, in 1890, produced twenty-one suckers, have now with these suckers given thirty stalks of stubble cane, by far the best record of any of the varieties. The best four imported varieties in the stubble were the Pupuha, Crystallina, Tibbo Merd and Otaheite. No analyses could be secured of Uwala, as nearly every stalk of it had been cut or injured in some way, supposedly by the colored people in search of "sweet canes." We find then that of the four varieties which were best in plant cane, three are also among the best four of stubble, with a possibility that the four would have been the same had analyses of the Uwala been secured.

Further analyses of stubble from some of the rejected varieties showed that the selection made for continued experiment was a good one, as the relative excellence of those selected was maintained.

PLANT CANE, 1891.

VARIETIES.—*Plant Cane.—1891.*

ANALYSES OF	Date.	Solids.	Sucrose.	Purity.
Plantation Purple	Nov. 27	14.8	11.1	75.00
Red Cavengerie	Dec. 2	12.8	8.6	62.7
Bamboo	Dec. 2	14.4	11.6	80.6
Tibbo Merd				
Crystallina	Nov. 21	16.8	13.9	82.7
Bourbon	Nov. 21	14.5	10.9	75.2
Pupuha	Nov. 21	16.6	14.0	84.3
Otaheite	Nov. 21	16.4	12.6	76.8
Uwala	Nov. 21	16.8	13.9	82.7

This cane was grown from seed furnished by the plant cane of the 1890 experiment plats. The analyses of the Purple are the average of two plats of this variety planted by the side of the imported canes, and within a few days of the same time. No sample of Tibbo Merd was secured, because the overseers had cut it all down and planted it before the proper time for making analyses had arrived. The loss of this analysis was all the more regretted because it had uniformly been one of the best varieties in the previous experiments.

Again, from unfavorable conditions of weather and treatment, the plats were very inferior looking canes, and I was disheartened from further trial. The analyses, however, gave me renewed confidence in this line of investigation, as in several cases the imported varieties surpassed the Purple in sugar content, thus indicating a better inherent quality of overcoming adverse circumstances in which they might be placed. Bamboo, Crystallina, Pupuha, Otaheite and Uwala, were all superior to the Purple, and in the case of the Bamboo the sample was secured from a load of cane crushed in the large mill, while the sample of Purple was from the small mill, which latter apparatus always gives a richer juice. The Pupuha is again in the lead with 252 pounds of sugar per tons, while the Purple showed but 199.8. The best four varieties were, in the order named, Pupuha, Uwala, Crystallina and Otaheite. Pupuha and Uwala are found in the best four of 1890 plant cane, and Pupuha, Crystallina and Otaheite are in the best four of 1891 stubble, while Pupuha alone is found in all. It must be remembered, though, that Uwala would probably have been among the best four of the 1891 stubble, and Tibbo Merd among the best four of 1881 plant, had we been able to secure samples of these.

No comparisons of the foreign varieties are made with the average analyses of the different seasons' crops, as the soils of the plantation differ vitally, the time of planting and harvesting varies greatly, and above all, because in the one case the canes are crushed in a small hand-mill, and in the other by the large factory mill. The comparisons made, then, with the plantation cane, have been restricted to canes of same age, and grown in close proximity to the plats of the imported varieties.

We will now compare the selection of varieties at Calumet with the analyses made at the Sugar Experiment Station, this State. In the *Louisiana Planter* of March 29, 1890, are given analyses of several varieties of cane grown in the Horticultural hall of the Station during 1889-90, where their growth had continued steadily for a year. Among these are analyses of seven varieties found at Calumet. Of these seven, Otaheite, Uwala, Tibbo Merd and Loucier were the best, and, with the exception of Loucier, were among the varieties retained for further work here. The remaining three were alike inferior in both places. So much for the comparison of cane grown in the field here with that grown in a hothouse at the Station; we will also compare it with the field work at the same place.

The *Planter* of October 25th, 1890, gives an extended number of analyses for that year. All the varieties sent to Calumet are found in this table, and of the seven selected here for further trial five are among the best varieties at the Station. Otaheite, with Dr. Stubbs, however, in 1890, proved a very inferior cane, while it was one of the best here. Pupuha also with him this year was only of medium richness, while it was the best cane with us. The remaining eleven varieties here were alike poor in both places with the exception of Loucier, which was with Dr. Stubbs, again a cane of medium quality. The issue of January 30, 1892, of the *Planter*, gives the analyses of foreign varieties grown at the Station in 1891. The seven varieties retained at Calumet in 1891 are all found in these analyses, and none of them are among the poorer varieties grown at the Station, while four are among the very best, and two, the Pupuha and Tibbo Merd, are respectively first and second best. Cavengerie, which up to the present time has been continued at Calumet, is, at the Station as well as here, poor in sucrose. The Pupuha has in 1891, proven the best cane at the Station, and has always, up to the present time, held that place at Calumet; Tibbo Merd has in both places retained its excellence throughout.

In continuance of these experiments there were planted in squares 209 and 210, East Field, plats of these same seven varieties in which both stubble and plant cane was used for seed, subdivisions of the plats having been made to try the relative excellence of these two growths of cane for seed at the same time the qualities of the varieties themselves are being tested.

PLANT CANE, 1892.

VARIETIES.—*Plant Cane.—1892.*

VARIETY.	DATE.	GROWN FROM PLANT CANE SEED.			GROWN FROM STUBBLE CANE SEED.		
		Solids	Sucrose	Purity.	Solids.	Sucrose.	Purity.
CRYSTALLINA.	Nov. 1	15.7	11.7	74.5	16 6	13.2	79.5
	Nov. 14	14.7	11.0	74.8	15.8	12.8	81.0
	Nov. 19	15.0	11.6	77.3	....	....	....
	Means.	15.1	11.4	75.5	16.2	13.0	80.2
BOURBON.	Nov. 1	14.7	10.3	60.1	16.1	12.7	78.5
	Nov. 11	14.5	10.6	73.1	15.1	12.3	81.4
	Nov. 19	15.4	11.8	76.6	16.4	13.7	83.5
	Means.	14.9	10.9	73.2	15.9	12.9	81.1
PUPUHA.	Nov. 1	17.3	13.8	79.8	17.5	13.9	79.4
	Nov. 14	16.9	14.4	85.2	16.9	13.1	77.5
	Nov. 19	17.4	14.7	84.5	16.8	14.0	83.3
	Means.	17.2	14.3	83.1	17.1	13.7	80.1
OTAHEITE.	Nov. 1	15.6	10.7	68.5	15.8	10.7	67.7
	Nov. 14	14.7	10.9	74.2	15.5	11.5	74.2
	Nov. 19	16.4	12.0	73.2	15.8	10.6	67.1
	Means.	15.6	11.2	71.8	15.7	10.9	69.5
UWALA.	Nov. 1	16.1	12.6	78.2	15.4	11.8	76.6
	Nov. 14	15.5	12.5	80.6	14.7	11.7	79.5
	Nov. 19	15.9	13.4	84.8	15.4	13 5	87.7
	Means.	15.8	12.8	81.0	15.2	12.3	80.9
BAMBOO.	Oct. 24	15.4	11.6	75.3	15.8	12.4	78.5
	Nov. 2	16.6	13.9	83.7	16.8	14.3	85.1
	Means.	16.0	12.8	80.0	16.3	13.4	82.2
TIBBO MERD.	Oct. 24	17.2	13.7	79.6	17.6	14.0	79.5
	Nov. 1	18.0	15.2	83.8	18.0	15.2	83.8
	† " 11	15.7	12.5	79.6	†16.4	13.6	82.9
	Means.	17.0	13.8	81.2	17.3	14.3	82.7
*PLANTATION PURPLE. (East of plats.)	Oct. 24	18.4	15.8	85.9	....	....	....
	Nov. 2	18.1	15.5	85.6	....	....	....
	Means.	18.3	15.7	85.8	....	....	....
*PLANTATION PURPLE. (West of plats.)	Nov. 2	17.8	16.0	89.9	....	....	....
	† " 12	15.4	13.0	84.4	....	....	....
	Means.	16.6	14.5	87.4	....	....	....

† Cane ground in large mill.
* Not known whether seed was stubble or plant, though probably the former.

EXPERIMENT PLATS.—*1892.*

VARIETY.	Kind of seed from which grown......	Number of mother canes grown......	Maximum numb'r of canes during growing season..	Number of canes died during growing season......	Number of canes reaching maturity	N'mb'r of suckers reaching maturity	N'mb'r of suckers to one moth'r cane	Length of plat in feet........	Number of canes per foot.......	Number of canes died per foot.....	Date end of week last mother canes appeared.......
Crystallina	Plant Cane....	191	434	132	302	111	0.6	211	1.4	......	....
Crystallina	Stubble Cane..	43	99	20	79	36	0.8	35	1.0	......	....
Bourbon	Plant Cane....	218	472	99	377	159	0.7	232	1 6	......	....
Bourbon	Stubble Cane..	43	110	33	77	34	0.8	42	1.8	......	....
Pupuha	Plant Cane....	242	517	211	306	164	0.7	120	2 6	1.8	May 15
Pupuha	Stubble Cane..	70	159	51	108	38	0.5	35	3.1	1.5	May 22
Otaheite	Plant Cane....	142	307	105	202	60	0.4	87	2 3	......	....
Otaheite	Stubble Cane..	26	61	19	42	16	0.5	16	2.4	......	....
Uwala	Plant Cane....	200	442	110	332	132	0 7	227	1.5	0.5	May 22
Uwala	Stubble Cane..	63	114	13	101	38	0 6	46	2.2	0.3	May 22
Bamboo	Plant Cane....	264	538	102	436	172	0.7	150	2.9		
Bamboo	Stubble Cane..	172	451	58	393	221	1.3	150	2.6	......	....
Tibbo Merd	Plant Cane....	200	419	94	325	125	0.6	116	2.8	0.8	May 8
Tibbo Merd	Stubble Cane..	147	406	106	300	153	1.0	116	2.6	0.9	May 15
Purple, square east of plats..	Unknown	181	433	138	295	114	0.6	106	2 8	1.3	May 8
Purple, square west of plats.	Unknown	247	550	148	402	155	0.6	153	2.6	1.0	May 1
Purple	Rich Canes....	371	889	14	875	504	1.4	277	3.2	.05	May 15
Purple	Poor Canes....	350	777	7	870	520	1.5	277	3.2	.03	May 15

The results on the seven varieties kept over from last year because of their promising sucrose content, are given above in tabulated form. No analyses of the Cavengerie are given, as it had been kept solely for its physical characteristics, and as these did not amount to what was expected of them the variety was discarded. One analysis was made, but the sucrose content was so ridiculously low that it was not considered worth while to make further tests.

Each variety this year was subdivided into two plats, one planted with stubble and the other with plant cane seed. The results on this part of the work will be discussed further on; at present we will deal only with the quality of the different varieties. There were but three of these—the Tibbo Merd, Pupuha and Uwala, kept for further experimentation.

In point of sucrose the Bamboo was as good as the varieties kept, but the cane itself was so small that it could not be hoped that it would soon become a competitor of the native canes. As this cane has uniformly been comparatively small since it has been here, there could not be much doubt it was nothing accidental that made it so this year, and in conformance with our plan, decided upon at first of keeping only those varieties which gave some promise of an early betterment of our condition, we could do nothing but discard it. We cannot judge a variety solely on its sucrose content, for a cane might very well contain a large amount of sugar and yet be so small that enough sugar per acre could not be grown to warrant its cultivation. And, also, a variety might do excellently during a dry season and make an almost entire failure during a wet one, or *vice versa*. If it should happen that some of the varieties discarded here prove valuable, it will not be difficult to secure them from the experiment station again. Certainly none of them will prove so valuable that much will be lost in the time it would take to regain a stock of seed.

The three varieties selected for further propagation have uniformly, from the first, been among the best. Pupuha, in point of sucrose content, has always held the lead till the present year, when it dropped a point to second position, being replaced at the top by Tibbo Merd, which has, in reality, always been its nearest competitor, though its record is not so complete because of the loss of one year's analysis. Even this year the analyses on their face only give the Tibbo Merd a very small fraction the better sucrose content, but as one of the samples of this variety was taken from the large mill which always gives a poorer juice, it is certain that the average would have been higher had all the samples been taken from both plats in the same way.

The order, then, of the varieties in point of richness is Tibbo Merd, Pupuha and Uwala.

For the first year since the testing of varieties was begun here, the plats have had excellent cultural treatment, the season has been suitable for growing a large crop of cane, and also for the first time, the native cane has excelled all the foreign varieties. This year it is undoubtedly far superior to all but Tibbo Merd, and its average analysis shows one per cent. higher sucrose content than that of this variety, which would make it give eighteen pounds more sugar per ton—a difference that is very large. It is perhaps the better way, however, to compare these two by means of samples taken at the large mill, as we have the analyses for this, and large samples, such as these were, are undoubtedly better than those from the small mill.

The samples of Tibbo Merd, taken November 11th, were both of sufficient size to be ground by the large mill, one consisting of one load of cane and the other of two loads. The analysis of November 12th of the Purple cane consists of more than a half day's run of the large mill on the cane growing just west of the experiment plats. The Tibbo Merd grown from stubble seed shows a purity of 82.9 and sucrose of 13.7; that grown from plant cane seed had a sucrose content of 12.5 and a purity of 79.6. The average of two is 13.1 per cent. of sucrose and purity 81.4. The sucrose of the Purple cane was 13.0 with a purity of 84.4, a little lower sucrose but a purity sufficiently higher to make it a better cane, though not so much better but that it was considered the part of wisdom to keep all the Tibbo Merd for seed. The physical characteristics of the Tibbo Merd were all that could be desired the present year, the stalks being tall, large in diameter, very heavy, and not badly tangled as it was the first year of its growth here. It is to be regretted that no actual weights were secured, but this was impossible as the cane was kept for seed. During next grinding there will be such an amount of this cane that quite a run on it can be made at the mill and a strict comparison with the Purple cane secured. We have one way of comparing the amount of this cane with the plantation variety though it cannot be considered very satisfactory. It is by comparing the number of canes grown per linear foot of the ground planted. This will not, of course, give the weight, but will allow us to form an approximate estimate. Strangely enough it happens that these two varieties give exactly the same results in this respect, one plat of the Purple giving 2.8 canes per foot, the other 2.6, while the cane grown from the stubble seed of the Tibbo Merd gave 2.6 and that grown from plant cane seed 2.8.

Some of the points of value other than sucrose content, which must be considered in introducing new varieties, have been studied, in part, this year. It was thought at the beginning of the year that it would be an important thing to observe the relative time at which the different varieties stopped producing new canes, as this might give a means of determining what variety would mature the earlier, it being supposed that the cane which ceased producing additional canes the earliest, other things being equal, would have more time for the elaboration of sugar. The observations on this point, however, have not this year given the information desired. It appears from the observations made that the weather has had more to do with the time the last canes appear than any other factor. This season was, however, distinctively a wet one after the first of June, and it may be that the continued producing of young canes was not a normal condition, and were the season dryer the cane might more truly show its inherent producing qualities. One reason for supposing that this might be the case is because the mother canes stopped appearing at different times. By mother canes is meant the cane from which the suckers grew, not the seed from which these so-called mother canes were produced. The last mother canes of Pupuha from plant cane seed appeared during the week ending May 15th, and those from the stubble cane seed the week ending May 22d. The last mother canes of the Uwala came during the week ending May 22d, both from the stubble and plant cane seed; those of the Tibbo Merd from plant cane seed during the week ending May 8th, and those from the stubble cane seed the week ending May 15th, while the mother canes from the two plats of Purple with which the experiment plats were compared appeared during the weeks ending respectively. May 1st and and 8th. Of the imported varieties, then, the Tibbo Merd got the earliest start in this particular, while none of them were quite as early as the Purple, though the Tibbo Merd was nearly so.

The relative number of canes growing per foot, and those started but dying before reaching maturity, gives us some very interesting data and the results can be found in tabulated form in an appended table. We will only discuss here the results on those varieties which have been kept for further experimentation.

The plat of Pupuha from plant cane seed was one hundred and twenty feet long and produced three hundred and six canes which reached maturity, or 2.6 canes per foot. There were, however, at one time five hundred and seventeen canes in this plat, showing that two hundred and eleven canes came to naught after having once started. This is 1.8 canes per foot, an enormous waste of energy. The cane of this same variety grown from stubble seed matured 3.1 canes per foot, and lost 1.5, a little better showing, but still bad enough. The canes reaching maturity were also quite small as compared with most of the other varieties. The results this year with Pupuha have been disappointing as it before has been one of the most promising varieties, not only in sugar content but also in its ability to mature canes once started. There seemed to be but little difference between this variety and the Tibbo Merd as to the time of maturing, the analyses of the two showing approximately the same purities for the same dates; it did not, however, mature as early as the Purple, the first analysis of it being considerably lower in both sucrose and purity, though the last one showed a marked improvement, almost equaling it in both qualities. The number of suckers to one mother cane was 0.7 for the cane from the plant seed, and 0.5 for that grown from stubble.

The plat of Uwala from plant seed was 227 feet long and gave 332 canes that reached maturity, an average of 1.5 canes per foot. This plat lost 110 canes, an average of 0.5 of a cane per foot, which shows a large waste of energy, though not nearly so great as with the Pupuha. The plat from stubble seed of this variety produced 2.2 canes per foot, and lost 0.3 of a cane for the same distance, a still better showing than the cane of this same variety from plant cane seed. Both subdivisions of this plat produced their last mother canes during the week ending May 22d. a little later date than the average of the Pupuha. This cane also seemed to mature a little later than the other imported varieties, though the last analysis indicated a rapid elaboration of sugar as going on, the purity being relatively higher than in the other plats at the same time, and almost as good as the Purple. This would seem to indicate that the Uwala was not as thoroughly acclimated as the other varieties, or that it is naturally a later maturing cane. In either case, if it continues in its present characteristics, it might prove a valuable variety to plant for grinding the latter part of the season. Of the amount of cane produced by this variety, as compared with Pupuha, we can judge by comparing the relative length of the two plats. They were both originally derived from three canes each, and all the cane from each has been planted, except that taken for analysis, the amount of this being nearly the same. The united length of the two plats of Uwala is 273 feet, and of the Pupuha 155 feet, an amount of ground planted by the former almost double that by the latter. This shows the Uwala to be much the more prolific cane of the two. In the plats planted for next year this same relation is maintained, the Uwala planting proportionately much more ground. There were not as many canes per linear foot in the plat of Uwala as in that of the Pupuha, but they were much taller and heavier.

The Tibbo Merd, the other of the three varieties selected for further trial, has almost passed beyond the experimental stage. It has been so uniformly good ever since it has been here that it was decided to plant all of this variety we had, amounting to 3.6 acres, and secure for next year a sufficient amount of cane for a run with the large mill. A part of one row of this variety was also measured for the purpose of making the same observations as were done with the smaller plats. This distance was, for both the cane grown from plant and stubble seed, 116 feet. From the plant cane seed there were in this distance 200 mother canes, from which there started 219 suckers, 94 of which never reached maturity, leaving a total of 325 canes fit for grinding, an average of 2.8 canes per foot. The number of canes dying per foot was 0.8 of one. The plat from stubble seed gave 300 canes, 147 of which were mother stalks. This makes an average of 2.6 canes per foot fit for the mill, while there were 0.9 of a cane per foot that started and did not reach maturity. In number of canes per foot the Tibbo Merd was behind the Pupuha and ahead of the Uwala. The Tibbo Merd, however, like the Uwala, was a much larger cane than the Pupuha, so a greater weight of cane was grown on the same amount of ground. The last mother canes were produced during the weeks ending, respectively, for the cane from plant and stubble seed, May 8th and 15th, a week earlier than the average of the other imported canes, and only a week later than the average of the Purple. It did not mature as early as the Purple, nor did it ever seem to be quite as good, though it was clearly ahead of the other varieties in these respects. It was the only variety that matured as much as one sucker to one mother stalk, the cane from stubble seed doing just this, while that from the plant seed gave only 0.6 of one sucker per one mother stalk. The Uwala was its nearest competitor in this, giving, respectively, for the plant and stubble seed, 0.7 and 0.6 of a sucker to one mother stalk. The Purple cane, with which the plats were compared in other particulars, did not, either, reach this number, giving for each of the two plats 0.6 of a sucker to each mother cane. The Tibbo Merd also had an average of three tenths of one cane less die per foot than the Purple. Summarizing its qualities we can see that it excelled all, foreign and domestic, in the number of suckers produced, excelled the Uwala and the Pupuha in sucrose content, and the Pupuha in the size of stalk, and both in the time of maturity, both of mother canes and in final ripening, and excelled all but the Uwala in having less canes die, and this variety in having more canes to the foot; equaled the Purple in this last particular, and was excelled by the Pupuha in it. It equaled the Purple in size of stalk, and was surpassed by the Purple slightly in quality of juice and in time of maturity, and by the Uwala in having less canes die. It was, then, a good all-around cane, so slightly inferior to the Purple that it would not do to decide which was the better by the one year's experience. In fact, taking into account its previous record here, it is a somewhat more desirable cane.

THE NUMBER OF CANES GROWN AND THEIR SUCKERS.

While the number of canes growing on a given length of row, and their suckers, have already been mentioned in connection with the varieties, the subject and the data we have on it are of sufficient concern to justify further discussion.

All the plats, except the Tibbo Merd, Bamboo and the Purple, were planted with two canes in the row. These three were planted by the regular plantation labor under the direction of the field management, and while the canes were not counted as they were being planted, it is safe to infer from the usual practice that at least three canes were planted per row. These three plats were also planted a little earlier in the fall than the others, so they had the advantage of a little better growth in the fall, if there is any advantage in it. We will, however, ignore the effect that this may have had, and proceed to a direct comparison. I will, in this discussion, limit myself also to those plats which were kept for further experimentation, and to the Purple. The most interesting results are those secured from the seed-selection plats of rich and poor canes, as compared with the ordinary planting by the field people. The estimate usually made here for seed cane is that it takes four and one-half tons to plant one acre, planting three canes to the row. On this basis, if only two canes were planted, it would take but three tons to plant one acre, a difference of one and one-half tons per acre. This would, were it found the latter number was sufficient, on a planting of 500 acres save 900 tons of cane. The two plats in which two canes per row were planted gave each 3.2 canes per foot, and one and four-tenths and one and five-tenths suckers per mother stalks, respectively, while the canes that once started and then came to naught, in one case amounted to but five one-hundredths of one cane per foot, and in the other to three one-hundredths, an amount that is easily within the limit of error in counting the number of canes there were in the plat. The cane planted by the plantation people, and having not less than three canes planted per row, gave, in one case, 2.8 canes per foot at time of maturity, and in the other 2.6, both plats having 0.6 of a sucker to one mother cane. There were also in the one case 1.3 canes started that died before reaching maturity, and in the other 1.0 to each linear foot of ground, simply an enormous waste of energy. The advantage, then, this year is entirely with the cane that was planted with but two canes per row, for the material produced certainly was as large, and the quality better, if there was any difference in this last respect. There were five-tenths of a cane more grown per foot, and each mother cane had more than double the number of suckers and, perhaps of more value than all else, there was no waste of energy in starting canes that came to naught.

A most unexpected result to me in connection with this work was the very small number of suckers to a mother cane. I have always been told that from two to three suckers to one mother cane was the usual number, and in an actual count of foreign varieties in 1890, I found in some cases as high as four to a stalk, but this year the highest number is found to be 1.5, and by far the greater majority of the plats, both of the imported and native canes, have less than one sucker to a mother stalk. It cannot be said, either, that this was due to a poor crop, for none of these plats yielded less than at the rate of twenty-five tons to the acre. Whether it was due in part to the season or not I cannot say, but the fact remains that the suckering was small, and I can assign no other reason for it than that there was too much seed used. A great number of mother stalks were produced and, there being a limit to the number of canes possible to grow, these being the fittest, survived the great number of suckers which died.

THE RELATIVE VALUE OF STUBBLE AND PLANT CANE FOR SEED.

The results on relative excellence of stubble and plant cane for seed are so contradictory that no conclusions can be drawn at all. There were no trials of it made with the Purple, and so the results are of still less value. Three of the six plats in which trials were made gave the progeny of the plant cane better physical qualities and three were in favor of stubble. So it was in the matter of sucrose. The results on this subject are undoubtedly of value in forming a link in the chain of evidence which I believe it will take years to complete, and would seem to indicate that the question was largely one of varieties, and what might be true of one would not be of another. The investigation is one that it is worth while to continue, for it will entail no great amount of work, and results of some value at least will be attained. At present I do not feel justified, from the data at hand, to make any extended remarks, but will tabulate the results, and when enough are secured to draw a conclusion I will endeavor to do so. *(Concluded next Number.)*