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There has been no change in the price of sugar in New York for the month past—$3\frac{3}{16}$ being the last quotation.

THE value of sugar imported into the United States during the year 1893 is stated to have been $124,000,000, the largest on record, with an annual consumption of sixty-five pounds to each inhabitant.

Copious showers have fallen in every district of the group during the past month, and in some localities the rainfall has been exceptionally heavy since the first of January. The prospect is certainly fair for good crops this year.

A Jamaica sugar planter, in the *Louisiana Planter*, states that his irrigated plant cane yields $2\frac{1}{2}$ to 3 tons per acre, and rattoons yield $1\frac{1}{2}$ to $2\frac{1}{2}$ tons per acre. To secure this yield the land has to be well manured.

The year 1893 was a very prosperous one for the sugar plantations of Hawaii. The total exports for the year amounted to 165,000 short tons—the largest crop that has ever been recorded for Hawaii. The increase is to be credited largely to the three new plantations, which turned out over 25,000 tons for the year 1893, and give promise of about the same crop for the current year.

The three beet sugar factories in California turned out in 1893 the following yields of raw sugar:

Alvarado	2250	tons.
Chino	7550	"
Watsonville	7769	"

This is a large advance over the previous year's crops. The present year will probably show a total of nearly or quite 20,000 tons for California.

CUT WORM REMEDY.—If cultivators who are suffering from the depredations of the cut worm will mix one heaping teaspoonful of Paris green with one-half peck of coarse wheat bran (dry), and at evening apply a small quantity by the side of plants to be protected, they will find it a certain and prompt remedy. The bran need not be put on the plant, consequently no danger of burning. The worms will leave the plant to eat the bran, and a single application will destroy all. Additional applications may have to be made if new broods hatch. This will probably be an effectual remedy for the brown night beetles.

As a cane sugar-producing country, Louisiana ranks third of all the countries of the world, being exceeded only by Cuba and Java. The yield of Louisiana last year was 226,000 tons —the largest crop on record—worth to the producer fully $20,000,000, and, with other products, the sugar district of the State yields not less than $30,000,000 annually, making an interstate trade of $50,000,000 or more. Properly fostered, the culture of cane sugar in the southern portion of the Gulf States will, ere long, exceed Java and rival Cuba.—*Memphis Appeal.*

TOBACCO.—Lancaster county, Pa., still stands at the head of all the tobacco growing counties in the United States, with her 19,217,800 pounds grown in the season of 1889. Four other counties—Christian and Henderson in Kentucky, Dane in Wisconsin, and Pittsylvania county in Virginia—grow over 10,000,000 pounds each. There are seventeen other counties that grow from 5,000,000 to 10,000,000 pounds each. Lancaster county's product was sold at exceedingly low prices, and even then produced the growers $1,349,090.

We call the attention of persons interested in handling and packing fruit to the closing paragraphs of the article on Oranges, on page 118, relating to this matter. The business is now conducted far differently from what was formerly the mode. and bananas, oranges, lemons, and other tropical and choice fruits are handled and boxed with great care, the result being that fruit is carried from two to five thousand miles in better condition than it formerly was in as many hundreds. It is well to keep abreast of the times in the improvements that are being made.

The gratifying discovery that seven of the nine members of the Senate Committee on Foreign Relations are for annexation, leaves little disposition on the part of the friends of Hawaii to criticise minor points of inconsistency and ambiguity in Senator Morgan's report. He has put plainly before the world the fact that American sentiment is overwhelmingly in favor of the annexation of the Hawaiian Islands, and that annexation is bound to come.

The *Louisiana Planter* says very truthfully of the present partizan legislation in Congress, which disregards the sacredness of national bonds and national honor:—

"There has not been during the last half century such a complete disregard of the rights of American labor, of the rights of capital invested under our laws and of all the ties that have thus far bound the nation together in its vast industrial and economic progress. The country thus cast loose from its moorings has seemed to have drifted away from the path of progress and to have fallen under a sort of communistic control, the leaders in the movement being determined to tax the rich and exempt the poor.

As proof of the justice of Mr. Bovell's charges against the sugar planters in Barbados of neglecting the condition of their canes, the *Sentry* of St. Vincent instances the case of Mr. Alexander Porter of that island, who imported 9,000 'Caledonian Queen' plants from Barbados, which upon arrival were found to be riddled with disease, "and orders were at once given for them to be carried out to sea and thrown

overboard." In ordering the plants, Mr. Porter had asked that the greatest care should be taken to send only healthy ones; and as a matter of fact they were obtained from a district where, it was believed, the disease had not obtained a footing, and were guaranteed sound. All of which would go to prove that certain planters in Barbados fail to recognize the symptoms of disease in their canes.—*Demerara Argosy.*

The following statement of the cost of cultivating sugar in Louisiana is taken from one of our exchanges. It goes to show that small farmers, when favorably located, may there obtain fair remuneration for their work. The cost of harvesting, as given below, is less than most cane growers would find it, unless located near a railway:

Rent of 12 acres of land at $5 per acre	$ 60 00
Cost of seed cane to plant, $15 per acre	180 00
Preparing the land to plant, $2 per acre	24 00
Cost of planting cane & covering same, $3 per acre	36 00
Hoeing cane during growth, $3 per acre	36 00
Cultivating " " " "	36 00
Harvesting and delivery on car at $1.50 a ton per acre	450 00
Total	$ 822 00
Average yield of 25 tons to the acre at $4.25 per ton per acre	1,275 00
Less cost of cultivation and marketing per acre	822 00
Net profit on 12 acres	$ 453 00

The engagement made between Prof. Koebele and the Hawaiian Government and the Planters' Association meets general approval. He has visited the four principal islands of our group and ascertained what insects are needed here to exterminate the various pests found, and has now gone to Australia to procure such as he knows will be beneficial here. The insects he has procured for California have no doubt served a good purpose, and rid many of the orchards there of the pests which threatened to destroy them altogether; and it is not too much to hope that he will accomplish as much good here. One thing is very certain that the ladybugs which he sent here to combat the cottony scale did their work very thoroughly, and though some few can yet be found here and there, their enemy is sure to find and destroy them.

We incline to think that the protection Democrats will frame a tariff bill which will pass both Houses, after some months consideration, the basis of which shall be to give all manufacturers (sugar refiners included) a protection against foreign manufacturers, equivalent at least to the difference in labor at home and abroad. Such a protection will be granted for the express purpose of giving manufacturers no excuse for lowering wages. It is said that Senator MacPherson of the Finance Committee is at work upon such a bill, and that it is likely to be received with much more favor by the country than the present mongrel bill which has passed the House, and is now being considered in the Senate Finance Committee. If such a bill is passed, it is not likely that the sugar refiners will be excepted from its operation, on account of any personal spites against refiners. Petty grievances will scarcely be allowed to direct legislation.—*Willet and Gray's Circular, Feb. 15.*

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THE HAWAIIAN RECIPROCITY TREATY.

The statement brought by the mail of the 16th inst. is no doubt correct, that an amendment to the tariff bill had been reported to the Senate, instructing the President "to immediately notify the Hawaiian Government that the United States will terminate in twelve months the treaty with Hawaii made in 1875."

The mere fact that such an amendment has been inserted in the bill by no means insures its acceptance by the Senate and the House of Representatives. However, as such a change, if carried into effect, would add a considerable sum to the revenue of the Government, a strong argument is furnished in favor of its adoption to a class of politicians who care only for increased income, regardless of other benefits.

Even if approved, and if the tariff bill should become a law, any notice to terminate the reciprocity treaty cannot take effect under twelve months from the date of the termination of the treaty. At least this is the way in which it is understood here. The clause relating to this reads as follows, the italics being ours:

"This convention shall remain in force for seven years from the date at which it may come into operation; and further, until the expiration of twelve months after either of the contracting parties shall give notice to the other of its wish to terminate the same, *each of the high contracting parties being at liberty to give such notice to the other, at the end of said term of seven years, or at any time thereafter.*"

This would place the earliest date for its termination, November, 1887, and both parties to the convention are barred by its terms from giving earlier notice. It will also allow ample time for the negotiation of a new treaty, if such is desired, either by establishing a protectorate over the Islands, with a perpetual cession of Pearl Harbor for military and naval purposes, or any other provisions of cession that may be decided on.

Another point to be considered is the fact that the treaty of 1887 differs materially from that of 1875, in that it contains an additional article relative to the cession of Pearl Harbor, conveying its surrender to the United States, so long as the treaty remains in force. It may be contended that this made it practically a new treaty, as it certainly conveyed a new and most extraordinary concession of what will yet become the largest and finest harbor in the Pacific.

It may therefore be maintained that the treaty of 1887 was a new treaty, inasmuch as its scope was greatly enlarged and required anew the sanction of Congress to approve and endorse the extraordinary change made in it. If this point be correct, then the notice in tariff bill does not apply to the treaty now in force, but solely to that of 1875, which terminated when its successor was promulgated.

It is now generally believed that the bar at the entrance of Pearl Harbor consists of hardened sand mixed with loose coral, similar to what existed at the entrance of Honolulu harbor. Less than two years before the entrance to our harbor was deepened to thirty feet, and with comparatively little labor or cost, a surveyor reported that hard coral rock was found in various parts of the bar, which would certainly require blasting in deepening the channel. Nothing of the kind, however, was found, and the whole work of deepening the channel was done at a cost of less than two hundred thousand dollars including the dredger.

It is not at all unlikely that a similar condition will be found to exist at the entrance of Pearl Harbor, and that the work of depening that bar can be as readily accomplished. Actual trial alone can determine whether this be the case or not.

RAISING CANE FROM SEEDS.

In view of inquiries which have already been made, and will naturally arise as this matter comes in a practical form before our cane planters, we reproduce a description of Mr. Daruty de Grandpre's method of obtaining and planting the seeds of cane:

"After the cane has arrowed, and is in full bloom, a piece of thin muslin is taken and thrown over the flower and tied to the stem, so as to prevent the loss, and catch every spikelet that may fall from the flower. This is left there until the flower is well matured; then the panicles are gathered, and as the seed does not separate easily from the glumes, and cannot be discerned by the naked sight, all the material is rubbed off the panicle, and the muslin first mentioned. Boxes are prepared with very small holes perforated in the bottom, and filled with loamy soil. The sowing is made, and placed in sufficient shelter, but the material is so light that care is taken, only using the hand to press it a little, but no soil must be used to cover it, for the seeds are so delicate that if covered they cannot penetrate through to the surface, and to water them the boxes are dipped in water until sufficient moisture has reached the surface of the soil. Apparently not more than two or three spikelets among a hundred are fertile. The seed takes from a week to a fortnight to germinate, and must be sown freshly gathered, for the vitality is very fugacious. During the first three months the plants are very slow, and resemble very much buffalo grass, after which they grow more rapidly, and can be planted in the ground in six or seven months."

In order to show the unanimity of the results obtained by experiments in various parts of the world, we add the following further extract from Mr. Daruty de Grandpre:

"The canes thus produced are very thin, but by replanting these stalks in the present way the result is very good—the cane large, healthy, and of different variety. The chief duties of the future will be raising, testing, and selecting the new cane stocks, with the object of obtaining varieties superior to any now in cultivation; consequently, by chemically analysing, and with a careful growth, side by side, will come to a conclusion."—*N. W. S Agricultural Gazette.*

SUGAR PLANTATIONS OF HAWAII.

NAMES OF PLANTATIONS.	MANAGERS.	AGENTS.
Ewa Plantation Co., Oahu.	W. J. Lowrie.	Castle & Cooke.
Waianae Plant. Co., "	A. Ahrens.	C. O. Berger.
Waialua Plantation, "	R. Halstead.	Castle & Cooke.
Kahuku Plantation, "	W. H. G. Arnemann.	M. S. Grinbaum & Co.
Laie Plantation, "	M. Noall.	J. T. Waterhouse.
Heeia Ag. Co., Ltd., "	F. Buchholz.	M. S. Grinbaum & Co.
Waimanalo Plant., "	G. C. Chalmers.	W. G. Irwin & Co.
Pioneer Mill, Lahaina, Maui.	C. F. Horner.	H. Hackfeld & Co.
Olowalu Sugar Co., "	A. Hannberg.	W. G. Irwin & Co.
Waihee Sugar Co., "	C. M. Walton.	C. Brewer & Co.
Wailuku Sugar Co., "	C. B. Wells.	C. Brewer & Co.
Haw. Com. & Sugar Co., "	H. Center.	H. Hackfeld & Co.
Paia Plantation, "	J. W. Colville.	Castle & Cooke.
Haiku Sugar Co. "	J. W. Colville.	Castle & Cooke.
Hana Plantation Co., "	F. S. Gjerdrum.	M. S. Grinbaum & Co.
Reciprocity Sugar Co., "	W. von Gravemeyer.	W. G. Irwin & Co.
Kipahulu Sugar Co., "	O. Unna.	H. Hackfeld & Co.
W. Y. Horner, Lahaina. "	W. Y. Horner.	H. Hackfeld & Co.
Waikapu Sugar Co., "	W. H. Cornwell.	W. G. Irwin & Co.
Overend Plantation, Hawaii.	Capt. Ahlborn.	H. Hackfeld & Co.
Paauhau Plant. Co., "	Andrew Moore.	W. G. Irwin & Co.
Hamakua Plant. Co. "	A. Lidgate.	T. H. Davies & Co.
Hamakua Mill Co. "	J. R. Renton.	T. H. Davies & Co.
Kukaiau Mill Co. "	J. R. Renton.	T. H. Davies & Co.
Kukaiau Plant. Co. "	J. M. Horner.	H. Hackfeld & Co.
Ookala Sugar Co. "	W. G. Walker.	W. G. Irwin & Co.
Laupahoehoe Sug. Co. "	C. McLennan.	T. H. Davies & Co.
Hakalau Plant. Co. "	Geo. Ross.	W. G. Irwin & Co.
Honomu Sugar Co. "	Wm. Kinney.	C. Brewer & Co.
Pepeekeo Sugar Co. "	Hy. Deacon.	T. H. Davies & Co.
Onomea Sugar Co. "	W. W. Goodale.	C. Brewer & Co.
Hilo Sugar Co. "	J. A. Scott.	W. G. Irwin & Co.
Waiakea Mill Co. "	C. C. Kennedy.	T. H. Davies & Co.
Hawaiian Ag. Co. "	E. W. Fuller.	C. Brewer & Co.
Hutchinson S. P. Co. "	G. C. Hewitt.	W. G. Irwin & Co.
Hawi Mill, "	John Hind.	J. T. Waterhouse.
Beecroft Plantation "	H. R. Bryant.	T. H. Davies & Co.
Union Mill Co. "	J. Renton.	T. H. Davies & Co.
Puehuehu Plantation "	R. Wallace.	T. H. Davies & Co.
Kohala Sugar Co. "	G. F. Renton.	Castle & Cooke.
Dr. J. Wight, Halawa "	T. S. Kay.	J. T. Waterhouse.
Niulii Mill, "	Robt. Hall.	T. H. Davies & Co.
Pacific Sugar Mill, "	D. Forbes.	F. A. Schaefer & Co.
Honokaa Sugar Co. "	J. Watt.	F. A. Schaefer & Co.
Kilauea Sugar Co., Kauai	G. R. Ewart.	W. G. Irwin & Co.
Makee Sugar Co. "	W. Blaidsdell.	C. Brew.r & Co.
Hanamaulu Sugar Plant., Kauai.	A. S. Wilcox.	H. Hackfeld & Co.
Lihue Plant. Co. "	C. Wolters.	H. Hackfeld & Co.
Koloa Sugar Co. "	A. Cropp.	H. Hackfeld & Co.
Eleele Plant. "	A. Dreier.	F. A. Schaefer & Co.
Hawaiian Sugar Co. "	H. Morrison.	W. G. Irwin & Co.
Gay & Robinson, "	Gay & Robinson.	J. T. Waterhouse.
J. K. Smith & Co. "	J. K. Smith.	Castle & Cooke.
Waimea Sugar Mill Co. "	E. E. Conant.	F. A. Schaefer & Co.
Kekaha Sugar Co. "	O. Isenberg.	H. Hackfeld & Co.
Meier and Kruse, "	H. P. Faye.	H. Hackfeld & Co.
Hanamaulu Mill "	C. Wolters.	H. Hackfeld & Co.
H. P. Faye & Co. "	H. P. Faye.	H. Hackfeld & Co.
Grove Farm, "	G. N. Wilcox.	H. Hackfeld & Co.

CORRESPONDENCE AND SELECTIONS.

FACTS CONCERNING THE HAWAIIAN OR SANDWICH ISLANDS.

THE Editor of the PLANTERS' MONTHLY is in receipt of frequent inquiries from strangers, asking for information regarding these islands, their extent, capabilities and products. The following statement has been prepared by him with a view to answer such correspondents as briefly as possible. Further information may be gathered from local publications, the *Tourists' Guide, Thrum's Almanac,* the *Hawaiian Gazette,* and other papers, which are always procurable at publishers' rates, when applied for by mail.

The Hawaiian Islands were discovered by Capt. James Cook, in 1778. There are eight principal inhabited islands in the group, with about 12 islets, including the chain extending northwesterly to Ocean Island, 1,200 miles from Honolulu, some of the latter being valuable for their phosphate guano which is now being taken from them.

The area of the eight larger and inhabited islands is 6,640 square miles, or 1,160 less than that of Massachusetts, and about 580 more than Connecticut and Rhode Island combined.

Hawaii was first recognized as an independent nation in 1843,—fifty years ago—and has since continued such.

The group has several safe harbors, the principal one being Honolulu, the entrance to which has thirty feet on the bar, and the harbor forty feet depth,—capable of receiving and docking the largest merchant vessels cruising in this ocean.

Honolulu is 2,100 miles from San Francisco, 3,440 miles to Yokohama, Japan, and 3,810 to Auckland, N. Z. It is the capital city, with a population of about 25,000, two-fifths of whom are native Hawaiians. The village and port of Hilo, on the east side of Hawaii, is the second in size, with a population of about 2,500. Both Honolulu and Hilo possess good hotels and stores, and travelers can generally find every comfort and all the necessaries obtainable in other countries.

The native population live in frame houses, and dress for the most part in modern American and European clothes. The dress of the women is the old style "Mother Hubbard gown," worn without a belt. A half-clad native is rarely seen, unless while bathing in the sea or ponds.

Native Hawaiians are among the kindest and most peaceable of the Pacific Islanders, and they rarely show a disposition to harm foreigners resident among them. As musicians they excel, as is shown by their fine instrumental bands, while their singing is conceded to be among the sweetest and most melodious of any Polynesians.

The temperature of the Islands varies from an annual average of 74 deg. near the seashore, and 64 deg. on the highlands, to 32 deg. on the summits of the highest mountains, which are often snow-capped in winter. The average daily variation during each day of the year is from ten to twelve degrees F.

The annual rainfall varies largely in different localities—from 20 inches each year near the sea, on the lee side, to 150 inches in the windward or rainy sections.

The population is now (March, 1894,) estimated at 100,000, made up as follows:

Native Hawaiians	34,436
Half-whites	7,300
Chinese	15,000
Japanese	21,600
Americans and Europeans and their descendants	21,708
	100,044

The number of votes cast at the last general election in 1892, was 10,493, of which, as near as can be ascertained, 6,454 were deposited by native Hawaiians, and 4,039 by foreign-born and their descendants. The number of native voters is each year decreasing, while that of half-whites and foreigners is increasing.

Chinese and Japanese are not allowed to vote.

All male residents of American or European birth or descent, of twenty years age, are permitted to become Hawaiian citizens, by taking the oath of allegiance to the Hawaiian government and to obey the constitution and laws of

the country. The right to vote is qualified by residence of from one to three years, and ability to read and write the Hawaiian or English language.

GOVERNMENT STATISTICS.

The Government is fully organized with efficient executive and judiciary branches, the latter comprising supreme, circuit and district courts and judges, with a strong constabulary on each island, capable of preserving the peace.

The men who took office at the time of the revolution in January, 1893, were not adventurers. Associate Justice Dole of the Supreme Court, who left the bench to become President of the new Government, was one of our most respected judges, and his colleagues are men of standing in the commercial world, who personally have nothing to gain, but much to lose, through giving up their time to public affairs. Their government has been the best in twenty-five years, a fact readily admitted by Minister Blount, who came from Washington if anything prejudiced against them, but after a thorough investigation went away quite satisfied that the public business was being honestly and wisely conducted. This group will probably be known hereafter as the "COMMONWEALTH OF HAWAII."

The public and private schools number 168, with 260 teachers and 10,712 pupils. Education is compulsory, and very few of the Hawaiian population are unable to read and write. The rising generation of school children of all nationalities are all able to speak and read English.

The annual revenue of the government from taxes, duties and all other sources, except loans, is $1,625,000. The latest treasury exhibits show a cash surplus on hand of nearly $400,000. The number of tax-payers is about 60,000.

The public debt, according to the last official statement, was about $3,400,000, which sum includes the Postal Savings Bank deposits, $703,616. Of the entire debt, less than one million dollars is held in England, the balance owing chiefly in Hawaii and America. Legal interest is nine per cent. per annum, government bonds are six per cent. with interest payable semi-annually.

The currency consists of one million dollars, in silver

dollars, halves, quarters and dimes coined for Hawaii at the United States Mint in San Francisco. The gold currency consists wholly of United States coins, no other gold coins being current. The only paper currency are government treasury notes, of ten, twenty, fifty, $100, and $500, payable in currency. American gold notes are current also in Hawaii.

NATIONAL AND LAND STATISTICS.

The national property—that belonging to the government—is valued in the last official census returns, at $5,797,576. This is believed to be a very low estimate, especially of its real estate, and it is probably worth fully ten millions.

The crown lands, not included in the previous statement, comprising about one million acres of the best soil in the group, which is now government property, are probably worth at least five millions, with a prospective annual income of between one and two hundred thousand dollars.

The real and personal taxable property is assessed for taxation purposes at nearly forty millions.

Most of the real estate being held in large tracts, by the government, the crown lands, the Kamehameha and other estates—much of it under long leases—land is not readily acquired either by purchase or lease. It is consequently difficult to purchase large tracts of land here, except at forced sales, which occasionally occur.

The census of 1890 reported only 4,695 real estate owners. Land titles in Hawaii are among the best, being based on awards made by a Land Commission, whose decision was final. Aliens hold land on the same terms as natives.

The total area of land on these islands has been estimated between four and five million acres, half of which may be termed arable and pasture land. On Hawaii much of the stony or lava *(aa)* land is suitable for growing oranges, coffee and small fruits, though it is worked with more difficulty than land that can be plowed.

Homestead allotments can be secured on each of the islands, but not to the extent as in the United States. They are limited to a small number of acres each.

Paupers are not allowed to land, and such emigrants should seek other countries than Hawaii.

INDUSTRIAL STATISTICS.

Though the American population here is considerable, the interests of the United States are much greater in proportion; in fact they overshadow all other interests. The American capital invested is about $30,000,000, against $5,000,000 British and $2,000,000 by Germans and others. The exports are almost exclusively to the United States, and the imports from the same country amount to more than three-fourths of the entire imports.

This capital is invested mainly in the sugar plantations, the first of which was established about fifty years ago. The sugar crop of 1893 was about 150,000 tons, which at $70 a ton, represents upwards of ten million dollars. All the sugar is sent to the United States, under contract with the United States sugar trust, of which Claus Spreckels is the San Francisco agent. There is no trust in the islands, and the contracts were made with the individual planters, for five years, commencing January 1st, 1893, and under these the price paid for Hawaiian sugar, delivered in San Francisco, is fixed by the price of Cuban sugar in New York on the same day. The sugar is shipped in sailing vessels as well as in the steamers. More than one-third of the whole amount is carried in Claus Spreckels' ships. All the plantations are on a large scale, and are operated mostly by incorporated companies, but in these there are a great number of small shareholders.

The sugar crops of the past three years were: for 1890, 146,000; 1891, 122,000 and for 1893, 152,000 tons. With increased water supply, the yield may possibly be increased to 200,000 tons annually.

The rice industry is mostly in the hands of Chinese, and the annual crop is estimated at 30,000,000 pounds, of which about ten millions are exported to the United States, and the balance is consumed by the resident Chinese and Japanese population. This crop may be largely increased in the future.

The coffee industry is in its infancy, but it is believed to be one of the most promising. The number of acres now

being planted with coffee has been estimated at 5,000, scattered over the group in various localities. The plants are, however, mostly young, and no large crops have as yet been taken off. The quality of Hawaiian coffee is equal to the best Java, and where it has one or more years' age is not surpassed by the best "old Java" or Mocha. The possibilities of coffee cultivation are very large, as there are extensive tracts on each of the islands adapted to its growth.

Orange culture affords a good opening, as this fruit will thrive in almost any part of the group. But, like coffee, it takes several years to reach the bearing period, and can only be engaged in by those having ample means. Oranges are, however, quite profitable for supplying the local market, for which the present supply is inadequate. No finer fruit is grown in any country than our Sandwich Island oranges, which are generally sweet, juicy and extremely healthy, when allowed to ripen on the tree.

Grains, such as wheat, oats, barley, &c., as well as corn, can be grown on the uplands, but not to such perfection or profit as in other countries, and for this reason their cultivation is not much attended to.

For minor tropical fruits, Hawaii can hold its own against the world. The opening for pineapples, for instance, surpasses Bermuda, as pines of the smooth skin cayenne variety, weighing ten pounds, are not uncommon here, and they are a sure and paying crop, and always in demand.

All the tropical fruits grow here abundantly. Among them, bananas, oranges, avocado pears, peaches, tamarinds, limes, lemons, citrons, pineapples, guavas, strawberries, raspberries, ohelo berries, grapes, mountain apples, plums, etc.

Nearly all kinds of garden vegetables are also raised here, such as potatoes, beets, carrots, onions, peas, beans, corn, melons, cabbage, cauliflower, squashes and tomatoes. Their cultivation is carried on chiefly by the Chinese, who are very expert in this line.

Flowers grow here in great perfection and abundance, such as roses, dahlias, carnations, chrysanthemums, violets, pansies, tulips and other bulbs, with almost every species of flowering vines.

As soon as the Government is reorganized, it is the purpose to survey and offer for sale to settlers such portions of the public lands as may be best adapted for immigrants and settlers. Owing to the mild climate which permits cultivation of fruits and other crops to grow and ripen all the year round, ten acres here will support a small family more comfortably than one hundred acres will in the United States. The extent of land available for homesteads has not been ascertained, but it will probably be sufficient to locate several thousand families, on small awards.

NOTES FOR TOURISTS.

The wonderful volcano of Kilauea, on the island of Hawaii, is the great attraction of visitors. It is the only volcano in the world that is constantly in action, and that can be safely approached at all times to the very edge of the precipice which encloses the boiling lava. To reach Kilauea necessitates a passage of sixty hours from Honolulu in a fine steamer to Hilo or Punaluu, then a ride of thirty miles in coaches takes visitors to a fine hotel, which overlooks the molten lava lake. It is a sight that will repay the effort and expense incurred ten times over, and one that will never be forgotten.

The scenery everywhere met is very charming, especially in the vallies and through the forests which abound throughout the group. Carriages or other wheeled vehicles are to be had in Honolulu, and on each of the islands; or, if persons prefer horseback exercise, there are plenty of safe saddle horses always to be hired.

Churches and schools abound everywhere, and in this respect no new country can surpass Hawaii in the number and quality. In Honolulu reading rooms are always open to visitors, who take the usual course to obtain access. Papers and magazines are there on file from every civilized country.

COMMERCIAL STATISTICS.

The average annual exports of Hawaii for the past few years have amounted to between eight and ten million dollars.

The foreign importations average about six millions.

The combined foreign trade of these islands has exceeded fifteen millions per annum for several years.

The number of Hawaiian vessels employed in the foreign and domestic trade of the islands is 50, of which 22 are sailing vessels and 28 are steamers.

The carrying trade between the Islands and the United States is done mostly by American and Hawaiian vessels, these two flags carrying four-fifths of the whole.

Statistics show that 9,571 passengers and immigrants arrived and left these islands during the year 1892

The Hawaiian Islands are provided with an efficient postal system, and mails are carried between the metropolis and the most distant sections of the group by steamers once a week or oftener.

We also possess a good domestic and foreign postal money order system, by which remittances can be made, not only between every district of the group, but with every country in the Postal Union.

There is also a Postal Savings Bank in Honolulu, with branches on each island, where deposits may be made, that draw interest at six per cent. per annum.

Telephones are in use in the four larger islands, and in Honolulu there are 1,276 call boxes.

Hawaiian, English and other daily and weekly newspapers are regularly published, and circulate, free of postage to subscribers, to the most distant parts of the group.

In brief, the Hawaiian Islands possess a civilized though cosmopolitan population, where all the comforts of modern civilization are found. They constitute an American colony. Honolulu is really an American town, and the same remark may apply to other villages in the group. The English language is of course the official and only medium of business, and is spoken by all classes, the same as in the United States.

As a pleasure resort, where tourists can pass a few days, weeks or months with comfort, enjoyment and with a fair prospect of improved health, these islands have no superior in any part of the world.

Mails to and from the American coast arrive and leave by steamers on an average every ten days. There is no cable, however, and the lack of it is greatly felt by the government and business men.

Honolulu, March, 1894.

ORANGE CULTURE.

BY ALBERT H. BENSON, FRUIT EXPERT.

IN NEW SOUTH WALES AGRICULTURAL GAZETTE.

(Concluded from Page 86, in February Planter.)

MANURING.

In order to keep up the fertility of the soil it is necessary to replace the materials extracted from it by the crop that has been taken off the trees, and to do this it is necessary to have recourse to manuring. This may either be done by the addition of new soil to the orchard or by the application of farmyard or stable-manure or one or more of the various artificial manures sold for the purpose. Manuring with fresh soil is only applicable where there is a quantity of new land adjacent to the orchard from which the surface soil can be taken, but in any case it is a very costly method of renovating an orchard, as the expense of carting and spreading is very great in proportion to the good accomplished, and also it is simply a case of robbing Peter to pay Paul, as the land from which the soil is taken is impoverished to as great an extent as the orchard is benefited, and also the constant use of fresh soil tends to bury the roots of the trees too deeply unless the surface is continually washed away. Of course in the case of wash-outs where the soil is removed from around the roots of the trees it is always necessary to cart new soil and spread it round the trees; but, except in this case, the use of stable-manure or artificial manure combined with proper mulching is preferable to the addition of fresh soil. Stable-manure acts as an all round fertilizer and supplies all the necessary plant foods, and in the case of stiff soils it has also a beneficial effect by improving the mechanical condition of the soil, thus rendering it more easily cultivated. The great drawback to the use of stable-manure is that the cost of its application, owing to the bulk it occupies as compared with its manurial value, is much greater than is the case with artificial manures, and also by its means large quantities of weeds are introduced into the soil, thus causing extra expense in cultivation to keep them in check. Artificial manures on the other hand are in

a concentrated and easily-handled form, and thus readily available for assimilation by the plant or tree. The principal ingredients required by the orange for its proper development are lime, phosphorus, potash, and nitrogen, and if the soil is deficient in any of these materials the deficiency must be supplied before it can be made to produce the best returns. Lime should always be applied by itself, as, if used in conjunction with manures containing nitrogen, it will free the nitrogen contained in them, causing it to pass off in the form of ammonia vapour, and so be lost. Lime is best applied in the autumn or winter by being spread evenly over the surface of the ground, and then lightly plouged in. Previous to spreading, it should be allowed to stand in heaps in the orchard for a short time so as to become partly air-slacked, when it can be easier and more evenly distributed, but if the soil is sour and stiff the lime is best applied hot. Lime, in addition to its manurial qualities, has also a chemical effect on the soil, as it neutralises the free vegetable acids that sour the land and also tends to break up the clayey matter of the soil, thereby liberating the potash it contains and rendering the land more friable and therefore more easily worked. Lime should never be ploughed in too deeply, it will sink fast enough by itself. Phosphorus is obtained mainly from bones, coprolites, and phosphatic guanos, but a new and deep source is basic slag. Phosphates are usually applied to the soil either in the form of ground bones or bone-meal when they are in an insoluble condition and not available for plant food till they have been rendered soluble by the carbonic acid gas dissolved in the water contained in the soil, so that their action is slower and more lasting than in the case of the other class—"superphosphates," when the insoluble phosphates have been rendered soluble by being treated with sulphuric acid. Thus if a quick result is desired you use the soluble phosphates, and if a slower and more lasting result is wished for use the insoluble or slowly-soluble phosphates. Generally speaking, the best results are derived from an admixture of the two kinds, as the soluble phosphates stimulate a rapid growth and the slowly-soluble phosphates maintain the growth when started.

Potash is usually applied either in the form of kainit or of sulphate of potash, and, as a rule, except in soils very deficient

in potash, it is better to apply it in conjunction with a mixture of phosphates rather than alone, so as to obtain the best results. Nitrogen is applied in the form of dried blood, and in the refuse from meat works and boiling-down establishments, when it is always combined with more or less organic matter and phosphates. In such circumstances it is often in not a very readily available form, and its action is in consequence much slower than in the case of the other forms in which it is applied to the soil, the principal of which are sulphate of ammonia, nitrate of soda, and nitrate of potash (saltpetre). Of these latter the one almost exclusively used in this Colony is the sulphate of ammonia, which is obtained as a by-product in the manufacture of coal gas. Sulphate of ammonia acts very rapidly and causes the trees to throw out a vigorous growth, thereby making an increased call on the roots, so that its use must always be followed by that of other manures. In order to produce the best effects sulphate of ammonia should always be used in conjunction with other manures so that when its stimulating effects on the tree are over, the tree has the necessary plant food at hand to maintain a vigorous and healthy growth. Strictly stimulating manures such as sulphate of ammonia and soluble phosphates should never be applied except when the tree is making growth, and they should always be followed by slower-acting manures so as to obtain the best permanent results, as it is no use to induce a strong growth by means of quickly-acting soluble manures, if after they have become exhausted there is no plant food available for the tree to maintain the increased vigour of growth imparted to it by the stimulating manures. Nitrate of soda and nitrate of potash are somewhat similar in their action to sulphate of ammonia, and what I have said about the use of the latter applies equally to them. Old and apparently worn-out orange trees can be often entirely renovated, provided the roots are sound, by following out such a treatment as I have described, and the results in any case will prove much more satisfactory than the common plan of using nothing but bone-meal. Manuring a tree continually with bone-meal and expecting to get the best results by so doing is like feeding a man on nothing but bread, and expecting to get as much work out of him as if he were fed on a properly

arranged diet, for trees, as men, require an admixture of different foods to produce the best results.

DISEASES OF THE ORANGE AND THEIR TREATMENT.

The diseases of the orange are of two kinds, insect and fungoid, and the treatment, therefore, varies accordingly. The principal insect pests are:—

1st. Aphides of various kinds attacking the young growth, for which the simplest and cheapest remedy is the resin and soda wash, made as follows: Dissolve 3 lbs. of washing soda and 4 lbs. of resin over a fire in about 5 pints of water; then add water to make 5 gallons; boil well till the resin is thoroughly dissolved, and the mixture is of a dark brown colour, and then take 1 gallon of the mixture to 7 gallons of water and apply milk-warm.

2nd. The different scale insects infesting the fruit-bark and leaves, for which the following remedies should be used:—

Kerosene Emulsion, 1 *in* 15.

Dissolve 6 oz. of soft-soap in 1 gallon of boiling water; when thoroughly dissolved, and 1 gallon of the *best* kerosene and mix thoroughly with a syringe or spray-pump for at least five minutes, till the emulsion is perfectly stable, and there is no free oil; add to the mixture 13 gallons of water and apply milk-warm.

Resin Wash for Scale Insects.

Take 20 lbs. of resin, 6 lbs. of caustic soda (70 per cent.) 3 pints of fish oil, water to make 80 gallons; place the resin, caustic soda, and fish oil in a large boiler with 20 gallons of water, and boil for three hours, then add hot water slowly, and stir well till there are at least 40 gallons of hot solution; then add cold water to make up the total to 80 gallons. Never add cold water when cooking or the resin will be precipitated, and it will be difficult to get it in solution. The above is the strength to use for citrus trees; a winter wash for deciduous trees may be used one-half stronger, the total amount being made up to 54 gallons instead of 80 gallons.

This is a winter wash and can only be applied when the fruit is off the tree, as if applied to the tree when in fruit it is

liable to turn the skins of the fruit. It is the best remedy for the white scale (white louse), mussel scale, and glover scale.

3rd. The Maori—rust mite, or organ mite, is easily kept in check by the application of the following remedy once or twice, as soon as the young fruit is set:—

Soft-soap and Sulphur.

Boil 1 lb. of sulphur in 2 quarts of water for ten minutes; add 3 lbs. of soft-soap to the mixture and dissolve. Add sufficient water to bring the whole up to 4 gallons and apply.

4th. Caterpillars.—Weevils (Dicky Rice) and all other insects devouring the foliage. The simplest and most efficacious remedy is the spraying with Paris green, at a strength of 1 lb. of Paris green to 160 gallons to 200 gallons of water.

5th. Borers of all kinds.—Remedy: inject turpentine into the hole and plug it up. Destroy mature insects whenever found.

6th. Bronzy Orange Bug.—The young insects may be readily destroyed by the use of kerosene emulsion.

7th. Insect Galls.—There is no known remedy other than cutting off the galls and burning them.

The following are the principal fungus diseases:—

1st. Scab, and other surface feeding microsocopic fungi. The remedy most likely to prove successful in this case is the Bordeaux mixture, applied as soon as the fruit is set; it is made as follows:—

Bordeaux Mixture. (Summer Solution.)

Take 6 lbs. of sulphate of copper (bluestone), 4 lbs. slacked lime, 22 gallons water. Dissolve the 6 lbs. of bluestone in 4 gallons of hot water. Dissolve 4 lbs. of quick-lime in 2 gallons of water. When cool, mix and make up to 22 gallons with more water; strain and keep constantly stirred whilst using.

2nd. The growth of moss and lichens on the trunk, branches, and leaves.—This is easily kept down by the use of lime wash or Bordeaux mixture.

3rd. Smut or Fumagine.—The remedy in this case is to destroy the aphis or scale insect causing it, as the smut is a fungus, living on the exudation of these insects.

4th. Gum.—Root or Collar rot or Mal-di-Goma. This is the worst disease of the citrus family and no absolute remedy is known. The following remedies, however, if carefully carried out will save a very large proportion of the loss. Good drainage, and cutting out the affected part whenever seen, taking care to entirely eradicate all traces of the disease, and to cover the wound with grafting wax or shellac varnish. When a large limb has to be cut off, always carefully trim the edges of the cut and cover the wound with the wax or varnish, otherwise it may die back and form a rot that will kill the tree. All bruises on the trunk or main branches caused either by the careless use of a hoe, when chipping round a tree, or by a rut from a harrow or other implement should also be attended to at once, as if neglected they are apt to develop the rot.

HANDLING AND MARKETING THE FRUIT.

In this respect the orange-growers of New South Wales are, as a rule, very far behind, as they take no especial care or trouble with the fruit, but simply pull it off the tree, handle it very carelessly, and send it to market anyhow, and then wonder how it is that it will not sell or only sell at a miserable price. In the first place the fruit should never be pulled from the tree, but should always be cut and placed carefully in the bag carried by the cutter, and used to hold the oranges whilst gathering. From the picking bag the oranges should be carefully emptied, so as to avoid bruising, into the picking box where they should remain from three to six days before packing, in order that a portion of the water contained in the skins may evaporate and the skins thereby become tougher, and so stand handling and packing better. The oranges should now be sized either by hand or by means of a grader similar to the one recently imported from California by the Department for this purpose, as only one size of oranges should be packed in a case. After sizing, the oranges should be wrapped in tissue paper and packed tightly, and evenly, so as to completely fill the case, so that when the lid is nailed on the oranges may be so tightened as to prevent any possible shaking during the transit to market. The case used should be light and strong having a division in the centre, attractively got up, and the ends should be distinctly marked, so as to

show at a glance the kind of fruit, the grower's or packer's name, and the number of fruit contained in the case. The better the fruit is got up, and the more attractive the case and packing, the better the fruit will sell, and the extra expense put on the fruit will be more than returned in its increased selling value. This has been conslusively proved in America and England, and now that we are trying to open up new markets for our fruit we must leave no stone unturned in our endeavours to place our fruits on these markets in the best and most attractive manner possible—in fact, to try, if possible, to turn them out rather better than any one else.

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STRIPPING CANE IN GUADELOUPE.

[FROM THE FRENCH OF BONAME, TRANSLATED BY HUBERT DYER.]

During the vegetation of the cane, and in proportion as the leaves lengthen, those of the lower nodes having become inactive dry up and fall to the ground, or remain more or less adherent by their sheaths which class the stalk stripping is the operation of completely removing these dry leaves in order to expose the cane to the air and light.

Ordinarily only the dry leaves are removed; but sometimes a number of green ones are taken off with the false idea of hastening the cane's maturity. While the leaves are green and in active vegetation, they play such an important role in the cane's growth that their removal is decidedly wrong. In the fixation of carbon, in the great evaporation of which they are the seat, they are organs absolutely indispensable to the plant's growth, which ceases whenever these assimilating organs are removed. Each node, as it were, possesses a separate existence and its alimentation depends on the leaf which it bears. If this leaf is suppressed before its functions have naturally ceased, the node's development is arrested and the soft tissues dry up and shrink.

When the stalk's growth is over, the leaves becomes useless; the sap ceases to circulate in their tissues and they turn yellow and dry; there may then be an advantage in stripping the stalk so that it may be directly exposed to the air and light, and may more easily elaborate its juices.

The drier the year and the greater the distance between plants, the less stripping becomes necessary, if, on the contrary, the canes are planted closely on fertile soil, and if the year is a wet one, then it becomes advisable to remove the dry leaves in order to facilitate the action of the air and sun, and to hasten the stalk's maturity. The removal of green leaves will only lessen the yield.

Rational stripping, that which consists in aerating the plant by removing the dead leaves but leaving those which serve in its alimentation, is useful in rainy years. During a wet year the following results were obtained by treating three plots at three different times and each time in the same manner.

1. Removal of all dry leaves.
2. Stripping "to the white," that is, stripping a number of green leaves besides the dry ones.
3. No stripping whatever—cane allowed to take its own course.

	1	2	3
Brix of juice	14.30	13.30	13.60
Sucrose	13.40	11.60	12.20
Glucose	1.30	1.56	1.29
*Purity**	*93.70*	*87.21*	*89.70*
Glucose ratio	*9.70*	*13.44*	*10.57*

The exceptional poorness of these juices does not, however, prevent one from remarking what an influence removing the dry leaves had on maturing the cane, as well as the bad effect of stripping green leaves, thus depriving the plant of its organs of respiration and nutrition. (In this connection it is interesting to recall an experiment made recently in some German beetfields. A similar idea, regarding the removal of green leaves, prevailed and it was practically tested by removing a certain proportion of leaves from the growing plant. It failed to materially hasten ripening and was besides injurious to the plant's growth and disastrous to the formation of sugar. This is but to be expected, since most careful tests by Girad in France not only confirmed the idea that the leaves are where the sugar is made, but actually determined the weight of sugar that each day passed from the leaves into the

* Figures in Italics not in original paper but have been calculated from the data there given. Trans.

beetroot. This under varying condition of sunlight and warmth. Trans.)

When the dry leaves are left they maintain a dampness around the stalk, which in rainy seasons, may provoke the growth of shoots, (Lalas) and nodal roots.

It is an injurious practice to remove simultaneously some green leaves with the idea of avoiding a second stripping or of rendering it less indispensable.

If the stalks which are enveloped in dry leaves remain white and have none of that yellowish, orange color of those exposed to the sun, they ripen less easily, but it is nothing when compared to the white ends (bout blanc) that is the white portion of the stalk surrounded by green leaves and which is still growing. These contain but little sucrose and much glucose, whereas, the former may be suitable for manufacturing when they have fully matured. For instance; ripe cane, which was enveloped in dry leaves and was white the entire length has given a juice testing 18.10 per cent. sucrose and 0.51 per cent. glucose. Some months before cutting and during stripping, all the young shoots (lalas) should be removed as they will never get fully ripe and as they simply exhaust the parent stalk without making compensation. (This practice seems somewhat at variance with that followed in the island. Trans.)

In conclusion, when cane is planted at good distances and the year is dry there is not much necessity of stripping, but it becomes of use if the year is wet and if the cane is vigorous and close enough together to support the leaves and prevent them falling to the ground. (Planting in Guadeloupe is usually in hills, 50 inches apart in one way and 39 the other.) Dry leaves adhering to the stalk favor the ravages of insects particularly the "ver de canne" (caneworm) to which it offers a natural shelter. Although stripping as a general proposition may be useless in dry seasons, it may nevertheless be practiced without inconvenience and the dry leaves spread on the ground forms a matting highly beneficial to the soil. When the cane has become fully ripe and partially prostrate, it is much better for it to rest on a bed of dry leaves than on a damp soil where it will often take root.

THE TIME FOR PLANTING AND CRUSHING.

WE are indebted to the General Manager of the Colonial Sugar Refining Company for permission to publish the following extracts on the above subject:—

As a consequence of the want of experience in cane cultivation, of the heavy crops yielded with indifferent farming by the rich virgin land at the disposal of the early settlers, and especially as a consequence of the ease with which cane grows in tropical countries, even if planted at nearly any time of the year, and of the facilities offered for deferring the cropping from one year to another, the planting season in Queensland and Fiji has in past years not always been arranged according to the best plans with regard to the subsequent vigorous growth of the young cane, and to the cropping of the ripe cane at a proper and convenient time.

There existed a most remarkable contrast between the farming in the old country and cane growing in the new. In the latter there was a want of that long experience which, in the older countries, is handed down from generation to generation, and forms a safe guide in selecting the best season of planting or sowing, with a view to securing both a good growth as well as a fairly manageable succession of cultivated work and harvesting operations. Besides, the planting and cropping of the cane did not seem to offer any difficulties on account of a season that could at all compare with the European winter, which completely interferes not only with the growth of the plants, but also with the reaping of the crops, and, what is more serious still, destroys the crops which are not reaped in time: so that the European farmer, if he wants to live at all, has to be extremely smart and careful in arranging his time of sowing and cropping. If there was any difficulty in getting the cane planted in one month it did not appear that much would be lost by postponing this operation to the next. It would then, perhaps, not grow as well for want of subsequent warmth and rain, and it might also require greater expenditure for supplying and weeding, or, possibly, would not be sufficiently ripe for the next year's crushing. However, it would grow at any rate, and if not sufficiently advanced to be

crushed the following year, it could be left to stand over for a later crushing season. The difference there might have been in the returns, if the cane had been planted in a better season, did not appear in the books, and the high price of sugar, and the heavy yield from the virgin land, eased the mind on that score.

How much matters of minor importance, which can easily be changed when arranging the plan of cultivation, were formerly of influence in selecting the time for the planting season, may be gathered from the fact that planting was extensively done during the crushing season, mainly for the reason that the seed was then most easily obtained, and was also cheapest, although the weather during the greater part of the crushing season was not propitious for planting, and the scarcity of labor should, on the face of it, have prohibited all planting operations at that time of the year, except of cane to be grown for seed.

A considerable change has, during the last few years, been effected in these matters, as in cultivation generally. The growing of the cane had in many cases been attended by very serious losses; the rich virgin land was becoming exhausted. Errors in the cultivation were therefore shown more strikingly, and it has become more evident from year to year that cane-growing, if it is to be a permanent institution in a district once selected for it, is not so simple as it seemed at first, and that it requires some of that care and thoroughness which characterises farming in Europe, where land that has been made to yield crops for hundreds of years is expected to yield equally well or even better in future.

When the old unsatisfactory style of canegrowing is to be replaced by one more in accordance with the laws of nature and solid financial enterprise, it is of primary importance that the proper time for the planting season should be selected as this is the base of all other operations, be they connected with the preparation of the land and green manuring, or with the working in the cane and cropping.

Putting aside all minor considerations, it will be found, that the conditions of labor, and the weather, are the two main factors to be studied when determining the best season for planting.

It has already been mentioned, and is a matter so plain as to need no further comment, that the planting and crushing seasons should be kept strictly separate on account of the labor question, except with regard to cane which is grown for seed.

It will now be shown, by the meteorological records for the three years 1889–91, that the weather also decidedly favors such a distinction being made between the planting and crushing season.

The cane, as has been urged in the foregoing, grows best when there is plenty of rain in fairly warm weather with a minimum temperature not below 60 deg. F., whereas the sugar is formed mainly by the action of the sunlight at a time of slow or checked growth. Planting, therefore, is best done just before or during rainy and warm weather, and cropping best during bright and dry weather, or not very long after it. The latter allowance may be made, as some little time elapses between the setting in of rainy warm weather, and the consumption of cane sugar as a consequence of fast growth.

It has already been pointed out that the rainfall in Queensland and Fiji is by far the highest during the warmest six months of the year—viz., from November to April; so much so, that in Queensland only about one-fifth and in Fiji only a little over a quarter of the total annual rainfall occurs during the six coolest months of the year.

As far as the conditions of rain and temperature are concerned, the planting season should therefore fall in the six warmest months of the year—viz., November to April or thereabouts, and the crushing season in the six coolest months of the year or thereabouts, say from May to November. That the last mentioned period is the best for cropping, not only on account of the scarcity of rain, but also on account of the amount of sunlight, may be gathered from the following:—

Though we have not yet any direct figures on the amount of sunlight, some deductions with regard to it may be made from the number of days without any rain, and from the difference between the maximum and minimum temperature. For the chances are the greater the number of days without rain the more the direct sunlight, and as to the differences between the maximum and minimum temperature, these are

the higher, the brighter the days as well as the nights, as the amount of heat admitted at day time and lost by radiation at night time depends upon the brightness of the atmosphere.

The figures showing these relations have been compiled for the half-year, from December to May, and from June to November, which periods are nearly the same as those found to be most suited for the planting and crushing season on account of rainfall and temperature. The figures are given in the following table for the three years 1889–91:—

AVERAGES FOR THE THREE YEARS, 1889–91, ALLOWING DEDUCTIONS AS TO THE AMOUNT OF SUNLIGHT RECEIVED.

	Six months, Dec. to May.		Six months, June to Nov.	
	Days without Rain	Difference between Mean, Max., and Min. Temp.	Days without Rain.	Difference between Mean, Max., and Min. Temp.
		F deg.		F deg.
Homebush	79	24	145	33
Victoria	83	26	136	33
Goondi	77	16	121	19
Nausori	33	13	80	14
Viria	41	17	85	18
Rarawai	106	25	145	28

It is seen from the table that the number of days without rain is in all cases much larger from June to November than from December to May, and that in the case of Victoria and Homebush there is also a remarkable difference for this period between the maximum and minimum temperature, which, though, is less considerable for Goondi and Rarawai, and rather insignificant for Nausori and Viria.

It is, therefore, evident that the conditions as regards sunlight are greatly in favor of selecting as crushing season the time from June to November.

We are thus placed in face of the remarkable fact that in Queensland and Fiji all main conditions—viz., those of labor, rainfall temperature and sunlight point to the desirability of having the planting done from November or December to April or May, and the crushing from May or June to about November.

It is, therefore, surprising when it is found that in 1891 by far the most of the planting was done during that quarter of the year—July to September—which not only is right in the middle of the crushing season, but is also the most inappropriate time for planting, both on account of the scarcity of rain and of the cold.

The scarcity of labor and the pressure of business on account of the cutting and crushing operations cannot but be productive of carelessness in the planting, whereas the weather will be the cause of a poor and uneven coming up of the cane, so that the cost of supplying and weeding will be greatly increased, the time required for the development of the cane be lengthened, the yield be greatly made dependent upon supplying and suckering, and the cane, when cropped, be of different age, and consequently differing in maturity.—*Queensland Sugar Journal.*

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GERMAN BEET SUGAR RETURNS.

[U. S. Consul Reports, August 1, 1892 to July 31, 1893.]

From the official statistics, just published, I beg leave to submit the following data.

This year has been of special importance to the sugar-growers, as the system of taxation was changed by law of May 31, 1891, to go into effect August 1, 1892. Under the old law, beets were taxed 80 pfennigs* per 100 kilograms,† and an additional tax of 12 marks‡ was levied on every 100 kilograms of sugar for domestic consumption. This tax of 80 pfennigs on the beets was refunded on exported sugars by means of a premium. The new law dropped the beet tax of 80 pfennigs entirely and substituted a tax of 18 marks per 100 kilograms on sugars for domestic consumption. The sugars which are exported are, as heretofore, exempted from this tax, but the export premium, which ammounted under the old law to 8.50 marks per 100 kilograms, is reduced as follows:

* 80 pfennigs—about 18 cents. † 1 kilogram - 2.2 pounds. ‡ 1 mark 23.8 cents

Description.	August 1, 1892, to July 31, 1895.	August 1, 1895, to July 31, 1897.
	Marks.	*Marks.*
On raw sugar of at least 90 per cent and refined sugar of from 90 to 98 per cent purity	1.25	1.00
On candies and sugars in white, full, hard loaves, blocks, plates, sticks, and crystals, and other sugars of at least 99½ per cent purity	2.00	1.75
On all other hard sugars	1.65	1.40

After July 31, 1897, all bounties are to be discontinued. I notice, however, from the papers that the sugar growers and refiners are putting out feelers already to have this premium system continued after July, 31, 1897, claiming that they would be at too great a disadvantage with other countries, principally France and Belgium, if the premium was dropped entirely.

By the same law the duty on imported sugars was raised from 30 marks to 36 marks, excepting on such imported sugars as enter again into the manufacture here. Such sugars are credited with the consumption tax of 18 marks, thus paying only a net duty of 18 marks per 100 kilograms.

The number of raw-sugar factories decreased from 403 to 401. As in former years, the factories have made great endeavors to obtain an even, small, and sweet beet, have themselves, in most cases, furnished the seed to the growers at cost price, and have closely watched the sowing and cultivating of the fields. As far as manuring is concerned, the growers are now permitted to use artificial fertilizer, especially Chile saltpeter in liberal quantities, adding in the fall fresh stable manure, which was formerly strictly prohibited. The weather was not very favorable to the beet crop during the year. A mild spring quickly developed the plants, but their growth was checked by an exceptionally dry and hot summer. The dry heat hastened their ripening, without allowing them to grow out to their full size. A wet and cool September again set the beets to growing, but at the expense of their sugar quality. Especially in my district, the most important for this industry, the crop was considerably below the average.

In purifying the raw juice of the beets new experiments have been made with electricity. The juice by means of sinc electrodes, has been subjected to electrolysis in a vessel expressly constructed for that purpose. By this process a cloudy, slimy mass settles at the bottom of the vessel, and thus the juice is cleared of its principal impurities. After this treatment the juice is saturated as formerly. So far, however, these experiments have not been accompanied by a pronounced success, and the practicability of this process is doubted by many.

The refining of the syrups and residues in the sugar factories themselves has been abandoned to a great extent, and it is claimed that the time is not far off when sugar factories, instead of refining their own syrups and residues, will find it to their advantage to sell them to factories especially built for that purpose.

The chips of beets have always been a very nourishing fodder for the farmer's stock. To preserve the chips over winter they were generally stored in large pits dug in the ground. It was proved, however, that in this way the chips lost about 25 per cent of their nutritious qualities, and to overcome this loss a method of drying them has been adopted which has given satisfaction.

The following tables show the state of the industry during the year, compared with the previous year:

Description	1892–'93.	1891–'92.
Number of factories	401	403
Steam engines in use	5,122	4,879
Horse power	81,596	73,211
Beets grown by factories ....tons	1,511,835	4,639,633
Beets grown by stockholders under contract ....tons	3,302,740	
Beets grown by outsiders ....do	4,997,365	4,848,369
Total beets grown ....do	9,811,940	9,488,002
Area under cultivation ....hectares	352,015	336,454
Average yield per hectare ....tons	27.9	28.2
Average value of 100 kilograms of beets ....marks	2.09	1.80
Raw sugar extracted ....tons	1,175,137	1,144,368
Raw sugar yielded by 100 kilograms of beets ....kilograms	11.98	12.06
Beets required to gain 100 kilograms of raw sugar ....kilograms	835	829
Raw sugar on hand July 31, 1893 ..tons	26,920	50,851

NOTE.—1 ton=2,200 pounds; 1 hectare=2.471 acres.

JULIUS MUTH,

Magdeburg, Germany, December 11, 1893. *Consul.*

REVOLUTION IN SUGAR MILLS.

The building of the Cora nine-roller mill, by the Fulton Iron Works, of St. Louis, Mo., opened a new era in the sugar industry. For a quarter of a century experiments in building sugar mills have been in progress—first a two-roller supplemental mill was tried, which increased juice extraction; then sensation, first hot then cold, between the mills was tried; then three-roller supplemental mills, or six-rollers, which increased the sugar output but still left too much in the bagasse. Heavier mills were tried—those of greater diameter—but while they made finer bagasse the sugar extraction was no greater, because it was found the width of the roller prevented a ready flow of the juice and reabsorption by the bagasse. The next change was to greater length but *less* diameter—a move in the right direction—but still none of these styles of mills could nearly approach the diffusion method of extraction.

At length, a quiet but most observing engineer, Mr. M. L. Flower, saw that *repeated* pressures were necessary—as did the venerable and lamented Hon. M. S. Bringier, years before, but, unlike the latter, realized that not only repeated pressures but *most powerful* rollers were absolutely required, and devised the great nine-roller mill, the first being erected on the Cora plantation, then the property of Messrs. A. & V Meyer, near Whitecastle, in Iberville parish. This was in 1892. It did such magnificent work, having several new features, with new style turn plate, avoiding all breakage and choking, a screw to assist in moving rollers, and cogs at both ends of the shaft, etc., that it attracted a great deal of attention. It has nine rollers 6½ feet long, 34 inches diameter, worked in clusters of three each, and grinds 800 tons per day. It has ground *a ton per minute.*

Mr. Flower, in 1888, had put up rollers on same style, five in number, 4 by 26, at the Nina plantation, of same proprietors, in Pointe Coupee parish, and that led to the great Cora mill. Since then he has put up that style of rollers or mill, all made by the Fulton Iron Works, for the following parties:

For Mr. Adrien Gonsoulin, Loreauville, Iberia parish, 6-rollers, size 6 by 34, and this year the sugar yield was nearly 200 lbs. per ton of cane.

For M. E. A. Weems, Rapides, a 6-roller mill, 6 by 34.

For Mr. Andrew H. Gay's Union plantation, Iberville parish, 6-roller, 6 by 34, which last season rolled 900 acres cane.

For the Tally Ho central house of the G. M. Murrell Planting and Manufacturing Co., in Iberville, 6-rollers, 6.5 by 34.

For Mr. J. H. Mecker, in Rapides, a 5-roller mill, 5 by 34 and others.

In every case, a new Corless engine was put in, and we saw several of the above mills and engines at work, last season, and must say that we never saw prettier machinery.

The result of this very perfect mill is that no more diffusion plants are being erected in Louisiana, as the yields are practically equal to those of diffusion.—*Sugar Boiler, Feb. 11.*

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THE PREPARATION OF CANE FOR THE MILL.

By Sr. D. GASTON DESCAMPS, Manufacturing and Consulting Engineer, Havana.

From Sugar Cane.

BEFORE dealing with the maceration of the bagasse and filtration, purification, and decolorization of the juice, we have to investigate the question of the influence which the preparation of the cane for the mill may have exercised on the extraction of the juice, and the working capacity of the mills.

As a matter of fact and from the point of view of the mechanician, mills are not constructed to grind the cane as grain is ground, but to "laminate" it. This means, that the extraction of the juice is on principle effected by "laminating" the cane-stalks between two rollers the pressure of which, after first breaking the rind, forces the juice out of the cells in which it is contained, and it may be remembered that in the primitive mills the rollers were disposed vertically.

In the present mill, with three horizontal rollers, this "lamination" is effected twice; firstly, by the passage of the cane between the front roller and the top roller (which is in reality a true preparatory operation), and secondly, by the passage, between the top roller and the megass roller, of the

cane prepared by the first crushing. In order to facilitate this passage, there is the knife or "trash-turner," the name of which very clearly indicates the only part it plays, viz., that of serving as a bridge by which the material issuing from the first crushing may pass with facility and be presented to the second.

The primary condition necessary for perfect crushing is the continual and always regular feed of the material to be crushed, calculated exactly in proportion to the power and capacity of the laminating rollers. Hence it is also an essential condition for the due utilization of the mill that there should be a constant and regular feed adjusted to the power and capacity of the mill, since the function which it performs is a double crushing facilitated by the trash-turner.

This crushing, effected in duplicate by a three-roller mill, is converted into a quardruple or sextuple operation, when performed by making the cane pass successively through two or three three-roller mills, or when the corresponding number of crushing rollers are arranged in an adequate form in one machine, as was the case in the old mills of Derosne with five rollers, and in those of Fletcher, Baissonneau, Thomson and Black, Fulton Iron Works, &c.

On the other hand, if through these laminating rollers—which deal perfectly with metal rods, wood poles, or plant stems—we try to pass wet tow or cotton, we meet with two difficulties; in the first place, the rollers do not grip these substances properly, and, secondly, if we succeed in forcing them through, in the case of the three-roller mill for example, they get jammed on the "trash-turner," and are difficult to bring to the second pressure, the mill "snores," and the trash-turner suffers severely, if indeed it is not broken. Hence, as the mill was conceived for the purpose of crushing the cane, its constructors basing themselves on the form and natural contexture of its stem, it follows logically that in order that the crushing should attain full efficiency, and the maximum extraction of juice eventually be secured, the avoidance of the infringement of this principle, and the alteration of the natural contexture of the cane as much as possible, must be cardinal points in the construction of this apparatus.

To the essential colonial production of cane sugar there succeeded the essentially European production of beet sugar: and in the dawn of this new industry, the existing processes for the production of cane sugar were transplanted to Europe to be used in the manufacture of beet sugar. But beet is a root and does not admit of "lamination"; it was necessary to submit it to pressure, and to facilitate this operation, it came quite natural to cut the roots in pieces, or to rasp them and reduce them to pulp.

The preliminary division of the sugar containing substance, which is not necessary for the extraction of the juice from the cane by crushing was found to be an indispensable necessity in the case of the beet, arising from its having to be submitted to the action of presses, in order to extract the juice.

However, let us see whence and how the idea has arisen of applying this previous preparation also to the cane destined to pass through the mill, in the same way as is done with the beet which is to go to the presses.

We remember having seen some years ago in the Antilles, and especially in Cuba and Portorico, that the two men stationed on the right and left of the top end of the mill to regulate the cane arriving from the carrier and prevent it from falling in irregular bundles, were accustomed to use a large *machete* with which they slashed through the cane as it fell, thus more easily separating the bundles formed, and better regulating the entrance of the cane into the mill, and therefore the feed. For when the cane was left entire, it rendered difficult, in consequence of its length and curved shape, that regular and continuous feed which engineers and constructors always demand as a fundamental necessity for successful crushing; so much is this the case that at the central factories of the French colonies the pieces are required not to exceed one metre in length, and in Cuba the custom is to cut the cane in pieces of one yard.

Instinctive recourse was thence henceforth had to previous division of the cane in order to secure a regular feed to the mill, but this operation was also effected without thereby changing the usual shape and contexture of the cane, which, after cutting, still reached the mill in its natural state as a "stalk," that is in a state adapted for the "lamination" to which it is subjected in the mill.

Later on, some fifteen years ago, there was introduced into the tropical factories certain machines with which it was endeavored to perform mechanically this operation which had hitherto been done by hand. Their construction varied, passing from the defibrator of Faure by way of the simple Ross cutter, the Fiske shredder, and the crusher of Krajewsky and Pesant until we reach the comminutors of Ross and of Hughes, and the Swenson apparatus, which reduces the cane to a state like sawdust, not to mention others which were rejected on the first practical trial.

Attention may here be called to the fact that in the list of inventors of machines for preparing the cane, mill constructors do not figure. This was, however, quite logical, inasmuch as they were not ignorant of the fact that, as we shall see further on, this preparation is capable of being effected without in any way changing or detracting from the principle of "lamination" which lay at the foundation of the construction of cane-mills. Now the constructors of machines for preparing the cane completely upset this principle, constructing machines which changed the primitive form of the cane, and reduced it to such a state of division or disintegration, that the raw material reached the mill in a filamentous and spongy state, tending to invalidate considerably its crushing power. For as we have already stated, a mill which is capable of perfectly crushing cane stalks, and turning out a stripy and dry bagasse, loses perforce much of its power of juice-extraction, if it is employed to flatten wet tow or cotton, because it has not been constructed for that purpose.

It is also certain that if the cane, reduced to small pieces by these preparing machines, were passed through a press, as is done in the case of beet, the result would be a much greater extraction of juice than when it is crushed by the most powerful mill. But as the cane thus prepared is passed through the mill, it results that the extraction obtained does not exceed that which is got by the regular ordinary crushing.

In addition the disadvantages already indicated are met with, viz., the rollers do not "grip" this comminuted substance properly, in proof of which we see that "force-feeders" have had to be invented to meet the difficulty as much as possible. But there remained after all the great difficulty, the knife, or

"trash-turner" to which the twisted fibres of the cane adhered closely, and as this obstacle could not be got over, the proposition was made to substitute a mill with three rollers for that with two, although that also, being also a "laminator," loses a great part of its efficacy, and does not work well without the "force-feeder."

The result of all this is, that the primitive state of the raw material having been completely changed by the preparing machines, the substance from which the juice is intended to be extracted being no longer cane stalks, but a filamentous, pulpy matter,—in place of submitting it to "lamination," difficult to effect satisfactorily and yielding results inferior to those obtained from presses or by diffusion, it would be more business-like to deal with it, as is done in the case of beet, by those processes both of which require this state of minute division in order to secure the best result.

Or if it is really necessary to keep to the present mills it will be more logical and more advantageous to relegate this previous preparation also to a mill, regulating its strength and capacity solely and exclusively for this special function. And this is just what was done when recourse was had to double crushing, the industrial success of which has justified the proceeding.

This is why mill engineers have not occupied themselves with making machines for preparing the cane, seeing that in these very mills they have at hand the means most adequate for securing that end.

Let us look at the actual results obtained by the machines for preparing the cane.

As regards the extraction of juice, those planters who use them are in agreement in recognising that they have not effected an increase in this respect, and the working records of the central factories also show that the average of extraction fluctuates, with prepared cane and single crushing, between 68 and 70 per cent., in both cases without maceration. But at the same time they all attest the fact that with the same mills a greater quantity of cane has been able to be ground in a given time, which could not fail to be the case, because the preparation effected by the first "lamination" was done by the preparing machine, and a greater quantity was

able to pass through the entrance aperture of the mill in its natural form of a stalk.

Thus what is obtained by means of the preparing machines is an augmentation of the quantity got through, which some make out to reach as much as 50 per cent., although up to now the percentage has not been proved by practical experiment or numerical data.

Now, can this same increase in the quantity of cane worked up be attained without infringing on the fundamental principle of the construction of cane mills?

When double crushing is set up, *i.e.*, when the cane is made to pass successively through two mills of three rollers, it is a regular thing to get, along with an increase in the amount of cane worked up, *an increased juice-extraction*, proportionable to the superfices of the rollers employed.

If to a mill calculated to crush 15 tons of cane per hour, with an extraction of 60 to 62 per cent., another mill is added, the entry and issue of the cane as well as the number of revolutions of both mills being properly regulated, 22 tons of cane can be crushed per hour, with a total extraction of 68 to 70 per cent. Thus in this case the use of a second mill as preparer, in place of a preparing machine, will give an increase in the quantity worked up, equal if not greater than the latter would secure, and in addition an increased extraction of juice amounting to 14 or 15 per cent., calculated on the yield from the single mill with prepared cane.

If it is desired to further increase the quantity of cane got through by the double crushing, the use of a preparing machine will secure this increase and nothing more: but if with that view recourse is had to setting up a third mill, using it properly and solely for this object of preparing the cane, the desired increase in the quantity of cane got through will be attained, and in addition an increased yield which will raise the total extraction of juice to from 76 to 78 per cent., with canes containing 13 per cent. of woody fibre, but with those containing 9 per cent. it is impossible to reach 80 to 82 per cent., in place of the 68 to 70 per cent. obtained with prepared cane and double crushing, without maceration both in the case of the preparing machine and that of the mill used as preparer.

This increased extraction is owing to the fact that both in double and treble crushing, the preparing mill, viz., that which receives the cane in its ordinary state, can reach an extraction of juice not lower than 35 per cent., without at the same time —if the openings and revolutions of the mills have been properly regulated—failing to present the prepared material in the form best adapted for "lamination," viz., a continuous layer of flattened canes with the rind perfectly broken, the cane not, however, being reduced to a state like tow, nor the continuity of its fibres interferred with.

Among the preparing machines there are some which also extract a certain quantity of juice, which goes to improve the extraction, thus partially making up for the negative effect on the "lamination" of the reduction to a state of division. Others extract no juice at all, which fact is sometimes alleged as a superior excellence in them: this is nothing less than nonsense and pure humbug, which has no force in itself, and is not worth the trouble of discussing.

Having enumerated facts which are sufficiently well known to those who make proper use of cane mills, and are easily provable in practical working,—there remains the argument of cheapness, which is adduced in favor of the preparing machines, an argument which is, as a general rule, as illusory as that of increased extraction.

At present, in those sugar countries which are undergoing that industrial transformation which necessitates a centralisation of the manufacture, by the establishment of central factories, the machinery in a large number of works is superfluous, as their proprietors find it more advantageous to sell their cane to these central factories. In consequence of this transformation, there are in those countries mills in good condition, which being no longer employed on the estates which sell their cane, can be bought at prices under half the cost of the preparing machines. And the expense of setting up such mill (including the accessories of seating, connecting plant, and pieces for repairing), if not less, is no greater than that for the preparing machines.

Such being the case, the choice cannot be doubtful, for with half the outlay one can get, in addition to the desired increase in the work done, an increase in yield which in itself alone

will bring in sufficient to recoup, in a single season, the money expended on the preparing mill.

In those countries where the cane sugar industry is of more modern creation, and the plant has been set up at once on the centralised system, there are no second-hand mills to be had, and the preparing mills will have to be got from the machine-makers just like the preparing machines; but not even in this case will the outlay be burdensome, if we take into account that the preparing machines generally in use cost from $6,000 to $12,000 for a capacity of 20 to 30 tons per hour, and that the preparing mill secures, in addition to the increased quantity of cane worked up, an actual increase in the extraction of juice.

To sum up, for the preparation of the cane destined to be passed through mills, *i.e.*, to be "laminated,"—the best machine, whether from a mechanical or an industrial point of view, is a mill.

Of the different machines for preparing the cane, those which will produce the best results will be those which, while they extract juice, interfere as little as possible with the primitive contexture of the cane.

The less the quantity of juice extracted by a preparing machine, and the greater the state of division or dismemberment in which it delivers the cane to the mill, the poorer will be the ultimate yield in extraction of juice.

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NOTES ON DEMERARA SUGAR TRADE, 1893.

The year about to close has been one of many vicissitudes for agriculture in British Guiana. In passing it may be stated that reference to agriculture is made chiefly in connection with sugar, as there are unfortunately no other agricultural industries of any importance in the colony. The year opened with a satisfactory stand of young canes on the ground, and the rainfall during January was not excessive. Heavy rains, however, fell during the succeeding five months, and the total fall during the first six months of the year averaged 75 inches. Estates in the river districts got a larger share of the rainfall

than those situated along the coast. The incessant rainfall and absence of bright warm forcing weather checked the development of young canes, and yields obtained during the recent busy reaping season, have, on the whole, been disappointing. The rainfall for the year will approximate on the average 125 inches, and the bulk of sugar estates in the colony give best results with a well-distributed annual rainfall of about 85 inches. On loose porous soils, and on new land where there was a good covering of vegetable mould, canes grew well notwithstanding the heavy rains, but in the heavy clay soils which form a large proportion of the area under cane cultivation, growth was slow and unsatisfactory. The canes generally have contained a larger percentage of fibre than usual, and the juice has been poor in quality, containing less than the average quantity of sugar. This is now the fourth year that abnormally heavy rains have been experienced in the colony. The total shipment of sugar for the year will be approximately 110,000 tons. The shipment for the previous three years were:—

1890	105,483 tons.
1891	116,978 "
1892	114,075 "

These figures are taken from the fortnightly report issued by the Chamber of Commerce, Georgetown. In 1887, 134,876 tons sugar were shipped, and shipments during recent years compare unfavorably with this.

The variation in prices ruling for produce during this year has been phenomenal. The highest price obtained in London for average Demerara yellow crystals was 21/. and the closing price for the year for the same quality is 17/. a difference of $19 per ton of sugar. The highest price obtained in the local market for refining crystals polarising 96 deg. was $4.15, and the closing price for the year for the same quality is $2.70 per 100 lbs., a difference of $32 per ton of sugar. The average price obtained in London for rum during the year may be stated at ½ per proof gallon.

The acreage tax returns give the acreage under cane cultivation during the undernoted years as being:—

1890	79,243	acres.
1891	78,777	"
1892	76,101	"
1893	75,926	"

The acreage given for 1893 as under cane cultivation is for the first six months of the year, but the average for the whole year will be rather less, as Bel Air *cum annexis* returned 1,776 acres as in cane cultivation, and some of this acreage has since been cut off and abandoned.

There are at present 75 estates in the colony on which sugar is manufactured. The largest area under cane cultivation on any one estate is 3,324 acres, and the smallest 46 acres. There are three estates with over 2,000 and under 3,000 acres; six with over 1,500 and under 2,000 acres; twenty-two with over 1,000 and under 1,500 acres; and twenty with less than 600 acres in cane cultivation.

During the year the following sugar estates were abandoned, viz.: Plns. Greenfield on the East Coast, and Blenheim in Leguan. The following amalgamations were effected: Pln. Vive-la-Force, West Bank, with Vriesland: Pln. Stewartville, West Coast with Leonora; and Pln. Ma Retraite, Berbice River, with Mara.

Considerable difficulty was experienced throughout the year on account of the insufficient supply of labour available for the sugar estates. Very high rates of wages were paid for nearly all kinds of work. Cane cutters were in great demand during the heavy grinding season in the end of the year, and a good cane cutter could in 6 days' steady labour easily earn $10. The cost of cane cutting has been about $1.00 per ton on sugar made, higher than the average of the past few years. East Indian Immigrants equal to 5,450 statute adults are expected to arrive in the colony during the current season. During the season 1892–93, East Indian Immigrants equal to 4,402 statute adults arrived and were allotted to estates. A largely increased immigration is required to meet the demand and necessity for labour which now exists. The sugar estates especially feel the want of sufficient reliable labour at moderate rates; but the gold industry is also likely to be hampered for want of suitable labourers.

No special or extensive improvements have been carried out with regard to sugar manufacture during 1893. The important question of economy in fuel consumption has received further attention, and furnaces of new and improved designs have been erected for burning green megass with the object of getting this fuel to generate in boilers all the steam required in factories. The system of double crushing has been further extended; 2nd mills for this purpose were erected on Mon Repos, La Grange. Windsor Forest, Uitvlugt, Tuschen de Vrienden, Golden Fleece, and Perseverance. Multiple evaporators have been erected on Anna Regina, Success (Leguan), and Ogle. A new evaporating plant is on order for Pln. Ruimveldt; a triple effect for Marionville; and it is proposed to erect a tripple effect at Maryville, and a diffusion plant at De Kinderen. There are 14 vacuum pan estates not yet provided with multiple evaporators. Muscovado sugar is still manufactured on 4 estates, but the annual output of this class of produce cannot be more than about 1,000 tons.

The proprietors of sugar estates have during recent years invested large sums in improved modern machinery and appliances. By so doing they have prevented the colony disappearing altogether from the list of sugar-producing countries, and have shown their confidence in the future of the industry. Since 1883, the world's production of sugar has increased from 4,000,000 to 6,000,000 tons. There has been no increase in the production of this colony; in fact, the exports of 10 years ago have not been maintained. The industry is having a hard struggle to keep alive, and it has to contend against many difficulties. The cane cultivation suffers from abnormal seasons, periods of excessive rainfall, and protracted drought. The tillage of the land on account of the system of open drainage which has to be adopted, is most expensive, and the yield of sugar obtained does not average more than 1½ tons 1st sugar per acre. The want of labour and consequent inability of the planter to get tillage done when most desirable, also tells against estates. The heavy burden of immigration cripples the industry not only from the cost of introducing the immigrants, but on account of the expense of cottages, hospitals, medicines, food, implements, etc. The

cost of keeping up sea dams, back dams, kokers. and public roads, etc., is also a heavy charge on estates. It is only by judicious management, strict economy, and never ceasing energy on the part of the staffs employed on estates that a fair interest on money invested can be realised, and in specially unfavourable seasons the proprietor has to be prepared to meet a loss. In many sugar producing countries, bounties are paid by the government to encourage production—witness the United States and France, Germany, etc In some countries the yield of sugar averages 4 tons per acre, as in the Sandwich Islands, where the soil is very fertile. In Cuba, which stands first as a cane-sugar-producing country. the crop now due for reaping is estimated at 900,000 to 1,000,000 tons, the soil is good, the drainage is simple, the cost of tillage is small, steam ploughs or ploughs drawn by oxen are used, and the cane juice is rich in sugar and easily manufactured. The rainfall averages about 60 inches and the climate permits of white labour in the field, resulting in a satisfactory system of farming, the large factories being almost entirely supplied with canes in this way. As compared with other lands in which sugar is produced, this colony has many and serious drawbacks, but with an ample and cheap labour supply, and by the adoption of every appliance that can improve manufacture or lessen cost of production, it should continue to rank as a sugar producing country.

The prospects for the year just about to begin cannot be considered very promising. There have been some excessive falls of rain during the closing month of 1893 that will adversely affect the young cultivation, and render of litte value much of the tillage already done to fields. The supply of labour during 1894 is not likely to be equal to the demand. and high rates of wages will have to be paid. The price of sugar is now lower than it has been for many years, and with the large crop of beet sugar made in Europe, and the enormous output expected in Cuba, it appears hopeless to expect any rise in the sugar market for sometime to come. It will be a serious matter for the colony if the weather during 1894 should prove to be a repetition of that experienced during the past few years.

Of minor industries very little can be said. There are two

or three cocoa and coffee estates that are kept in cultivation, but the production of cocoa and coffee gives little indication of increasing. There is abundance of cheap land available, suitable for the cultivation of these products, but the want of reliable labourers willing to accept reasonable wages, prevents any extension of cultivation. The gold industry has seriously interfered with the cultivation ground, provisions are largely imported from Barbados and other West India Islands. The cattle farming and rice growing industries have made no progress, and both are carried on in a haphazard sort of way. Until there is a very large increase in the population of the colony, and the labourers are more ambitious and industrious than they are at present, any extension of the so-called minor industries will be looked for in vain. R. G. D.—*Argosy.*

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SUGAR CONSUMPTION.

The consumption of sugar per capita is regarded as one of the surest tests of the prosperity of a country. While sugar is, in one light, a necessity, in another it is a luxury; poorer classes feel that they can do without it, except in periods of great prosperity. It is noticed, therefore, that as the world grows richer its consumption increases, and that the amount used by each person in European countries is an excellent test of the social and financial conditions of these several lands. Nor has the production anything to do with it, for in those like Austria, Russia and Germany, where immense quantities of sugar are raised, the consumption is very light. The following table will give some idea of the rapid increase in the consumption per capita which has occurred in the last three years :

	Pounds	
	1892.	1889.
Germany	23.56	18.30
Austria	16.05	13.00
France	30.46	25.33
Russia	10.34	10.16
Holland	26.28	17.92
Belgium	21.29	21.21
Denmark	46.63	38.21
Sweden and Norway	24.14	21.12

	Pounds	
	1892.	1889.
Italy	7.18	8.90
Roumania	3.90	4.85
Spain	11.06	8.84
Portugal and Madeira	12.43	12.08
England	80.73	73.23
Bulgaria	5.16	3.98
Greece	8.62	10.58
Servia	3.81	4.74
Turkey	9.30	5.95
Switzerland	31.30	29.98
All Europe—average	22.64	19.88
United States	67.46	54.42
Together—average	29.00	24.70

It will be seen that England still leads in the per capita consumption, but that the United States is rapidly catching up and will soon equal it if not pass it. The use of sugar increases rapidly, the gain in the countries given above being 4.10 pounds, or 17 per cent. in three years.

Although the amount of sugar consumed to each person in the United States is less than in England, we use a great deal more in the aggregate, because our population is so much larger. The immense consumption and the fact that it is certainly increasing should encourage us to make some effort to raise all or at least a portion of the sugar at home, instead of depending altogether on other lands for it.—*Times Democrat.*

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DISEASED SUGAR CANE.

Mr. Thistleton Dyer, Director of Kew Gardens, was recently called upon to report on the subject of a root disease in sugar canes, specimen stools having been forwarded for investigation by Mr. Bowell, Barbados. Mr Dyer declared the disease totally distinct from that on which he had reported in April, but practically identical with one existing in Java, from which he thought it not impossible it had been introduced. In his despatch to the Under-Secretary of State for the Colonies covering his technical report, the Director of Kew states:

4. It is evident that the weak point in sugar-cane cultivation in the West Indies is the want of care in the propagation of the canes. The

very finest and most healthy canes should be scrupulously selected and set apart for the purpose. Unfortunately, any weakly or even diseased canes appear to be thought good enough. Apparently, in consequence of this short-sighted practice, a disease which, under ordinary circumstances would have been of little moment, has assumed troublesome dimensions.

5. It appears to me that the cultivation of the sugar-cane generally in Barbados is not prosecuted with much intelligence. The outbreak of diseases in a cultural staple is not always to be looked upon as simply "the act of God," but is often aggravated if not actually produced by the neglect of reasonable precautions.

I long ago pointed out, and it is now beginning to be understood, that an immense deal can be done for the improvement of the sugar-cane by the continuous selection for propagation of the best possible canes. Not merely should this be done systematically on individual estates, but it should also be carried on at the Botanical Station. In the latter the canes should be systematically analysed in order to select those canes which are richest in sugar.

6. In this connection I am sorry to learn from Mr. Bowell, in a letter which accompanied the specimens of diseased canes, that nothing has been done with regard to the provision of a larger experimental station. A committee appears to have been appointed by the Legislative Council to consider the matter, and it was allowed to lapse without reporting.

7. In conclusion, I must point out that though Kew may be able to be of some assistance in technical matters like the present, it cannot supply the cultivator with the energy and intelligent resource without which no industry in the long run can be successfully prosecuted.

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A little wrinkle in babbitting journal-boxes is given by a Canadian writer, which although not new, may not be generally known. When lining up a shaft put a small piece of pine wood in the bottom of the box, in length about one and one-half or two inches less than that of the box and in width five-eights to one and one-half inches, according to the size of the box. Equalize it in the bottom from each end and let the shaft lie on it and pour. After you have scraped out the box remove the piece of pine and substitute some woolen cloth saturated with oil. This prevents the oil from dripping off, and not only insures a positive lubrication of the journal, but also is clean and requires less oil than other journals.