THE HAWAIIAN PLANTER'S MONTHLY

PUBLISHED FOR THE

HAWAIIAN SUGAR PLANTERS' ASSOCIATION.

Vol. XIX.] HONOLULU, APRIL, 15, 1900. No. 4

NEW YORK SUGAR MARKET.—March 8. The raw sugar market opened easier in tone and tendency, as noted for the past few weeks, during which a total decline of 19c per 100 lbs. has been made, while refined sugars have declined but 10c. per 100 lbs. Centrifugal sugars are now quoted at 4 5-16c. for 96° test, which is 1-16c. below the parity of beet sugars in Europe, and it is possible therefore that the downward reaction is nearly ended, for the present at least, unless the European markets again start downward. It is a time of year when the tendency is usually towards ease in raw sugar, because of the accumulating of large supplies of new crop sugars in Cuba and other West India islands. Cuba particularly is making sugar rapidly, more Centrals being at work than last year, and notwithstanding the fact that the cane is reported, as producing less sugar than last season. An immense quantity, about 400,000 tons, of the new Java crop has changed hands in Java, for June, July and August shipment, at the equivalent of 4⅜c. duty paid for 96° test. Reports do not show how much of this amount has been secured by the refiners. Our local market closes with light offerings of sugar from Cuba and elsewhere.

March 15. The week under review has been one of strength and some considerable activity on improving conditions with an established advance of 1-16c. per lb. at close. The receipts increased to 35,576 tons for the week and meltings to 32,000 tons giving a small increase of stocks, 3,576 tons. The quantity of cane sugars on offer from the new crops of Cuba and the West Indies is much less than is usual at this season, being evidently held back for some reason. The stock in Cuba is now 99,500 tons, or 36,000 tons more than last year. There

will be no considerable arrival of Javas until August. All the cane sugars available during the next few months will be wanted, and if they are not offered as promptly as they may be required, a rapid advance may be established, temporarily at least. The tone and tendency is toward continued firmness and improvement.—Willett & Gray's Report.

———:o:———

The bubonic plague, which first appeared in Honolulu about four months ago, has steadily declined, till at the present writing it may be said to have been stamped out, there having been only one death per week from it during the past six weeks, and none for the past ten days, while the deaths from consumption and pneumonia have averaged fifteen or twenty per month. There is, therefore, no good reason why the quarantine should not be raised, and the port declared free from contagion. The continuance of the quarantine, under the present conditions, is working as a hardship on every branch of business. In Sydney, N. S. W., with over thirty deaths during the past six weeks, there has been no quarantine established, up to the last advices. With ordinary care on the part of Boards of Health, in any large port, and especially where a reward of $100 is paid to the person who first reports to the Board of Health any case of bubonic plague, comparative safety is secured against the spread of the disease.

The Plague has very seriously interfered with the shipping business of the port of Honolulu, but seems now to have been entirely checked. The cases reported averaged about four or five each week, while the total deaths from it for three months past have been only 60. Strict quarantine of the sections of the city in which the deaths have occurred, is still maintained, and no communication is allowed with them. How much longer the present conditions of restricted travel and trade will continue, no one can tell. Over fifty buildings occupied by Asiatics and others as dwellings or shops, where the plague has found lodging, have been burned, in the hope of destroying, the germs of the disease. Certainly, everything is being done that the most enlightened policy could devise, and every house is visited twice each day, to ascertain the condition of the inmates, and report any cases of illness.

The first symptoms are noted, reported and watched. This for a population of 40,000 is no light task, but it is endorsed and aided by all classes.

As the sugar plantations are located from ten to seventy miles from the city, and no communication with them is allowed, except by telephone, they remain strictly free from contact with the plague. The sugar from them is shipped direct from the mills onto vessels, which are not permitted to come within the plague limits. Trade and travel between Honolulu and the other islands of the group are suspended, and though it is a hardship to many, it is acquiesced in by all. Sugar on the other islands of this group continues to be shipped abroad as before, and none of it comes to this port.

Now that the serum antidote for this disease has been received from Washington, it is probable that very few deaths from the plague will occur after this except in cases too far advanced to receive benefit, and it is hoped that its spread will thus be checked, if not entirely eradicated.

The weather throughout these islands has been very favorable to the harvesting of the sugar crop. As there has been no case of plague on any plantation in this group, there has not been the least interruption in the harvesting of cane and the manufacture of sugar. The shipment of sugar has been progressing from the various ports, and there has been no contact with the Chinese district in this city, where the plague commenced and has been confined. There has been some delay in the early part of the season, in distributing the sugar ships to the various plantation ports, but this is now over, and the crop is moving off as rapidly as could be expected under the circumstances. The total will not vary largely from previous estimates. It is possible that the very dry weather of the past four months may reduce the total outcome more than was anticipated. The quality of the sugar, however, is very fine—never better than the crop now going to market. Complaints continue to come in regarding the falling off in the supply of artesian water. This is attributed to the rice plantations, and the great waste of water taken by them, the surplus from which is constantly allowed to flow to the sea. The law to prevent this waste should be rigidly be enforced.

DR. MAXWELL'S REPORT.

We republish in full in this issue of the Monthly Dr. Maxwell's report to the Queensland Government on the sugar industry in that colony. Although the conditions of soil and climate in Queensland are quite different from those of Hawaii, yet planters here will be interested with the perusal of his investigations and his recommendations. There are three distinct divisions of this industry in Queensland, which he calls 1, the Bundaberg; 2, the Mackay; and last the Cairns. Each of these was visited, and advice given as to the proper treatment required for each. On finding that the planters did not manure their lands, he told them very distinctly that they could not expect good returns from their fields, if they neglected to manure them. Paying crops could only be secured by liberal manuring.

In the manufacture of sugar as well as the growing of the plant, he finds much to report upon. It not only necessitates a far larger consumption of fuel than should be the case, but the quantity of sugar extracted from the cane is materially lessened. After referring briefly to this question, and the machinery used, he says: More urgent than all improvements along mechanical lines is the introduction into the central and some other mills of a more thoroughly trained and scientific system of management. The men in charge have executive ability, and they appear able to get relatively good results from the labor they command; but they require training and aid in those specific parts of manufacture which demand a thorough knowledge of chemistry of sugar juices and of the nature of the agents which aid in clarification. In concluding his report he makes a number of recommendations as to what should be done. His first advice is for all the local associations in the respective districts to unite into one body to be called the Sugar Growers' and Manufacturers' Association. Three experiment stations are advised to be established, viz., at Cairns, at Mulgrave River and at Bundaberg. The one at Bundaberg is to be the chief experiment station and headquarters of the director, and of the main laboratory and chemical staff. The remainder of the report is taken up with the duties of the director after the establishment of the stations, these duties and functions being very onerous, and the selec-

tion of a proper person for the position will be found the most important work of the proposed association.

It is very evident, after reading this report, to see why the annual sugar yield of that colony is decreasing. With the fields cultivated in the most primative manner, and the mills not extracting the sugar that they might obtain, no other results should be looked for than the past few years have shown. It is to be hoped that a change for the better will now take place.

A colonial paper, referring to the report says: "After perusing the report one cannot fail to be struck with the intimate knowledge of the subject possessed by the writer, and the great falling off of the yield in some districts can be at once understood. The greatest falling off has been at Mackay where, in years past, the land yielded from 40 to 50 tons of cane to the acre, whereas at the present time the yield is only slightly over 10 tons per acre. Of course disease accounts for a great deal, but disease itself is brought about mainly by soil exhaustion, and a consequent loss of vitality of the plants. Scientific knowledge, therefore, it will be seen, is urgently wanted for successful sugar planting."

:o:

THE BEET SUGAR INDUSTRY IN AMERICA.

Like many other new industries which have started in America from small beginnings, beet sugar is passing through its experimental period with the reverses, arising from various causes, which all new enterprises have had to encounter. In no section of the country has it given more promise of future success, than in Michigan, Nebraska and California, notwithstanding the cold climate in the first-named state. This will prove only a temporary set back, and in the end the industry is sure to be as successful there as it has been under similar conditions in Europe.

On another page will be found an article from a Boston paper, showing some of the hindrances which this industry has had to contend with in Michigan. These, however, are no worse than what sugar planters in Hawaii had to pass through in its early history. They must be met with true American courage, and in the end the beet sugar industry will

prove to be permanent and profitable. This, like every other new enterprise, must work through its experimental period, proving successful in some places and in others a failure, owing partly to a lack of knowledge regarding the needs and habits of the plant.

In very few sections of the Union have the pioneer results of this industry been fully up to the expectations of its promoters. Probably the nearest to it has been in Chino, Southern California, which factory and fields the writer personally inspected two years ago. There the soil, occasional showers and the climate all combine in making the industry profitable. But in nearly every other locality of the Union that has been tried, the uncertainty of rainfall, the quality of the soil, or extreme cold has affected the crops more or less injuriously. The ignorance of beet farmers regarding the best time of planting and the best method of preparing the land and caring for the crop, has at the start proved discouraging to men who have never before planted beets, or had practical experience with vegetables. These and other causes have in many instances proved a setback, and discouraging to all interested. The cultivation of sugar beets, more than any other plant of its class, requires skill and care from the selection of the seed to the pulling of the roots, and their delivery at the factory. After one or two seasons' failures, the beet farmer becomes discouraged and gives up, in many instances.

With the factories the case is somewhat different. They are designed, erected and generally owned by capitalists, who have ample means to meet any reverses incurred at the start, and who can afford to wait for future dividends. And yet in California the first beet sugar venture was far from being a success. It was only after Col. Spreckles engaged in this beet sugar industry, ten or twelve years ago, that it proved a promising venture. This gentleman, who has done so much for Hawaii as well as for California, was born in Germany, where his early years were spent in the sugar beet fields and factories. He was literally to "the sugar manor born," and when his parents migrated to America, young Claus found his way, while yet a lad, into one of the Stewart sugar refineries in New York, where his industry and natural inclinations soon advanced him to positions of trust and responsibility in the

practical working departments of the factory. Later on, in 1861, he removed to California, and became connected with the Bay sugar refinery, of which George Gordon was the manager. On the retirement of Mr. Gordon, Mr. Spreckles became the manager, and was enabled to greatly increase its business by securing the Hawaiian sugar crop for several years. About this time he built the California Sugar Refinery. His more recent history is well known to our readers, how, after having placed the refining business of that state in a very prosperous condition, he launched into the sugar beet industry at Salinas, near Monterey, which has continued to expand to this date. His bold enterprise did much to stimulate the production of beet sugar not only in California, but throughout the Pacific slope. While his efforts have been in the main successful, the last year's beet crop was only partially so, owing to the prevailing drought, which also affected all the crops of that state.

While every one must applaud the efforts to establish the beet sugar industry in the United States, it is wise not to make such haste as will result in discouragement and loss to those who are not able to bear it. Several years must elapse before each factory can be expected to bring all parts of the co-operative enterprise into successful working order. Quite naturally the entire crop of beet sugar for the past year has fallen much below the expectations of its very sanguine friends, not through any fault of its promoters, but from lack of experience and adverse climatic conditions, which no foresight could prevent.

The beet-growers of the United States—many of whom start in without ever having seen a beet-field, will have to be educated to this new business, as the successful cane planters have been educated by years of hard experience, for beets can never be raised by broadcast sowing of the seed, then leaving dame nature to do the rest, as is done with grain, but they will have to learn how best to prepare the soil, how to secure the best seed, and then how to care for and thin the plant. Beet culture is intensive gardening on a large scale, and in this consists the success of the European beet-growers. Says a recent writer on this subject: "There is not in the vegetable kingdom, probably, another plant that will so quick-

ly impoverish the soil when fertilization is insufficient or wholly wanting. It is therefore evident that success in the cultivation of the sugar beet is dependent upon bountiful and unstinted fertilization."

In a recent address delivered by Dr. Wiley, he shows clearly that there is use for all the cane and beet sugar that can be made in the United States for many years to come. The present deficiency has to be paid for each year in hard coin, which absorbs a large amount of capital that should remain in the country. The following is a portion of the doctor's remarks:

"We have here a rapidly growing country. The time is not far distant when the United States will have a population of one hundred million souls and it will make us the strongest nation in the world in touch with each other. Other nations, like Russia, etc., may have a large number of persons nominally under one central government, but really consisting of scattered peoples and not in sympathy with each other or the central government. I say then the time is not far distant when we will see this country the most populous and the most powerful nation in the world for the power of a nation is in its community and belief. Now how does this fact have any connection with the sugar beet industry. In the first place we see that the consumption of sugar here is constantly increasing.

"We produce less than 300,000 tons of sugar, now what will the possession of these few islands have to do with our prices? For twenty years we have recived free of duty the sugar of the Hawaiian Islands. Under that treaty the product of the islands have grown from 150,000 tons to 300,000 tons and it would grow still larger if it had more area in which to expand. Porto Rico can never produce much sugar, and though all industries will undoubtedly thrive under American management, still two or three hundred thousand tons is all we may expect. Of the Philippines we know nothing, and although in the future we may expect something great, still we can count upon nothing sure at the present time.

"Cuba, is in my opinion, will remain a foreign country for some time yet to come, so admitting all of these free of duty, we find that we still have millions of tons to provide for. Now the production of sugar is something more than a sentiment, no one is going to bend his back to thin sugar beets for fun,

or unless there is some return for it. Admitting all these outside things I am first for the United States under all conditions, and I sincerely believe there is a great future for us as regards the sugar industry; for with all I want to see this a prosperous country, and want to see us manufacture everything we can at home. In all these years I have had the profoundest belief in America's ability to produce the sugar we consume. We have the soil and we have the brain, and after all, the brain mixed with the soil is better than commercial fertilizer. From the present outlook we should all certainly be encouraged by the many evidences of progress."

———:o:———

GREEN MANURING WITH LUPINS AND FLORIDA VELVET BEANS.

Niulii, March 16th, 1900.

Editor Planters' Monthly: Dear Sir:—Your article on Green Manuring with Lupins in your February number was read with interest. This is a subject that needs keeping to the front, for it is admitted that "Humus" is being rapidly used up from soils; this is owing not only to continuous cropping, but largely through burning off trash after each crop of cane has been reaped.

The importance of vegetable matter as food for crops, and as a moisture holding medium is beyond question, and side by side with this need for humus, comes the question of nitrogen gathering plants. This question involves the selection of suitable kinds; the method and time of planting; and the ploughing under of same; on each of these points there are some difficulties to be overcome, especially with the latter.

Mr. Lidgate's success with Lupins should encourage others to persevere, on his, or similar lines. We have tried Cow peas, Lupins, and Bengal Beans, (Mauritius) which last are similar to the Florida Velvet Beans of which I have a few plants. The Cow Peas became covered with an Aphis and died out, the Lupins did not amount to much, except in hollows where soil was good. From my observation the Bengal Beans will grow about as well on poor soil as on good, provided they are planted in showery weather.

The possibilities are for two crops of beans between the time of cutting ratoons and planting land again with cane.

The volunteer shoots from ratoon stubble can be pulled up and eaten by animals for or during a few weeks, and beans can be planted about three feet apart, more or less, with trash on the ground. The tug of war is to plow under this crop of beans and trash. I believe that larger Disc plows than those we have in use (Louisiana Rotary) will be needed, probably with 3-foot disc, so as to cut through both trash and beans without fouling. After this operation has been effected, beans can again be sown, and a heavy chain harrow, or the Notley pointed harrow turned on its back, used for covering beans and leveling land.

The first crop of beans and trash should be pretty well rooted by the time the second crop is ready to plow under. The first crop will be best planted in March or April and plowed under in November before beans ripen.

In planting beans for seed, it is well to have volunteer ratoons growing with them for the vines to train on, and so have bunches of beans hanging up, instead of rooting on wet ground. A light crop of volunteer cane with first crop of beans can be cut for fodder as ploughing progresses.

We can supply a few bags of beans as a starter to those who are desirous of having then, at 4 cents per pound, delivered at the port of Mahukona; provided applications are early enough, and not too numerous. We have been sowing lands lately ploughed with these beans and apparently have more seed than we actually need, left for planting ratoon cut land, amongst the trash. I would say that we have had to shell pods of beans by hand so far, but have come to the conclusion that they can be shelled by a machine, provided they are thoroughly dry, and I notice that about the same thing is said regarding the Florida Velvet Bean by a Floridian.

Yours truly,
ROBT. HALL.

Latest telegrapie advices from New York of March 31, report a firm market at 4:7-16, with light offerings from Cuba, the supply from that source having been largely reduced by drought. The prospect is that present prices will be maintained for some time, and possibly with a slight advance in the price.

THE EUROPEAN BEET-SUGAR PRODUCTION.

The production of beet sugar in Europe in 1899-1900 shows a very decided increase over last year's crop. The United States Government has issued a report on the subject which gives the acreages and the yield for the past two years, as follows:

	Area Sown.	Raw sugar produced. 1899-1900	1898-99
France	631,000	910,000	830,000
Belgium	143,000	230,000	209,000
Holland	115,000	170,000	150,000
Germany	1,057,000	1,830,000	1,722,000
Austria	795,000	1,015,000	1,039,000
Russia	1,191,000	880,000	795,000
Sweden	65,000	100,000	60,000
Denmark	29,000	55,000	35,000
Other countries ...	42,000	60,000	45,000
Whole of Europe.	4,068,000	5,250,000	4,885,000

:o:

LOUISIANA'S SURPLUS PRODUCT OF RAW SUGAR TO BE SENT TO LIVERPOOL.

Arrangements have been completed for the establishment of a line of sailing vessels between New Orleans and England, the idea being to take care of the surplus products of Louisiana in the matter of low-grade molasses and sugar. Heretofore these products have been something of a disadvantage to the cane raisers, because of the high freight rates and the other charges attendant upon their shipment to New York and abroad. The plan completed will, however, obviate these difficulties, and place the foreign markets within easy reach of the sugar planters of the State. Oscar M. Edgerley, a commission merchant and shipowner of New York, was here recently for the purpose of discussing the matter of exports with a number of prominent sugar planters. Included in his plan was the prospective inauguration of a line of sailing vessels between New Orleans and Glasgow or Liverpool. His idea was to start this line immediately, provided he could

secure further supplies of the cane products he desired. The sugar men said it would not pay them to make third-grade sugars and the molasses therefrom, as the price for better grade goods was now more profitable, with a good demand for the product in the market of New Orleans. Mr. Edgerley was, however, assured of at least 8000 barrels of low-grade molasses, to be delivered on the river front here in the late spring. He then decided to begin sailing vessels from this port in May or June. **The first vessel to sail will be the bark Obed Baxter, which will clear for New York. She will carry** about 3000 barrels of molasses, and to make up the remaining portion of her cargo will take rice, sugar, staves and lumber.

The bark Mary Hasbrouck will follow the Obed Baxter, and together they will take the 8000 barrels of molasses, as above mentioned.

Next year the regular line will be established, and there will be five sailing vessels put in the trade. These vessels will start from Baltimore or Philadelphia, bringing coal to New Orleans. Here they will load sugar, molasses, lumber, etc., for England. At Glasgow or Liverpool they will load coal for the West Indies, and in the West Indies they will load sugar for New York. In this way New Orleans will henceforth secure a monthly sailing vessel for the principal ports of England. Mr. Edgerley received great encouragement from the sugar, lumber and cotton interests in this city, who assured him that his venture will be liberally supported. His plans are matured to a point where he feels confident that five sailing vessels can be profitably kept in the New Orleans-Liverpool trade.

Speaking of the advantages to be gained by the sugar men under such an arrangement, Mr. Edgerley said that from seventy-five cents to $1 per barrel would be saved on the entire crop of low-grade molasses exported to England. At present if the planter realize $4 a barrel for this class of molasses he has to pay out of that fifty cents for freight to New Orleans, $1.50 for freight to New York, and $1 for each barrel. In other words, the cost of putting the product on the market is now $3 per barrel. He proposes to reduce these charges at least $1, thus increasing the profit to the planter from $1 to $2 per barrel on his entire export crop.—Picayune.

MEANING OF TERM "UNITED STATES."—The Ways and Means Committee, of the House of Representatives, has adopted the following opinion:

1. That the term "United States" in that provision of the Constitution which declares that all duties, imposts and excises shall be uniform throughout the United States means and is confined to the States that constitute the Federal Union, and does not cover also the territory belonging to the United States.

2. That the authorities treating of this question and decisive of it are those that treat of and involve in their decision the question as to whether the Constitution, expropriо rigore, and independent of treaty stipulations of Congressional legislations, extends to territory ceded to and acquired by the United States.

3. That the weight of these authorities sustains the following proposition, viz.: (a) That the United States may acquire territory either under the treaty-making and war declaring power of the Constitution, or by virtue of its general powers of sovereignty as a nation, in which are included all the inherent powers of sovereignty, both of the United States as an independent nation and all the powers of the several States as sovereigns. (b) That the power to govern acquired territory results from the right to acquire, and also from the provision of Section 3, Article IV., of the Constitution, to wit.: "Power to dispose of and make all needful rules and regulations respecting the territory and other property belonging to the United States." (c) That Congress has power to govern acquired territory independent of the limitations of the Constitution, but in cases where the territory has been acquired for the purposes of Statehood Congress "would be subject to those fundamental limitations in favor of personal rights which are formulate in the Contitution and its amendments, but these limitations exist rather by inference and the general spirit of the Constitution, from which Congress derives all its powers, than by any express and direct application of its provisions." (d) That Congress has power to govern Porto Rico and the Philippines independent of the limitations of the Constitution.

The White Transparent sugar cane, that hardy variety which has stood the recent long drought in Barbados in a wonderful way most satisfactory withal. Speaking of the vitality of the sugar cane, the Agricultural Reporter says:—"Any other crop would have been killed outright by the long persistent drought. There is absolutely no other staff on which we could lean with so much certainty, no other plant that in this Island of fitful rainfall could take its place." Then as to the relative qualities of the varieties:—"And of all the varieties which we plant it may be said that none combine with more certainty, hardihood and sugar-yielding quality than that known as the White Transparent. It was the first variety to come to the rescue of our fungus-stricken Island, in general adaptability to various soils none has so far surpassed it, or shown better drought-bearing habit. In a rich soil with plentiful rain No. 147 may run ahead as a sugar-maker, but its average under hardships and all kinds of varying circumstances will hardly equal that of the tough White Transparent. No doubt in Nature's womb there is a better, as possibly there may be better men than now live, but the plant to maintain an industry must above all have staying power. Fields of White Transparent will for a long time yet be required as a backbone, and reserve to those flashy varieties, which, under favouring skies, and in a genial soil are wont to make a brave show, but wilt and wither in the hot sun of reverse."

Has the seedling No. 147, which is named above, and frequently referred to as a superior variety, ever been introduced into Hawaii? If not, why not? Give it a fair trial here. It may surpass the Lahaina cane.

Locusts in Australia.—In the New South Wales Ag. Gazette for March is an illustrated article describing the locusts, which have been very destructive there the past year. These locusts resemble the common grasshoppers, but are a little smaller and of a brownish color, while the grasshoppers are green. Until last year the Australian locusts were comparatively few and harmless, but during 1899 they covered thousands of acres, destroying nearly every blade of grass and many plants. The locusts swarms were confined chiefly to the

plains, and in one place over 20,000 acres of wild land were cleared of the grass, and every green leaf. The timber lands, however, served as a check to their advance, and turned the swarms off in different directions. The breeding grounds of these pests are in thinly-settled and unoccupied plains, but they migrate in immense swarms. At times these swarms cross the railway tracks, and enter the windows of the passenger cars, proving very annoying to travelers. If we are not mistaken, there are no locusts here in Hawaii as yet, though grasshoppers are occasionally seen.

———:o:———

SUGAR PLANTATIONS IN CUBA.—The question is often asked, how many sugar plantations exist at present on the Island of Cuba? In 1868, previous to the ten years war, there were 1,250 plantations; several of which were destroyed, especially in the provinces of St. Iago de Cuba and Santa Clara; at the end of the war, in 1878, when slavery was abolished in Cuba, field labor was forcibly re-organized on a new basis and most of the smaller plantations, whose owners lacked means to establish thereon large and powerful machinery and modern apparatus, were transformed into cane tenancies, and, at the commencement of the last insurrection, in February, 1895, the number of plantations was estimated at about 500. Of these about 100 have been totally destroyed either by fire or dynamite, during the struggle between Spaniards and Cubans, which ended through the action the United States took in the matter.

Of the 400 plantations left on the island about 150 to 200 are grinding this year and the balance will need, in order to be able to resume active operations, to be previously thoroughly repaired in their buildings, machinery and apparatus, which have considerably suffered from the effects of the almost total abandonment in which they were left during five consecutive years.—Corr. Louisiana Planter.

SUGAR AT HARVARD UNIVERSITY.—From a recent issue of the Havana Herald we learn that Mr. Edwin F. Atkins, of Boston, owner of the noted Soledad plantation, near Cienfuegos, Cuba, has given Harvard University $2,500 for the prosecution of the study of the improvement of sugar cane and other tropical plants; $2,000 thereof for a fellowship for 1899-1900, and $500 for the preparation of an exhaustive card cata-

logue of works on sugar cane culture and investigations. This new movement at Harvard, for almost surely Mr. Atkins knew his gift would be acceptable, together with the offer of Harvard to accept 1,000 Cuban teachers at its summer school this year, tuition free, constitute a splendid contribution on its part, not only to Cuba's welfare, but to the better study of the sugar industry in all its phases.—Louisiana Planter.

Secretary Lelong of the Board of Horticulture, announces the most important discovery of the Board, and one which will mean millions of dollars to horticulturists. For many months past Secretary Lelong has been endeavoring to grow cuttings from different species of trees by grafting them on a foster mother root. Success has crowned his efforts, and he now gives the result of his work to the horticultural world. His discovery means in a nutshell that you can take the limb of any kind of tree, put a foster mother limb to it, and in a very short time the limb will take root and become a tree. Limbs two feet long were taken from Washington naval orange trees, and united with foster mother roots and placed in a sandy soil, and in eight months they had attained a growth equal to two or three years by the ordinary methods. As a result of this discovery, Secretary Lelong says that horticulturalists will not have to wait five years for orange trees to bear, as they can probably be advanced to the bearing stage in one year from the operation. With olives the bearing time can be reduced from four years to one year, and the same is true of apples, pears, and peaches. This will make an enormous difference financially to fruit growers, if the facts are as stated.—Cal. Paper.

The increase of tuberculosis among cattle, on these islands is becoming a very serious matter for the government to deal with. One of the best papers on this subject will be found in the Planter's Monthly, for September, 1897, page 409.

It is stated that the French Government are spending £4,000,000 on the Exhibition and foreign nations £2,000,000; that nothing like it has ever been seen, and that 150 millions of people will visit it.

DR. WM. MAXWELL'S REPORT UPON THE STATE OF THE SUGAR INDUSTRY OF QUEENSLAND.

Brisbane, 30th January, 1900.

Sir:—I have had the honor to comply with the request of your Government to "Investigate the Condition of the Sugar Industry of Queensland," and I hereby beg to submit to you my Report.

I have the honor to remain, sir,

Your obedient servant,

WALTER MAXWELL.

The Honorable the Secretary for Agriculture, Brisbane.

The sugar-producing locations of Queensland comprise areas of the low lands lying towards and bordering upon the East coast line of the colony. These areas are separated from each other by considerable extensions of intervening non-sugar country, and these intervening tracts make it advisable to resolve the sugar lands into three natural and well defined centres or districts, whose respective characteristics are resting upon variations in climatic conditions and of soil origins. The sugar-bearing areas in their entirety, at the present time, extend from the southern boundary of the colony northward to the locality of Port Douglas, thus covering portions of the vast line of surface lying between the 29th and the 16th degrees of south latitude.

By aid of the geological surveys and notations of rock formations, prepared by R. L. Jack and his assistants, and due also to the courtesy of the Chief of the Meteorological Bureau, Mr. Wragge, the data were obtained previous to leaving Brisbane, which made it possible to prepare a plan for the visitation and inspection of the widely separated sugar-growing areas, and for the division of these into definite centers or districts. The three main districts within which the sugar-producing lands are aggregated are:

1. Bundaberg District, including the subdistricts of Gingera, Woongarra, and the Isis.
2. Mackay District, embracing all sugar lands north and south of the Pioneer River.
3. Cairns District, which, for reasons to be given, is made to include all sugar-bearing localities north of Mackay.

Each of these districts and the subdistricts which compose them, was visited and carefully inspected, excepting the sub-

districts of the Herbert and the Johnstone River, in the district of Cairns, and the data accumulated, bearing upon the purpose of this investigation, are given under the several succeeding headings.

CLIMATICS.—The first and dominating factor in general climatic conditions is the relation of the rainfall to temperature. If the maximum rainfall, or wet season, is concurrent with minimum temperatures, or the cold season, the most extreme state of unfavorable conditions is caused; and on the other hand, where maximum rainfall and maximum temperatures, and minimum rainfall and lowest temperatures fall together, the most auspicious climatic state is found. This latter is the state of the climatic situation of Queensland, and its supreme bearing upon the possibilities of the colony's agriculture can only be appreciated by the imagination in depicting a direct opposite combination of conditions. If the wet season in these latitudes were coincident with the cold months of June, July, and August, and the rainless season covered the months of greatest heat, vegetation would be rendered almost impossible. This highly unfavorable combination exists over the Sandwich Islands and other countries, where the wet season falls with the cooler months of winter and the summer season passes with a minimum of rain, thus incurring the vital need of irrigation. In the latter countries the situation is saved by the smaller variations between the temperatures of winter and summer. If the winter of Hawaii, with the heavy rainfall, were as cool as the cool season of Queensland, sugar production would be impossible in the Sandwich Islands. From these considerations it is thus seen that, in the matter of the climatic conditions in general, the most supremely advantageous combination stands to the credit of Queensland.

Coming more specifically to the climatic conditions of the several defined districts of Queensland, a very notable variation in these is found. By aid of such data as were put at our service by Mr. Wragge, a statement in average is made covering the three districts, and based upon the observations of four successive years, from 1894 to 1897 inclusive.

DISTRICT	Humidity of the air, 4 years	Mean of min. temp., 4 years	Mean of max. temp., 4 years	Mean temp., 4 years	Highest temp., in 4 years	Lowest temp., in 4 years	Mean rainfall, 4 years
Cairns	73.1	67.6	83.3	75.4	100.4	45.1	90.0
Mackay	72.2	63.9	79 8	71.9	96.6	36 6	72.9
Bundaberg	70.5	61 3	83.4	72.3	99.6	36.6	49.7

The rainfall given for the Cairns district is the average of ten years, the data being furnished by Dr. Reed, the present manager of the Colonial Sugar Refining Company's Hamdon Estate. These data set forth generally the main prevailing variations and differences in the climatic conditions of the respective districts. It is not claimed that the temperature did not fall a degree or two lower than is stated during the four years. In low damp places the frost line may be touched, whilst the main surrounding district is several degrees warmer. The occurrence of killing frosts in any district appears to be so rare as to cause special remark when it occurs, which indicates conditions very far removed from those obtaining in such a sugar-growing country as Louisiana, where frost is an annual occurrence, and where precautions are regularly taken to protect some part of the crop against its action.

If the climatic conditions of the several districts are compared with those of other countries it is found that the humidity of the air and the mean annual temperature of the district of Cairns are almost identical with those of Honolulu; the difference lies in a greater range of variation in the temperatures between day and night and between summer and winter in the Cairns district. In Honolulu the highest recorded temperature is 87 degrees, against 100.4 degrees in Cairns, whilst the lowest temperature of Cairns is about 7 degrees lower than that of Honolulu. Generally speaking, however, it can be said that the temperature conditions of the Cairns district, whilst being somewhat less favorable than those of the city of Honolulu, are more favorable to sugar production than the average of the conditions covering the whole of the sugar-growing areas of the Sandwich Islands, all of which are less auspicious than those of Java, where the temperature variations are not only small but the mean annual temperature is over 80 degrees. The conditions of the Mackay and Bunaberg districts, whilst being distinctly less favorable than those of the Cairns district, are very much more adapted to sugar growing than the conditions found in some other countries where cane sugar is being produced. The more particular significance of the climatic variations spoken of in connection with the respective districts will be noted where they are found to bear on other matters.

Soils.—As soils are derived in the main from rocks, it is apparent that soils generally must vary in character and composition, as the rocks vary from which they have been produced. The rock formations which underlie the soils of certain sugar-bearing areas, and more especially those that have contributed to the production of the lands of the great alluvial levels, are several, and are found to be very distinct in

character, which is very apparent when the whole region is traversed from the Bundaberg district to its termination in or beyond Cairns. These variations in the rock sources of the soils, and consequently more or less in the soils themselves may be briefly set forth in the following comparisons:

District	Rock Formations Furnishing Soils	Soils
Cairns	(*a*) Permo-carboniferous, granite, trachytic, and volcanic rock	(*a*) Partley shaley, sterile soils, but in the main deep alluvial sandy loams.
	(*b*) Basaltic rocks	(*b*) Rich, red, volcanic soils.
Mackay	(*a*) Permo-carboniferous, granite, admixed with more recent basalt	North of river (*a*) Shaley in parts, with better alluvia over the lower levels.
	(*b*) Mixed basaltic beds	(*b* Mixed volcanic soils.
	(*c*) Mixed granite permo-carboniferous dioritic, basaltic	(*c*) (On river banks), rich silicious alluvia.
Bundaberg	(*a*) Permo-carboniferous, Trias-Jura, granitic, trachytic and volcanic	(*a*) Rich, alluvial delta soils, and also large sterile areas.
	(*b*) Pure basaltic lavas	(*b*) Deep, rich, red, volcanic soils.

The rock systems that have furnished the soils of the Johnstone River lands are similar to those which contributed to the alluvia of the Cairns (Mulgrave) district. The wide areas of basaltic formations surrounding the Johnstone valley can also have yielded up their rich, basic constituents to the formation of the Johnstone lands. The alluvial lands of the Herbert can hardly combine much of volcanic materials in their composition. They, moreover, are surrounded by a system of rocks (Devonian) peculiar to that region, and which distinguishes the Herbert district, as the Bundaberg district is distinguished by the Trias-Jura formation, from any other region in Queensland. The Burdekin Delta sugar lands comprise large levels of rich alluvia, whose constituents have been gathered by the great river from wide areas or granitic, Devonian, and basaltic formations. This subdistrict was specially visited and examined in connection with the question of economic irrigation.

Viewing the soils of the sugar areas from a more common standpoint, it is observed that the extensive areas in the Cairns district are made up of three more or less distinct types of soil. On the Hambledon Estate the soils are shaley, the larger part not bearing the stamp of great natural fer-

tility. Round about Mulgrave, deep rich alluvial soils cover extensive breadths, and these are interspersed by true volcanic areas, whose soils are deep and fertile. These red soils overspread also the Aloombah vicinity, and are covered with a dense scrub, which reaches down to the Russell. According to the official figures furnished by the Cairns Divisional Board: "Covering the area reaching from the Russel in the south to the Baron or Double Point in the north, there are some 60,000 acres," which figure, if reduced by one-third, leaves a large and fertile area of country admirably adapted to sugar growing.

The Burdekin soils now under sugar bearing are chiefly deep to moderately deep, heavy, dark loams, resting upon subsoils in some cases granular and porous and in others close and clayey. The areas which run into more or less pure sand cannot be economically used for cane-growing. The whole area of the Burdekin sugar district is the work of the great river, and the soils are a true delta alluvium, the lower levels being darker and richer in vegetable matter, the result of previous submergence, whilst the higher lands are spreads or banks of sand.

On the north side of the Pioneer River the lands of the Mackay district are extremely broken and hilly, the result of great volcanic disturbances. In the locality of Nindaroo, the areas under cane are mainly the sides of acutely sloping hills, whose soils are an indefinite mixture of granite stone mush and basaltic residues. Where the lava has more prevailed, the soils were very rich, and are still the better, but as a result of the prevalence of silicious matter, the great slopes of the hills, and the exposure to heavy rains, the higher land soils are terribly depleted, their more soluble matters having been removed and deposited over lower levels. The Habana Estate soils are much more generally volcanic, the eruptions, in their day, having spread the lavas more liberally over the land surface of that locality; consequently, the Habana soils were naturally richer, but the acute slopes of the hill sides have exposed them to extreme leaching, whilst the lower valley lands are too small in area to help out the depleted uplands. The lands on the north side of the Pioneer River, keeping away from the river banks, on account of their natural lay, as well as because of their present exhausted state, do not offer any immediate inducements for sugar growing. The large areas of alluvial soils, which are spread out along each side, but more particularly to the south of the Pioneer River, are generally sandy loams, whose depths over the lands nearest to the river are from 30 inches to 18 inches, these depths thinning out as the lands fall back from the river. The subsoils are in part gravelly and porous, and in

places more clayey and close. Small areas, that were in previous times under more constant submergence, are very close, the ground being the so-called glue-pot clay. The greatest portion of the alluvial or river bank lands in the Mackay district have been very fertile, and, on account of their location and level, are to be regarded as highly favorable sugar-growing areas.

The large Bundaberg district resolved, as it is naturally, into three notable subdistricts, is composed in the main of the volcanic lands forming the Bingera, Woongarra, and the larger Isis scrubs. The soils of the scrub lands in each of these districts are strictly volcanic, being derived from unmixed basaltic lavas. Over the large and beautifully-lying breadths of level lands, the soils are of great depth and native fertility. In the immediate localities of previous volcanic activity, and where the lands are more broken up, and marked by acutely sloping hillsides, which is particularly the case in the North Isis, the soils are thinner and of great variation in color, and on account of their special exposure to leaching will not be of durable fertility. All soils of the nature of the level, dark red scrub lands are of great natural fertility; but, due to their special chemical nature, are subject to constant and comparatively rapid depletion, if the right means for the maintenance of their productiveness are not used at once when they are brought under crop. In addition to the scrub lands, there are soils of other characters, such as the dark soils outside the Bingera Scrub, and the low alluvial levels of Fairymead. Notwithstanding the native fertility, the productiveness of those dark alluvial tracts is bound up with very express questions, such as drainage.

In bringing together in general expression the observations upon the lands forming the sugar areas in the several respective districts, it has to be said that in each of the districts inspected very extensive tracts have been found whose soils are of great natural fertility and peculiarly adapted to sugar growing.

Present State of the Soils.—Soils may be of great natural fertility, but their productiveness essentially is lessened if the stock of that fertileness is being constantly drawn upon and never restored. Fertility, or richness of the soil, is not the blind expression for an undetermined state of things that is generally understood. It means, and quite particularly, the presence in the soil of definite chemical elements, in given ample amounts, and in certain states of availability or getatableness by the crop. This definition necessarily implies that if given amounts of those elements in the soil are removed by crops and not returned, or by indifferent cultivation are left or rendered unavailable, the sum of the

native fertility must be reduced. This explanation of the causes of diminishing productiveness does not include the agencies over which there is little human control, such as the leaching out of the soil constituents by great rainfalls. It is confined to those causes which men can understand and prevent.

From the standpoint of the definition of soil fertility that has been given we may now go out into the fields of the several sugar-growing localities, and proceed to gather testimony from the men upon the soil as to the crops the lands used to afford, and from the lands and crops themselves a statement of their conditions to-day. In every district, from Cairns down to the Isis, recollections are preserved of the crops that used to be grown. It is not necessary to dwell upon the items of yields where 70, 80 and even 100 tons of cane are said to have been obtained; it is ample for our needs to have before us the common evidence of the virgin fertility of soils as expressed by the ordinary production of 40 to 60 long tons of cane per English acre. It would be as much out of place to doubt these records of earlier crops as to question the act of cane-growing as a past matter of fact. The scrub lands of North Mackay, as well as Mackay's alluvial lands, have borne the average of 40 to 50 tons of cane an acre. Bundaberg claims to have done as much and probably more, whilst the Isis is still dwelling upon its enormous virgin yields of only five to eight years ago. And what is the situation as set forth by the returns and state of the crops to-day? We have, in the course of the investigations conduced in each district, endeavored to procure data enabling a reasonably accurate reply to be made to this question. It has not been possible to obtain full returns of all the respective districts, yet the figures furnished are ample to indicate the situation as it at present exists. The data contained in the following table were furnished respectively as follows:—For the Isis, by the Colonial Sugar Refining Company and Penny and Co.; for Bundaberg, by Messrs. Gibson and Howes and Mr. Elliott; for Mackay, chiefly by Mr. T. D. Chataway of Mackay; and for Cairns, by the Colonial Sugar Refining Company and the Mulgrave Central Mill Company.

Districts		Number of Growers	Number of Acres	Yeild per Acre
				Tons
Bundaberg	Isis	184	7,326	22.7
	Bundaberg	93	4,362	18.1
Mackay		.....	18,000	10.8
Cairns		124	5,270	20.1

The yield per acre of Mackay, which is the oldest sugar-growing district, is lamentably low. Mr. Chataway, however, states that the total area of cane crushed in the district during the last year was 20,000 acres, and the yield of sugar per acre was only 0.88 tons; and, further, that the average yield of sugar per acre during the past twelve years has been only 1.28 tons. The returns of certain individual farmers in North Mackay show a production reduced to merely four or five tons of cane per acre, whilst in certain of the other districts yields of seven and eight tons per acre are recorded. The bitterness and depression of hope which these statements must have cost attest their claim to be accepted. These data, then, put before us a more or less adequate statement of the situation as it is found to-day, and they furnish a most palpable view of what has transpired since the period when the sugar-producing areas were virgin soils, and yielding the large crops that have been stated.

CAUSES OF FALLING OFF IN YIELDS.—As it has been already indicated, depreciation in the producing power of soils is chiefly due, first to the removal of elements from the soil by cropping, and not restoring those elements; secondly, to poor cultivation; and, finally, to diseases which are very liable to follow in the train of soil exhaustion and a lessened vitality of plant life.

In the course of widespread inquiries bearing upon the question of fertilization, which means furnishing in the form of manures the elements required by the cane, and which by cropping are in time gradually removed from the soil, evidence has been furnished showing that no system of rational fertilization has existed; that the cane lands, in the main, have never received manures, and where manures have been used, it has not been by those methods which are known to command results. Numerous individual statements have assured us that in some of the oldest lands, and where as far as the thirtieth crop is now seen in growth, not a pound of manure has ever been given to the ground; but not only have no artificial fertilizers been applied to restore the elements removed, the refuse parts and products of the crop have been wasted away. The leaves or trash have been burned, thus scattering to the winds the nitrogen and humus matter intended for the soil, and exposing the ashes also to being frequently blown away. The molasses leaving the mills, which also contain notable quantities of the vital elements taken out of the soil, is found running into streams or lagoons, and not in one case has it been seen returning to the land. The Colonial Sugar Refining Company's officials have stated that they cannot "give their filter press refuse away," and these

matters are rich in given elements that the soils and the crop are asking for.

In the matter of cultivation, it is made to appear, by the descriptions of the growers themselves, that the modes of handling the land have been crude and superficial. In the deepest soils ploughing has been shallow, and more adapted to preparation for barley or oats crops, than for the larger and wide-reaching root-system of the cane in its search for food. A thorough preparation of the ground before planting, meaning the turning over of the surface soil to a depth that its staple will bear—from 9 inches to 2 feet—and the movement of the subsoil, followed by cross ploughings and deep cultivating, is the groundwork of the crop. In fact, as it is frequently said, "The crop is made before it is planted." The lighter cultivation following planting has been, and, as the fields indicate to-day, is still, very defective. As exceptions to the character of the cultivation in general, it has to be said that there are a few examples of very thorough cultivation. Good ploughing and cross-ploughing and a thorough exposure of the soil to the sun and air before planting are to be seen in cases to-day. But in many of these instances the better cultivation is not being supplemented by manures, so that the work of the soil exhaustion is going on even more rapidly than where the poorer cultivation obtains.

It must be clearly explained that deep cultivation, whilst it brings into a state of availability a larger mass of the plant food contained in the soil, it does not add to the original stock. On the other hand, it tends more rapidly to deplete that stock, since, as the deeper and better cultivation brings more of the natural elements from a greater depth within the reach of the plant, the crop is larger as a consequence, and the larger crop takes out and removes from the soil a greater quantity of its vital constituents, thus rendering the depletion finally more complete and permanent, unless the drafts are being made good by rationally measured returns of those constituents. In sugar-growing countries familiar to the writer soils yielding the largest crops receive the heaviest applications of manures in return. Upon its surface, it is apparent that that it is the only mode of maintaining the yielding power of soils.

Ratooning requires to be considered as a part of the system of cultivation and as one of the immediate causes of the falling off in yields. The primary aims of good cultivation comprise the breaking up of the soil to a good depth and the exposure of the earth, containing the dregs of the previous crop to the oxydizing and sweetening action of the sun and air. Ratooning requires that ploughing after each crop shall not

be done, and that the old root-system of the previous crop shall be left practically undisturbed, and allowed to rot away in the closed soil at its leisure. When this has gone on for five, seven, or even ten years consecutively, each old furrow has become the grave of the rotting root-masses of as many crops, and, as it may be possible to show, the seedbed and breeding grounds of other forms of life. In given kinds of soils, such as the highly basic, porous and more naturally sweet volcanic earths, the souring and fouling effects of continuous ratooning are not so soon seen. In the course of the examinations in the several districts we endeavored to obtain precise figures bearing upon the matter of the relative production of "plant," "first ratoon," and "other ratoon" crops. It was not possible to obtain these data in all the districts, but in Cairns and at the Isis the yields of the several kinds of crops had been kept separate and the data were furnished to us, and are given as follows:

Districts	Number of Growers.	Plant Cane per Acre.	First Ratoons per Acre.	Other Ratoons per Acre.
Isis	145	30.1	23.2	16.2
Cairns	55	24.1	22.1	15.1

Apart from the fouling action upon the soil already explained, the data show the gradual falling off in each succeeding crop after the first ratoon until only seven or eight tons per acre in the sixth or seventh ratoon are obtained. Even if such a ratoon crop does not directly lose money, it is a loss by reason of its action on the soil.

It is to be remembered that the Isis is the most recently opened up sugar-growing district, and that Cairns is the next youngest; and that they consequently afford the best illustrations of the direct results of continuous ratooning, since the results cannot, in these comparatively young soils, be due to soil exhaustion only, or even in the first degree; yet in the examples furnished by both districts the results are very emphatic. Such effects of continuous ratooning for numerous consecutive crops—involving bad cultivation, and the fouling and depleting of the soils—are not the only grave results. These effects can also in their turn become the causes and precursors of other evil things.

Pest and Diseases.—The grub pest has been a severe scourge in given districts, and has cost the farmers and planters great care and expense. The statements of many growers indicated that the ravages of the grubs are the least in the plant cane, becoming greater, and reaching the worst in the oldest ratoons. Our personal examinations have in all cases

confirmed those views. The grub can be found at the roots of plant cane sometimes, but in isolated numbers; in ratoons, however, and especially those that have been in the ground several years, the old roots are infested with the pest. Numerous patches of cane that were yellowing and dying off examination turned out from six to fifteen grubs in the old cane and at the base of each stool. In some four instances the growers asked the writer to go and investigate "bad cases of gum," but in each of these cases the trouble was most pronouncedly found to be grub. The confusion, however, is not remarkable, since the grub and the gumming disease are in some examples working together. The examinations leave no doubt in the matter that the continuous ratooning for successive years, that the dead condition and fouling of the soil which after one or two crops it involves, provides all the most favorable conditions for the propagation of the grub, and furnishes another powerful reason for the introduction of a more rational and thorough system of cultivation.

More recently complaints have become current that fungus diseases are fastening upon the cane. The writer has not been able to meet with very pronounced examples of this kind. It appears clear, however, that such is the case, and it is also to be expected that the evidence will become still more clear and pronounced unless the underlying causes of numerous such foul growths are removed. An impoverished soil, and a weak and debilitated crop, growing in the unmoved and unsweetened *debris* of several preceding crops, provide all the desiderata necessary to the progress of the low fungus growths. The weak crop, in a worn out soil, aptly resembles the ill-fed Asiatic in his foul conditions, and with whom the invisible author of the plague seeks to try conclusions.

A matter, which is pressing itself most upon the concern of the canegrowers just now is the gumming disease. The disease is known in Brazil and Australia, and is spoken of in confusion with the "Sereh disease" in Java, and also in Mauritius, but it is not conclusive that it exists in the latter countries. Dr. Cobb has studied the disease in this colony and New South Wales, and states that it is due to the action of a bacillus (*Bacillus vasculorum*). We have no statements to offer along the line of the entomologists. The conditions, however, surrounding the local cases of the greatest virulence impress us that it may be found that the cause discovered and amply defined by Dr. Cobb is a secondary cause, and owes its prevalence to other less precisely definable physical causes. The disease has been traced by Dr. Cobb to the personal initiative of the *Bacillus vasculorum*; but we have not yet determined the primary conditions which enabled the bacillus to locate and begin its work, and which still aid

it in pursuing its ravages with a more pronounced virulence. The matter is too complicated in its nature for the writer, with the necessary limited observations, to speak definitely upon, but attention is called to certain cardinal points in the modes of distribution of the disease. It has been ascertained on repeated authority that, on the one hand, when gummed cane seed is planted in virgin soil the crop is highly subject to gum; and, on the other hand, when seed free from gum is planted in soil that has produced gummed cane, the crop is also equally liable to gum. These observations indicate that not only the cane is infected, but also the soils have been seeded and are infested with the disease. These indications are so strong as to make it advisable to consider any remedial measures from the double standpoint of the soil and the seed. In fact, the situation drives our considerations back once more to the question of the state and treatment of the soil; since, apart from the question of the soil being infected with the disease, if it has been reduced in fertility, and the crops growing upon it are rendered less vital and resistant, then the disease could increase its power and ravages in some proportion to the reduced resistance. It appears quite safe to say that amongst measures to be taken to resist and oust the disease, the two primary ones are, first, a thorough fallowing of the infected lands, and an absolutely reliable system of selection of the cane, such as will furnish security against the use of gummed seed. Beyond these general observations on the disease the writer, at present, is not able to go. The disease, however, in some measure similar to the occurrence and ravages of the grub and other troubles, is bound up with the consideration of the causes of the falling off in yields. Quite certainly, any remedial steps taken for the rebuilding up of the producing power of the soil and of the vitality of the cane will also be actions begun for the resistance and removal of pests and diseases. The study and selection of varieties can only be supplementary to the primary measures stated, since the strength of the most resistant variety will sooner or later succumb if the fundamental elements of resistance are absent.

Irrigation.—There is only one example of artificial irrigation being practiced at this time. A special visit was made to the Pioneer Plantation, on the Burdekin delta, to see it in operation. Mr. John Drysdale, who is in control of that estate, devoted very considerable time to showing his methods and results. The lands lie with great advantage for the experiment, and the rainfall of the district is so small as to render irrigation a necessity. As a result, the average production of all the lands in the hands of the Pioneer Estate, including plant and all kinds of ratoons, is 25 tons of cane

per acre. Some small areas upon the plantation, where water could not be applied, are bearing not more than one-third of the weight of cane, and the crops grown by certain farmers in the same district, who also do not use irrigation, are in a similar condition. There are strong reasons for saying that is some changes are made in the mode of applying the water, and, in combination with a rational system of manuring, the results already obtained by the Pioneer Estate can be very considerably increased and the fertility of the soil maintained. In considering the matter of irrigation in relation with the conditions of other districts, we are persuaded that there is room for extensive and economic application. In the Cairns district, in the locality of the Mulgrave and Aloomba, and extending south to the Russell River, much of the lands lie admirably for the purpose, and the Mulgrave River is passing through the locality to the sea. On each side of the Pioneer River, in the district of Mackay, and reaching from beyond Pleystowe far along towards the town, the alluvial lands lie perfectly for irrigation, and through the midst of that large loamy tract the river is discharging, according to the measurements of Mr. Rigby, C.E., over 100,000,000 gallons per day, or a supply capable of meeting the needs, in those soils and in those climatic conditions, of 15,000 to 20,000 acres of land. Coming to the district of Bundaberg, including the Bingera and Woongarra scrubs, large areas are equally adapted to irrigation, and in the locality of those lands another large river is wasting into the sea. Excepting the districts of Bundaberg and the Burdekin, the volume of the rainfall should be ample for the crop; but even in the Cairns district, with nearly 100 inches per annum, the concentration of the rainfall, chiefly within a few months of the wet season, leaves a large portion of the year annually in a state of drought. As shown by the rainfall records of the several districts there are four or five months between the close of the cool season and the beginning of the wet season when the temperatures are very favorable to growth, but during those months practically no rain falls. Therefore the especial value of an economically arranged system of irrigation will be to carry the cane along in growth through this annual period of drought and stagnation, and to enable it to use every day of the time from planting to cutting, until it meets the wet season. Whilst speaking with full persuasion of the possible values of irrigation in each of the districts named, we have to speak with great reticence and care in advising its introduction. The experimentations and experience of the writer in the matter of irrigation have caused him to note that whilst the lay and nature of the land and the conditions of the climate at a given season would render the application of water of great value,

there are other conditions which would cause a blind and misdirected mode of irrigation to be a disaster. There are not only the parched state of the soil and the drought in one season to be thought of, but the temperatures of the cool season, and the discharge of water from the lands in the season of heavy rains. Irrigation can be applied, if applied rationally—scientifically—with certain and large results, but we do not know of any situation and conditions in which an excessive or misdirected application could produce more disaster. Of course what has been said of irrigation can also be said, in its degree, of all misapplied acts bearing on cane culture; therefore the requirements of care and experience in the application of irrigation do not form any argument against its use.

THE CANE-GROWERS.—It is found that most of the large sugar-growing estates, which were originally in the hands of large planters, have been cut up into farms, and rented or sold to numerous cane-growers. Particularly in the case of the areas that are furnishing cane for the Government central mills, the growing is done by farmers, who have taken up and own or occupy those lands. These facts place before us a situation that is almost unique and peculiar to Queensland. In other cane sugar-growing countries the estates are in the hands of extensive owners or controlled by large corporations, which state carries with it the consequence that a minimum number of white men are located on the land. In this colony the ownership or occupancy embraces a vast number of strong, responsible, and progressive white men, who are planted over all the sugar-growing areas. These men furnish the material which puts the mills into operation, and, as the mills depend wholly upon the field, it appears that the future of the sugar industry of the colony is very much in the hands of those numerous and small cane-growers.

The principle of small ownership and occupancy is right and sound, and leading , as it does, to the dividing of the matters at stake amongst a maximum number of responsible men, it furnishes a broad and safe basis for the industry, and promotes development along lines that are agreeable and of value to the State. Small ownership and occupancy, however, have their peculiar drawbacks and dangers, not to speak of the numerous current difficulties that follow the system in its operation, and it is apparent that some of those drawbacks and dangers go with the working of the system in Queensland. In the numerous cases of occupancy by men who are renting the lands, it has been found that the tenure is extended to farmers almost wholly without conditions. Under such agreements the lands can be cropped and recropped, the fertility reduced by year after year, and nothing returned to the soil, until the lands are beggared, and the mills depending upon

them closed for need of material to continue in operation. Whilst stating that these are the results that can follow, and are following, such a mode of tenancy, it has to be understood that the farmers are not the only causes, nor even the chief causes, of soil beggaration; in fact, the tenancy of the farmers is too recent in many cases to be responsible for the state of the soils, and, moreover, it is known that some large estates have done better since they passed into smaller hands. In the case of farmers who occupy and are working their own freeholds, the conditions are different, but the results may be, and are in many examples, the same. Many of those owners are men who were farmers in other countries, but their experience has not necessarily prepared them for the agriculture of cane. Again, numerous others were the followers of divers trades and crafts, and land work with them is a very recent thing. But, independent of the previous experiences of those enthusiastic, hard-working men, there is not one farmer in their number who even pretends to know anything of the special principles of the science and practice upon which the continuous and economic production of cane must depend. This is a grave situation, and it is a state of things that should not continue to exist. It is not justice to those men with the hard-earned savings from previous labor, that if they will invest their little capital with their labor in the soil, they must do so utterly without direction and aid; and it is certainly not fair to the lands, nor is it to the interest of the State, that these things are being done. These remarks are not cursory; they proceed from careful examinations, and rest upon statements made by the farmers to the writer, who was in personal contact with some 300 of them. Those men said to us, "Dr. Maxwell, we know that we are all wrong, but what can we do? We don't know what our soils need, and if we were to try, we don't know that we should get for our money what was required; and the cost of manures, and not knowing whether we'd get any results, frightens us." We are satisfied that in the cases of men farming their freeholds, the chief need is advice and aid from someone in whom they can put their trust. They are men of broad sense, they have families coming up and looking for a future, and their freeholds are, or are becoming, their own, so that they have every reason and inducement to save and to add to the value of their properties if they only knew how.

MANUFACTURE.—The manufacture of the sugar is controlled by the Colonial Sugar Refining Company, some private millowners, and the central mills that arose and exist under the Sugar Works Guarantee Act. Our time was more specially devoted to the central mills and to several private ones, yet

three of the Colonial Sugar Refining Company's mills were visited, including the powerful plant at Childers, and we are indebted to the readiness and courtesy of the company's officials for many data in our possession. Unfortunately only one central mill was found running, the others having closed down for the season; consequently little was seen of the actual operations, but by the inspection of the plants, and the securing of data covering the quality of the cane and the course of the manufacture, material was obtained for framing some judgment of the work.

The generally confused state of many of the mills had to be largely attributed to circumstances attending the finish of crushing and to the difficulty of procuring enough labor to keep matters in order.

A circumstance which immediately seized our attention was the huge piles of wood stored up for use as fuel. In reply to questions, two mill managers said: "The megasse gives only one-half of the fuel we require." One large central mill manager said: "We consumed, in addition to the megasse, 3,987 tons of wood in making 4,278 tons of sugar, or 0.89 ton of wood per ton of sugar." One other mill manager said: "Our fuel bill was 0.88 ton of wood per ton of sugar," whilst others, stating the cost of fuel in terms of money, gave figures from 7s. 6d. up to 13s. 6d. per ton of sugar.

The occasion of this heavy consumption of fuel is the high maceration that is practiced. The figures given to us show that the maceration is ranging from 32 per cent. up to 87 per cent. upon the volume of juice, or a general maceration of not less than 60 per cent. Apart from the further question, as to whether heavy maceration is good practice, it is palpably evident that such maceration, involving the consumption of so much fuel, would be ruinous in those countries where the cost of wood or coal is from twice to eight times as great as it is in Queensland. The cost in fuel per ton of sugar, which we have stated (7s. 6d. to 13s. 6d.), is a reasonable profit, being from 5 per cent. to 7 per cent. upon the value of the raw sugars.

In the prevailing mode of juice extraction in this colony it is indicated that the principle conceived in the extraction of the beetroot has been followed. Not only is the volume of water used very large, but the megasse in the course of its passage from rollers to rollers is sometimes actually carried through diffusing cells or tanks. This practice is in direct opposition to the modes of extraction followed in some other cane-sugar countries. In those countries the principle acknowledged is *extraction under maximum pressure and with minimum maceration*, and this principle rests upon the special nature of the cane and its peculiar difference in behavior from the beet under extraction. The last portions of juice express-

ed from the beet are higher in sucrose and purity than the first extracted portion, whilst we know that the final extractions from the cane are extremely lower in quality and purity than the first mill juice, and that the decrease in purity in actual work bears a close relation to the volume and temperature of the water used. The effect, however, of heavy, hot maceration is not only the bringing out of an excess of impurities, it also disturbs the relation of the non-sugars to the sugar as it exists in the normal juice, extracting certain impurities in great excess, and leaving some others partially behind in the megasse, the result of which is found in the clarifying and handling of such highly diluted juices. It is assumed that upon gummed cane or cane that is immature at the beginning of crushing or depreciating at the closing end of the season, no such heavy maceration is attempted. If, under such conditions of the cane, large volumes of water at high temperatures are applied, then the difficulty brought into the work of recovering the sugar from the juice is very great. Not only are the normal gums, which are always present in healthy but immature cane, extracted in excessive proportions, the yellow gum contained in diseased gummed cane is also more completely extracted and mixed up with the juice, under hot maceration. Moreover, the great dilution of the normal juice, by use of excess of water, not only renders the mixed juice more libale to fermentation, and to fermentations not common in normal juice, the time required in evaporation keeps the thin juice a longer time on the way, and thus more exposed to a loss in the sugar content. In brief there does not appear to be one good reason for excessive maceration at high temperature, providing the sugar can be gotten out of the cane by other means. The data in our hands from six mills show that the average maceration was 45 per cent. and the average of extraction 91.9 per cent. In some five other mills the maceration is given as being in the neighborhood of 75 per cent., and the extraction from 94 per cent. to 97 per cent. of the sugar. In certain examples known to the writer in other countries the extraction of the best mills ranges from 93 per cent. to 95 per cent. The rollers of those mills move under a vast hydraulic pressure; the maceration, in average, does not exceed 10 per cent. to 15 per cent., and the whole fueling and evaporation are done by the megasse, not a pound of wood or coal being used.

The extraction of the mills in this colony which use excess of maceration (about 75 per cent.) is about 2 per cent. higher than the work of the heavy mills in other countries already referred to. The question arises: Does the increased extraction of 2 per cent. by the heavy maceration, with its great cost,

result in actual gain in recovered sugar? To answer this question it is necessary to look into the matter of the qualities of the juices entering into manufacture, and the amounts of sugar lost in the waste products. In fact, the sugar content and purity of the juice form the first word in manufacture, and the last word in the process is given by the volume, sugar content, and purity of the molasses. No sugar-maker can evade the conclusions passed upon his work by aid of these factors. The data obtained by us, and which represent some 30,000 to 40,000 tons of sugar, and from cane grown by about 200 growers, have shown an average quality of juice expressed by a sugar content of 15.7 per cent., and a purity of 88.7. By aid of the same data it is also found that the volume of waste molasses is equal to 6.1 gallons per ton of cane, or about 55 gallons per ton of 88 N. T. sugar; further that the average sugar content of those waste molasses is 40.6 per cent., with a purity of 48.7. From these data it is deduced, with a reasonable approximation to accuracy, that one long ton of cane, representing 1993 lb. of juice, contained 312 lb. of cane sugar, and that the molasses resulting from the ton of cane contained 32.1 lb. of sugar, or 10.2 per cent. of the total sugar in the cane. To be able to judge of these data by comparison, an example is taken from work in the Sandwich Islands, with which the writer is familiar. The average sugar content of the juices of that country is put at 17 per cent., and the purity of the juice at 89. The average production of molasses per long ton of sugar is 27 gallons, or 4 gallons per ton of cane, and the average sugar content of these molasses is 34 per cent., with a purity of 46.0. By use of these data a result is drawn which can be legitimately compared with the work of this colony.

Country	Sugar in 1 ton of Cane	Sugar in Molasses per 1 ton Cane.	Loss
	lb.	lb.	Per cent.
Queensland	312	32.0	10.2
Sandwich Islands	339	17.8	5.2

It is repeated that the data used in reaching the results bearing on this colony were furnished directly to us by a given number of mills: however, it is understood that they do not represent the whole of Queensland. From the data, as represented, it is shown that whilst the system of extraction in the best mills of Queensland gives 2 per cent. more juice than the best mills of Hawaii, 5 per cent. more of the total sugar is left in Queensland molasses than in those of Hawaii. This result is just what should be expected where such heavy maceration is practiced. Such a practice makes more molasses, but not

necessarily more sugar. These conclusions stand altogether apart from the matter of increased evaporation and its consequent large cost: they bear on the abstract question of extraction from the sugar maker's standpoint.

The mill equipments being such as they are, frequently of relatively light construction, and without appliances for use of excessive pressure, the modes of extraction practiced can only be modified within a limited degree. Although heavy maceration is highly undesirable, its results are vastly better than leaving the sugar in the megasse; and figures furnished to us show that several of the mills would give only about 70 to 73 parts of the 89 parts of juice without maceration, and that would not do. Wherever it is possible in the present mills, and in the equipment of future plants, we advise that the principle adopted in the construction of the rollers should aim at the highest extraction by pressure and with the least amount of water.

The further equipments of the mills generally are such as to allow of moderately good work being done. The engine power of the mills is unusually ample and good. Some of the newer central mills are in a very good state of equipment. The more recent introductions into moderns sugar houses, however—such as superheating and the latest mode of crystallization in movement—were not seen in the mills in Queensland. Superheating is at once strongly advised by us, and especially because of what is believed will be its particular value in handling highly diluted or gummed juices. Concerning plants for crystallizing in motion, it is advised that there shall not be any hurry along that line. Other changes and additions are more urgent in their demands, and the mills are generally very well provided with crystallizing capacity for jelly or low-grade goods. In any case, an extensive outlay for equipping many mills at the same time with new and costly additions is to be advised against. Experimentation is first needed along new lines.

More urgent than all alterations along mechanical lines is the introduction into the central and some other mills of a more thoroughly trained and scientific system of management. The men in charge have executive ability, and they appear able to get relatively good results from the labor they command; but they require training and aid in those specific parts of manufacture which demand a thorough knowledge of the chemistry of sugar juices, and of the nature of the agents which aid in clarification.

SUMMARY.

In bringing together, in summary, the observations contained under the several headings, it has to be said that the soils covering the greater portion of all areas where the industry is located were naturally very fertile, and are now highly suitable for sugar growing. The producing power, however, of the lands generally has become notably reduced, and in given localities the native soil fertility is gone. This condition appears to have resulted from continuous cropping and indifferent cultivation, and from a gradual removal of the elements of plant food from the soil, and the neglect of means for restoring those elements. As a direct consequence of the great deterioration in the strength and fertility of the soil, the crops have fallen off in size and vitality; and, as a further secondary result, the cane has decreased in the power to resist the attacks and ravages of pests and diseases.

The cane-growers are particularly in need of advice and aid in the practical treatment of the soils, in the cultivation of the cane, and for directing them in the matter of restoring and maintaining the fertility of the soils and the permanent value of their properties. Advice and instruction are also required in the supervision and control of the mills. This chemical and technical instruction is particularly needed in the matter of re-agents used in clarification, and in the handling of juices of varying qualities and conditions.

Briefly, the natural conditions are strongly favorable for sugar production in Queensland, but the state of the industry demands immediate attention and redress.

RECOMMENDATIONS.

Guided by our experience in these matters, we do not consider it advisable to formulate recommendations that shall be directly applied by the growers and manufacturers. The situation is such that the chief possible value that may accrue from any recommendations will depend upon the mode of putting them into operation.

Our recommendations are as follow:

It is advised that the several sections of cane-growers and manufacturers, as represented at present by local associations in the respective districts, shall unite themselves into one body, which shall be known as "The Sugar Growers' and Manufacturers' Association of Queensland." A chief function of the association, which shall be established upon a basis such as, or similar to, what is suggested, shall be to introduce modern scientific methods in the growing of cane, and to still

further improve the modes of manufacture. The lines upon which these agricultural and technical reforms shall be instituted and carried on are hereby set forth in detail.

Three experiment stations shall be established—one to represent the Cairns district, and to be located at Mulgrave, in the neighborhood of the Mulgrave Central Mill; one at Mackay, which shall meet the needs of that district; and one in the vicinity of Bundaberg, which shall represent the Bundaberg and Isis district. The one at Bundaberg shall be the chief experiment station and headquarters of the director and of the main laboratory and chemical staff.

A director shall be appointed who shall establish the said stations, appoint and locate an assistant director upon each station, and engage chemists for all laboratory requirements.

The functions of the director, after the establishment of the said stations, shall be as follows:

(1) To personally visit all districts and subdistricts where cane is grown, and to inspect the farms and plantations of the growers; advising in all matters of the field, such as selection of lands suitable, and leaving out of lands unsuitable, for cane; the individual acts of cultivation; the resting and rotating of the soils with other crops; the introduction of other economic crops and sources of profit; and the instituting of new means for the restoring and maintaining of the producing power of the lands.

(2) To examine the soils in the field, and take samples for analysis in laboratories, and to advise manures according to the ascertained requirements of each soil and location.

(3) To inspect the mills during the crushing season, advising and aiding the manager in the several acts of the manufacture.

(4) To institute experiments at each of the three stations along the several lines of cultivation, planting, manuring, irrigating, and study of cane varieties; and likewise to study prevailing diseases and pests.

(5) To advise and aid the cane-growers and manufacturers on questions of sale and purchase of cane, and to be at the service of the Association in its affairs which are connected with the State.

(6) To train and prepare the assistant directors, in order that they shall ultimately become fitted for the responsible direction of the respective stations. The term of requirement of the services of the director in chief should not exceed five years.

To embody and execute the functions as set forth, it is seen that the director must, of necessity, be a thorough agriculturist, a highly trained scientist, and conversant with all ques-

tions of the field and mill. His practical experience and technical knowledge must be such as to secure the absolute confidence of the cane-growers and the mill officials, whilst his tact and business capacity must be to hand in all practical situations.

The selection of the director will be the most important act of the association. His fitness for the position must be absolutely certain; then he must be given full responsibility and discretion. And his responsibilities will be varied and heavy; for he must not only talk with and advise the farmers in the fields and managers in the mills, but he must appoint the work of the chemists in the analysis of soils, and control inspections of manures and know that they are accurately carried out; and he must advise the composition of the manures to be used, and know where the manures can be most economically obtained. In brief, the absolute direction of the experimental work that we are advising will be in his hands, and its success will rest wholly with him. He, therefore, must be aman of the fullest and most unquestioned fitness for the be a man of the fullest and most unquestioned fitness for the work, we cannot accept the responsibility for the adoption of the remainder of our recommendations.

With the institution of such a system of scientific and practical experimentation as we have set forth, the direct advising and instructing of the growers and manufacturers along new and tried lines would begin. Upon these would follow the accurately ascertained results of the experiments at the stations, which results would serve as guides and as actual examples, showing what could be done on a larger scale. By these means would be set in movement the influence of new ideas and the knowledge of new methods and their results, until gradually, but surely, a new system and order of things will have taken root in the whole field of sugar production throughout the colony.

Now appears to be the time to put this new work into operation. We have seen the lands and conditions of the sugar-growing areas, and are fully persuaded of their native capability to produce; but we have also noticed the exhausted state of the soils and their demand for restoration and help. A decision of some kind cannot be evaded. If it is not determined to at once begin the new and advised order of things, then it is decided to let matters be as they are, or go from what they are to worse, until the opportunity is worn out. We most urgently advise that work shall begin at once, for great possibilities yet stand before the sugar industry of the colony.

WALTER MAXWELL.

BARBADOS.

There is luck in odd numbers after all. November, the eleventh month on the list, has been so far, glorious. The copious rains, too, have been general, nobody left out. The effect on the growing crop has been marvellous, and on all sides prospects are brightening; even the estates most injured by the drought in the upper part of St. Philip's Parish have readily responded to the generous rain, and we understand that the Harrow, which suffered severely, its crop being actually at a standstill for want of rain water, has already markedly improved. The rains although copious have not washed the surface—indeed the overthirsty earth, like a sun-dried sponge has sucked it all up. No wash, means that all the manure applied is thoroughly solved and available for the rapidly growing plants. And with plenty of available food at the roots to encourage and help on the strong tendency to suckering which exists, there is every reason to expect thick bundles of sugar making canes. A seasonable December and January will give us, we have good reasons to believe, something above the average for 1900.

The vitality of the sugar cane is really surprising. Any other crop would have been killed outright by the long persistent drought. There is absolutely no other staff on which we could lean with so much certainty, no other plant that in this island of fitful rainfall could take its place. And of all the varieties which we plant it may be said that none combine with more certainty hardihood and sugar-yielding quality than that known as the White Transparent. It was the first variety to come to the rescue of our fungus-stricken island, in general adaptability to various soils none has so far surpassed it, or shown better drought-bearing habit. In a rich soil with plentiful rain No. 147 may run ahead as a sugar-maker, but its average under hardships and all kinds of varying circumstances will hardly equal that of the tough White Transparent. No doubt in Nature's womb there is a better, as possibly there may be better men than now live, but the plant to maintain an industry must above all have staying power. Fields of White Transparent will for a long time yet be required as a backbone and reserve to those flashy varieties which under favoring skies and in a genial soil, we wont to make a brave show, but wilt and wither in the hot sun of reverse.

In sugar cane culture there is absolutely nothing so essential to success as healthy and vigorous plant or seed. Not only must there be proper selection of kind, but freedom from disease at the very beginning. No doubt the spread of fungus

was accelerated by the other methods of getting cane plants anywhere and everywhere, and distributing them broadcast without the slightest attempt at selection. It did very well until the germs of disease got in, but then, as always under unsanitary conditions, the pest spread by leaps and bounds, and almost slew our handicapped industry. Adversity has made us wiser, and planters have grown wary and careful. But still enough has not been done, and it is pleasing to note that the Secretary of State for the Colonies, notwithstanding the clatter in South Africa, has time for considering the minutiae of West Indian agriculture. The despatch published by his Excellency the Governor for general information in the Official Gazette of the 9th inst. is a very important document, deserving careful attention. It is very necessary that the subject of cane disease should be carefully and scientifically studied, and observations regularly published. This could not be done without the appointment of a special expert.

The proposal to appoint an economic entomologist who will be on the staff of the Imperial Department of Agriculture, and whose salary and travelling expenses will be charged to the Imperial grant for that department, is a right good one; and, if carried out, will surely prove to be a safeguard of the utmost benefit to the sugar cane industry. Again, with regard to the supervision of the importation of economic plants, we quite agree with Mr. Chamberlain and his coadjutator, Dr. Morris, that a system of inspection might be, and ought to be, devised under which all imported plants should be inspected by an officer of the Government. These are wise proposals, which ought to be put into effect without delay, and the experts at work before the planting-in season begins next month. —Brit. Agricultural Reporter.

———:o:———

RISE OF THE SUGAR INDUSTRY OF JAVA.

Under this heading the *Journal des Fabricants de Sucre* prints an account of the extraordinary conditions of sugar production in Java. According to an official report, the production for the last three years has been as follows:

Year	Factories in operation.	Production in tons.
1896	187	534,390
1897	188	586,299
1898	188	725,030

Java, therefore, produces as much sugar as France, with a number of factories of less than one-half.

The astonishing part, however, is in the yield obtained per acre. The figures are these:

Year	Cane per hectare in kg.
1896	76,900
1897	85,400
1898	98,700

The yield of beets in Europe is about 25,000 to 30,000 kg. per hectare on an average.

If the above figures are astonishing, the following are simply fabulous. They represent the sugar per hectare in Java:

Year	Sugar extracts per hectare in kg.
1896	8,100
1897	8,600
1898	10,100

Compare these figures of 8,000 to 10,000 kilogrammes per hectare to those of Germany, where they have only 4,000 kg.

On the other hand, the yield in the factory went lower in Java. The amount of raw sugar extracted from the sugar cane by weight was as follows:

Year	Yield in per cent.
1896	10.55
1897	10.06
1898	10.21

The factories which obtained more than 10,000 kg. of sugar per hectare were only 11 in number in 1896, in 1897 they numbered 30 and in 1898 they had reached the number of 87.

Die Deutche Zuckerindustrie says in connection with this subject: "This enormous superiority of the cane-sugar industry over the beet-sugar industry would increase still more if the bounty was taken off. The only possibility of keeping up the fight against so privileged a competitor rests in the value added by the bounty to the products of the beet. If by the abolition of the bounty the cane sugar and the beet sugar industries were placed on an equal footing from the point of view of realizing on their products, the fate of the beet sugar industry would be sealed.

And in consideraing the foregoing results one speedily acquires the conviction that the progress of the colonial industry is far from having reached its highest point, whereas one hardly perceives any noteworthy progress to be realized in agriculture and manufacturing in Europe."

The French paper agrees with the idea that the development of agriculture and industry in certain countries affords grounds of apprehension for the beet sugar industry of Europe, but it differs as to the future of the latter. It believes that under the stimulus of necessity it will make great

progress and reduce the cost of production so materially that it will have a long series of years of successful existence.

———:o:———

SISAL GRASS IN MEXICO.

Henequen; "jeniquen," Spanish; ci, Maya; "sisal grass," commercial term; *Agave sisalensis*, scientific term.

This plant has been in use among the ancient inhabitants of Yucatan from the earliest times. The writer has found it imbedded in the form of cord in the stucco figures that ornamented the facades of the mysterious ruined cities of Yucatan. There are two wild varieties of henequen, called by the navies "cahum" and "chelem." The fiber of these wild plants is used to some extent by the natives in the making of cordage for domestic use, and some claim that hammocks made from the fiber of the cahum are the best.

It is, however, the cultivated plant that furnishes commerce with the fiber known as sisal grass, Sisal being the old port from which the fiber was first exported.

Like the wild plant, the cultivated one is divided into two varieties—the "zacci," or white hemp, and the "yaxci," or green hemp. The zacci is considered the finest and best, but the yaxci is a good fiber, and by the time the henequen fiber reaches New York or Boston, it is simply as sisal grass, of a good or medium quality, as the case may be.

It has been generally supposed that sisal grass as an article of commerce has been known only within the last fifty years. This is a mistake.

Between the years 1750-1780, quite a furor was created in commercial countries of the Old World by the discovery that the fiber of a plant found in Yucatan was good for ship cordage. Spain sent over a royal commission to report upon the discovery, and in a few years many of Spain's commercial and war vessels were using cordage made from henequen. For some reason, probably because of the primitive method of preparing it, the use of the fiber gradually declined, until at the commencement of this century the former trade had been forgotten.

In 1847, Yucatan, until then a cattle-producing, cotton-growing, and logwood-exporting country, was in the throes of an Indian war. The Maya Indians had risen in rebellion and had succeeded in driving the white race out of the most fertile portions of the peninsula, forcing them to rely for means of subsistence upon the products of a sterile, rocky belt, too poor to sustain cattle in any numbers. Henequen was the only useful plant that would grow on such a soil. The first planta-

tion, so far as I can learn, was planted in 1848, and the 50 acres planted were cleared by the use of the tonka, the primitive cleaner used by the native Maya. There was a good demand for the new fiber in ship rigging, and it gradually came into general use, until sisal was a well-known article of commerce. The tonka was a piece of hard wood, shaped something like a handsaw, having the end curved in. The leaf of the henequen was drawn through the sharp curve and the fiber was stripped of the thick, pulpy covering. The leaf was subjected to this operation two or three times, until the fiber was left clean and free. This tedious process was not long tolerated. A machine was found to increase the output, but the demand again outgrew the means of supply. Then the machine known as the "raspador," or the "solis," from its inventor, came into use and has held its own almost up to the present day. It consists of a large-toothed wheel that scrapes the pulp and leaves the fiber. Its simplicity made it peculiarly fitted for use by the native servants. Plantations came to be known as plantations of one, two, or a dozen wheels.

The constantly increasing trade necessitated still more rapid means of fiber cleaning. Many new machines were produced, each of which was said by its inventor to be far better than any of the others. To-day, the following machines are in actual use in Yucatan:

Hemp-cleaning machines now in use upon the plantations of Yucatan.

Machine	Number of leaves cleaned in 10 hours	Actual horse-power	Number of men needed	Cost of Machine		No. in use
				Mexican*	United States	
Lanaux	130,000	35	3	$6,000 00	$2,856 00	6
Prieto	125,000	60	3	7,000 00	3,332 00	90
Stephens	150,000	70	3	11,000 00	5,236 00	6
Solis	9,000	6	2	250 00	119 00	1,200
Torroella	80,000	30	3	5,000 00	2,380 00	20
Villamor	70,000	35	3	6,000 00	2,856 00	.....

NOTE. - Compiled from data given me by the inventors themselves or their authorized agents.

*The United States Director of the Mint estimates the average value of the Mexican dollar in 1899 as 47 6 cents.

I give below a table showing the exportation of sisal grass from Yucatan during the ten years ended December 31, 1898:

Year	Quantity		
	Bales	*Kilograms*	*Pounds*
1889	243,968	40,641,521	89,598,297
1890	260,106	45,079,423	99,382,096
1891	310,090	52,065,024	114,782,552
1892	353,525	58,584,813	129,156,078
1893	355,123	58,097,925	128,082,685
1894	373,883	61,605,695	135,815,915
1895	381,504	61,729,584	136,089,041
1896	397,163	65,762,910	144,980,911
1897	419,975	70,545,153	155,523,844
1898	418,972	68,834,268	151,752,027
Total for 10 years	3,514,309	582,946,316	1,285,163,448

The Mexican Government requires all weights to be stated in the metric system.

In 1888 and 1889, the price of hemp reached 15 centavos per pound. The cost of production was then about 4 centavos per pound.

Exports of sisal grass from Yucatan during ten months of 1899.

Month	Quantity		
	Bales	*Kilograms*	*Pounds*
January	52,128	8,735,545	19,258,383
February	21,360	3,506,832	7,731,162
March	58,069	9,621,703	21,212,006
April	43,530	7,075,447	15,598,530
May	30,869	5,015,166	11,056,435
June	31,629	5,133,882	11,318,156
July	26,937	4,296,939	9,473,032
August	26,204	4,202,208	9,264,188
September	44,973	7,456,101	16,427,725
October	35,595	5,695,200	12,555,638
Total for 10 months	371,294	63,739,323	140,519,711

Prices during these months have ranged from 15 to 18 centavos (7.1 to 8.7 cents).

It is said that the best fiber-producing plant grows on the poorest and rockiest soil; but this does not accord with experiments made by me, and to my mind is open to contradiction.

One method of planting and cultivating is as follows: The field is first cut and burned off. The burning produces a certain amount of ashes, and many planters set out seed corn at the same time they plant the henequen. The one does not interfere with the other in the least, and the corn crop helps to pay the cost of the henequen.

The henequen plant is propagated, not by seeds, but by scions, or suckers. The plant produces seeds, and in a natural state propagates itself by both seeds and scions; but the planter uses only suckers from 18 to 20 inches high. By this method, he can produce a field of henequen ready to cut within five years, whereas by seed planting he would have to wait from eight to nine years.

Once planted and properly tended—that is, cleared of weeds twice a year and not under or over cut—a field will last twenty years, and instances are not wanting of fields that have lasted longer.

A leaf is ready to cut when it extends at right angles to the trunk of the plant. A healthy, vigorous plant in the maturity of its growth should yield from eighteen to twenty-four leaves. One thousand leaves should produce from 50 to 60 pounds of good, clean fiber. This amount is a fair average.

When the plants in an old field send up a flower stalk, it is nature's signal that the crop is finished. The old plants must then be clipped of all useful leaves and cut down, to allow the young scions (which should have been already planted between the old plants) ventilation for growth.

Bad cleaning, allowing rot to be produced by the acids nascent in the plant pulp, and dampness produce red and mold-stained fiber, of less than one-half the value of the good, clean, white fiber. This is rarely exported, but is sold at home for domestic use.

In March of last year, the preliminary trials of the machinery in the new cordage factory La Industrial gave satisfactory results. This factory was the first of its class established in Mexico, and its progress has been closely watched.

It is, in the opinion of experts, as completely equipped as any similar enterprise in the United States, and its total cost has reached nearly $700,000. The machinery is nearly all from the United States, and is of the best and latest pattern. The factory is now working double time in order to fill several very large contracts for binder twine from United States houses.

There are in Yucatan nearly twelve hundred henequen-producing plantations of various sizes. The largest plantation, or perhaps I should say the plantation producing the largest output, is, I think, on the line of the broad-guage rail-

way between Merida and Progreso. It is called Ticilche, and produces at the time of this report about 1,000 bales, or 375,000 pounds, of cleaned fiber per month.

Prophecies are dangerous, and I venture to make one with diffidence; but I have recently been over the henequen-producing belt and have perhaps as much data as most persons. My belief is that if the maximum production of henequen in Yucatan for the next three years has not already been reached, it will not exceed this year's output by over 10 per cent. Many factors unknown in the United States are of importance here, and parties interested will do well to bear this in mind. I have no henequen interests, and my judgment may be the clearer for that fact.

EDWARD H. THOMPSON,
Progreso, October 29, 1899. Consul.

:o:

BEET SUGAR ITEMS.

At Rochester, Mich., Dec. 23d, over 3,000,000 lbs. of sugar had been produced from 16,637 tons of beets. Arrangements are now being made to work up 10,000 tons of beets for the factories located north of there. If this goes through the run will continue for about 20 days longer. If not, a week or ten days will see the end. The recent freeze followed by thawing has caused considerable deterioration in the quality of the beets, but with the return of cold weather it is felt that the loss will not be great.

At Bay City, Mich., the Michigan Sugar Co. expects to finish the campaign about the middle of January, which will give a run of over four months. The run would not have been so long but for the obtaining of some beets from another factory. Contracting for next year is progressing rapidly.

At Benton Harbor, Mich., at end of December the campaign drew to a close. The Company had a good campaign and sliced 500 tons of beets per day, which is 100 tons greater than the supposed capacity.

At Pekin, Ill., the campaign closed during the first week of 1900, after an irregular run of about 80 days. About 15,000 tons of beets were sliced.

At Ames, Neb., after much trouble and delay the sugar factory started work end of December. A short run will be made on about 20,000 tons of beets only. The crop was considerably larger, but many tons had gone to Norfolk where the campaign is now nearing completion.

No other section in this country raising sugar beets can this year show so great a per cent of sugar or purity as the Grand Valley in Colorado.

The total imports of refined sugar into Great Britain during 1898 were 820,969 tons; of this amount Germany and Austria furnished 566,000 tons. Raw sugar importation was 734,643 tons. On the other hand, the importation from France of both refined and raw sugar into England was very much less, it being 112,900 tons refined and 102,000 raw.

Sugar beets have such pests as leaf blight, scab, crown gall and root rot, causing much loss.

The capital invested in beet sugar factories in Michigan is $3,714,786. It is estimated that 42,475 acres were harvested in 1899 and brought farmers an average of about $53 per acre.

Beet factories in Michigan silced the plants and were working right along through December. At the Cairo factory they were chopping up beets with regularity, turning out about 300 barrels of sugar every 24 hours.

Many papers of California continue their very severe effusions regarding the stench from the sugar skums in Salinas river. The Enterprise, of Castroville, declares that many people residing along the river within two miles of its banks are nightly made sick from inhaling the nauseating odor.

The Spreckels Sugar Company (California) contracts for 1900 provide for the payment of $4.50 per ton for beets grown in Pajaro valley and delivered at Watsonville, the price to be the same as paid last year. The Pajaro valley beets are to be delivered at Watsonville, and if they are milled at Spreckels the company, and not the grower, will pay the freight.

The value of the wash from sugar refineries and distilleries as a fertilizer has long been pointed out, but the wash being very dilute, and becoming very viscid when concentrated, many difficulties have stood in the way of those who have sought to turn the fertilizing ingredients to account.

Mr. Wiskemann, 9 Mincing lane, London, is placing upon the market a product obtained by Wencks' process, which has been christened "Chilinit," as it supplies nitrogen, and therefore can take the place of sodium nitrate (Chili saltpetre). Nitrifying bacteria are cultivated in a portion of the molasses, and when teeming with the desired bacteria the liquid is mixed with sterilized powdered chalk and sand, and gently dried at a low temperature. The bulk of the molasses is concentrated in a multiple effect evaporator, and mixed with some of the bacteria preparation. In addition to the potash and nitrogen in the molasses, there is a large percentage of dissolved organic substances, which afford an excellent fostering soil for micro organisms contained in the soil, more especially for nitro-bacteria. In experiments regarding nitrification of ammonia by means of nitrifying bacteria contained in the soil,

60 per cent of ammonia added became nitrified after 14 days with molasses wash of 50 deg. Brix as a fostering soil.

Seeing that the potassium oxide in the molasses wash is in most cases fixed to organic acids, an indirect effect has to be expected the direct fertilizing action, for the phosphates of iron of alumina are soluble in the salts of molasses wash. Molasses wash, therefore, acts only as a nitrogenous and potassic fertilizer, the latter being doubly valuable, seeing that phosphoric acid no longer dissolves in aeraeted water when it has been converted into basic phosphate of iron. As the average of a number of analyses, Chilinia may be said to contain 3 to 4 per cent potash, as oxide, 30 per cent organic matter, and 30 to 33 per cent of caustic lime.—Sugar.

———:o:———

An official German report has lately been made on the value of sugar as daily rations to troops. The Berlin correspondent of the Standard writes: I mentioned some time ago that elaborate experiments had been made in Germany with a view to ascertaining the effect of feeding troops on sugar. The object was to test the advantages of a sugar diet, in cases where great exertions have to be made within a brief period. According to the reports submitted by the surgeons and generals, the experiments conducted in the various army corps have had a very favourable result. Professeor Pfuhl, who was formerly assistant to Professor Koch, and is at present the head of the physiological laboratory of the army, states that it is proved that a sugar diet increases the muscular power in comparatively a very short time, and in a considerably shorter time than white of egg, the effect of which, however, is more lasting, though sugar has the advantage of being much cheaper. The extraordinary rapidity with which sugar is absorbed by the body explains the rapid effect on the nervous system, which is of the greatest importance in all cases where a speedy bodily recuperation is desired, as, for instance, in long-distance marching. Professor Pfuhl, in a series of successful experiments with sugar on his own person, has found that, after long walks, three or four lumps of sugar removed all feelings or lassitude, and to a certain extent restored elasticity to muscles, this effect being frequently produced in the short space of a quarter of an hour. He is of opinion that artificial substitutes for sugar, such as saccharine, & c., have not at all the same effect. With regard to the experiments made by civilian doctors, I may mention that Professors Senator and Munk, the eminent physiologists of the Berlin University, have come to the conclusion that sugar has a high nutritive value as the purest and most easily soluble hydrate of carbon. A certain minimum of albumen, differing according to individual cases, must be supplied to the body, in any circumstances, and cannot be replaced even by sugar