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The latest quotation of sugar in New York was \$3.40 for Cuban Centrifugals of 96 deg. test.

Any person wishing back dates (for four or five years) of the Manchester (Eng.) "Sugar Cane," for binding purposes, can procure them at the Hawaiian Gazette Office.

Orange culture in Southern California is engaging the attention of many of the best horticulturists in that state and attracting a few from our islands, as will be seen by a letter on page 116 from Mr. Osborne of Maui, who is spending a few months there for his health. Yet some who migrate thither are not satisfied with what at first appears a profitable and pleasurable vocation, as ten-acre orange groves are frequently in the market for sale. Still, for all this, Riverside must be a very attractive place to reside in.

A correspondent asks if anything has been published relative to the nature of and remedies for coffee blight. We are not aware of any full investigation of the disease or its remedies having been published here, though there are several references to the disease in former volumes of the PLANTERS' MONTHLY, notably in Vol. VIII, page 187, the remedy prescribed by the Ceylon Tropical Agriculturist is given. We should be glad to print any coffee grower's experience with the disease or the remedies tried.

Willett and Gray's circular of February 18, speaking of the sugar bounty, says that "there is not the shadow of a chance that Congress will go back on the bargain until its expiration, whether Republican or Democratic, as the bounty was a part of the contract by which the country obtained free sugar."

We are under obligations to Mr. Chas. R. Buckland of New York for an advance sheet containing his article on the "Possibilities of the American Sugar Industry" on page 132. Although we cannot endorse all his statements as to these islands, yet the article is a strong argument in favor of developing the beet sugar industry in America.

Public attention has lately been directed to the extraordinary development of sisal culture in the Bahamas, which has added another and very valuable staple to the exports of that tropical group of islands. Sisal is one of the agave family, closely allied to the century plant that grows freely here and throughout this group, and is known as the *agave rigida*. It is easily cultivated and grows in waste and rocky land almost as readily as in the best soils. The fiber is much sought for in making rope and all kinds of baling cord and twine, and the demand for it is constantly on the increase. The article, commencing on page 105, is condensed from a lengthy one which we find in the *Jamaica Bulletin*, and will give all the information sought for by any who wish to engage in its cultivation. When cleaned, sisal is worth \$100 to \$150 per ton, according to quality.

Those who are seeking information regarding new industries which in other countries are carried on with profit, cannot do better than to subscribe to the PLANTERS' MONTHLY. Although the prime object of this periodical is to publish whatever may help to instruct and benefit those engaged in cane culture and sugar manufacture, yet it should be and is our aim to give the latest useful information about every other agricultural industry. So in almost every number will be found articles on other topics than sugar, among them coffee, ramie, bananas, pineapples, oranges and lemons, olives, figs, beets, fruits and fruit trees, cocoanuts, cocoa, vanilla, walnuts, grapes, camphor trees, pepper, nutmegs, cinnamon, sisal, etc. The latest and best information regarding these and other

products, how to plant, cultivate and care for them, is given in this periodical in a form calculated to instruct those seeking information.

A very instructive article will be found on page 136, on "Seedling Sugar Canes," taken from the *Bulletin* of the Royal Kew Gardens, showing how diligently the study of seedling canes is being carried on and the benefits expected from this discovery. A portion of the Kew pamphlet, which lack of space will not permit copying, relates to what has been done in Java in producing seedlings. Of the discoveries made there, nothing was published until after Mr. Harrison of Barbadoes published what he had discovered in that island, and therefore merits the praise. Reference is made in the table at the close, on page 143, to a yellow Hawaiian cane, which is probably the Lahaina variety, that was sent to Java some years since, at the request of the Dutch Government. This cane is credited with producing the most plants of all the varieties tried, which fact would seem to indicate that it possesses, in an eminent degree, the qualities desirable for producing seeds, and consequently for cultivating for seed purposes with a view of obtaining a more valuable cane. The same idea has occurred to us before while reading of the success in obtaining seedlings, because we consider our Lahaina cane as the most perfect yet known, and therefore the most valuable. No other cane has ever produced 16,000 pounds of sugar from one acre of plants, as this has, and it is the ambition and hope of our planters yet to obtain 20,000 pounds from one acre.

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RESTRICTION IN BEET SUGAR CULTIVATION.

A very singular proposition has been advanced by one of the leading sugar journals of Germany (see page 125) suggesting restriction in the cultivation of sugar beets, with the view of maintaining the price of sugar at a paying rate. The idea is so novel that it will arrest general attention to inquire whether any plan of the kind can be carried out, even with the co-operation of the principal countries engaged in beet sugar production, for if it can, it will surely benefit the cane sugar interest, here and elsewhere. The journal from which we extract the article referred to, thinks that any such

attempt at co-operative restriction is impossible. And this will probably be the popular verdict.

There are certain laws of nature or providence which override all human laws and calculations in providing the supplies needed for the wants of the human race. Man may till the soil and plant the best of seed, but the outcome of his efforts are beyond his control. Never has this been more forcibly shown than in the past year, in Europe and America. An increased area of land was sown to beets in Europe, and the ablest statisticians, basing their calculations on the results of past years, predicted a large increase in the product of beet sugar. Instead of this very plausible theory being realized, there was a large shortage variously estimated, but probably not less than 300,000 tons of beet sugar.

In Russia, although the usual area of land was sown to grains, the crops have proved almost a total failure, spreading famine and death throughout the land. In both these instances, the weather and atmospheric causes, beyond the control of man, have destroyed the crops, or in the case of the beets reduced the expected outcome, based upon the yield of previous years. While in America the very opposite results have been obtained—the most bountiful grain and fruit harvests the republic has ever known.

Now had some restrictive plan been adopted for 1891 by the leading nations engaged in beet culture, it is evident that the decrease in the total crop might have been double what it actually was, inflating prices for a time and causing a great decrease in the consumption, and wild speculation in the sugar markets of the world. The more this subject of restricting the area of beet or cane sugar is examined, the more impracticable and undesirable it appears to be, even were it possible to make the experiment.

The demand for sugar is constantly on the increase, not only in the United States and Europe, but also in every country on the globe, and even among the semi-civilized peoples who are accustomed to use but little of it. The low price now ruling is a stimulus to consume more, both as a natural and healthy article of food, but also in the arts and manufactures where it is becoming indispensable. This annual increase in the demand for sugar is probably not less than 200,000 to 300,000 tons, which will tend to keep the price of sugar

at its present rate, or a trifle higher. Europe cannot divert much of her agricultural labor from grain to beet culture without risk of a shortage in her grain crops. The point seems to have been reached, when the rivalry between these two great industries in Europe demand that beet culture must give way to grain culture, or famines must often recur.

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HAWAII VIEWED FROM ABROAD.

In a lecture on the Hawaiian Islands and people, delivered by Mr. T. H. Davies at Southport, England, he refers to them in the following complimentary lines: "The Kingdom of Hawaii is alone as an instance of a country which in seventy years emerged from barbarism, to be completely recognized as one of the Christian civilized nations of the world, and whose national debt is quoted on the London Stock exchange. She is alone in not having one man, woman or child of proper years, who cannot read and write. She is alone in the large amount of foreign imports and exports per head of her population. And she is entirely alone in the wonderful fertility of her sugar lands."

Again, on political matters, Mr. Davies well and forcibly says: "Hawaii alone of all the Pacific groups has been elevated into an independent State, and as she entered the family of nations under the tutelage of United States citizens, to the United States must be given the credit of the superior political position which the Kingdom of Hawaii enjoys. Then, again, the United States is her nearest neighbor, and by far her largest purveyor and customer. Hence the commercial relations between the United States and Hawaii must always be of a preponderating character, in spite of the fact that the McKinley tariff has killed the profits on what we in Hawaii called free trade in sugar by giving the same free trade to all other sugar."

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THE COFFEE BLIGHT AND ITS REMEDY.

Two interesting communications relative to the coffee blight, called out by Mr. Meyer's and Prof. Koebele's letters on this subject lately published in the *Gazette and Advertiser*,

will be found in the present number. One is from Mr. Rycroft of Puna, page 143, giving an insecticide wash for plants troubled with the aphid, which will doubtless prove beneficial wherever it can be thoroughly applied. On a small scale this may no doubt be done with good results, but when it comes to a large field or to a dozen neighboring plantations, all more or less affected by it, with only one or two proprietors who have the courage and means to apply this remedy, while others neglect it, then its utility becomes doubtful in staying the insect plague.

The other letter is from Mr. W. G. Wait of Kona, page 121 who discusses the subject as though he was thoroughly acquainted with it from past experience, and handles Prof. Koebele and his claims without gloves, intimating that the merit claimed is really not due to him, but to others. He presents his views in a clear statement, taking the ground that the trouble with coffee is not confined to the tree, but also to the roots which the ants seem to destroy, and that any remedy to be effectual must reach both tree and roots. This is no doubt correct.

Just what part the ants play in fruit orchards and in coffee and other fields is an interesting subject for investigation. They may be seen traveling at a hurried pace up and down the trunk on many shrubs and trees, but invariably those shrubs and trees will be found affected with some species of insect injurious to the tree. Watch the ants as they scatter on the limbs and leaves, and they will be found to be industriously at work, carrying the tiny eggs or young of the insect from the mother to the very freshest opening leaves on the tree, or in gathering the delicate gum or liquid which exudes from the parasite insect, and which in some instances, as on palms, is sweet, and probably serves as food for the ants. They appear to work with a skill, dexterity and order that is truly wonderful, planting new colonies of the young parasite insect that feeds on the fresh leaves of the tree or plants, and thus furnishes the ants with a new field to obtain food and nourishment. The ants appear to be not the first cause of the blight, but the active agency that spreads and perpetuates it. They locate at the foot and among the roots of the tree, and make it their home and base of operations.

But the main question to be decided now is, whether there can be found an insect—be it the lady-bug or not makes no difference—which will destroy the aphid and restore the coffee tree to a healthy, fruit producing condition. If Mr. Koebele can find such an insect in Australia or elsewhere, let him bring it, and should it do the work thoroughly, he will deserve the thanks of all interested in coffee culture. We know that the vedalia did its work here thoroughly and satisfactorily, and practically exterminated the cottony cushion scale, and it has done the same in California. There are perhaps twenty varieties of the lady-bug known, some of which are here now, but so far as we know none of them are any protection to the orange or citrous trees, or to the coffee. The insect, if it exists, must be a new variety, not yet introduced, and if found, whoever introduces it will deserve a reward commensurate with its value to the coffee industry. If it destroys the aphid that kills the coffee and other valuable fruit trees and shrubs, the ants around the roots will soon disappear.

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DETERIORATION OF CANE SEEDS.

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The following letter from Mr. Hugh Morrison of Makaweli, Kauai, was received by Hon. W. G. Irwin in reply to the article by Mr. Moore on the "Deterioration of Seed Cane," published in our January number. Mr. Irwin received permission of the writer to publish the letter, and we doubt not that the points which are opened up will prove of great interest to our planters and managers, as it is a subject which has not heretofore received the attention it deserves. We will be pleased to hear from other parties on the same topic, and also whether any permanent changes have been observed in the beard of the Lahaina cane, and in the size and number of stalks to the hill, as noted by Mr. M.:

"Seed cane has always been a question open for dispute. When I came to Spreckelsville Mr. Williams and I disputed the point constantly. He used to say, 'If you wish to cut a five-ton per acre field you must plant it from a five-ton per acre lot,' and in other words urged the necessity of planting only long-jointed plant cane. This he considered was propagating the fittest and carrying out Darwin's law, "the survival of the fittest."

"I took the opposite side entirely, urging that we ought to plant only good eyes, regardless of the size of joint, and for this purpose found, 1st, untasselled tops; 2nd, volunteer ratoons; 3rd, lalas; 4th, ratoons, more valuable than plant cane. I considered that the eye of the cane was the point of germination, and on its qualities alone depended the future cane field. I further pointed out that long-jointed cane has not stability enough in its composition to resist any hardship, and generally it may be said, the time between planting and sprouting is full of hardship. A long-jointed cane has, in round numbers about the following composition, when green: 1, Fibre, 9 to 10 per cent.; 2, Water, 75 to 76 per cent.; 3, Cane Sugar, 13 per cent.; 4, Invert Sugar, 1 to 2 per cent.; 5, Gums, Wax, etc., 2 per cent. Now in the process of maturing, this cane gradually increases its cane sugar, while the invert and gums decrease. The short-jointed canes or tops, or ratoons have more fibre, say 12 per cent., 14 per cent., 15 per cent., and consequently more stable constituents proportionally than the former, thus being less liable to souring before its eyes have developed into shoots, and presenting more resistance to its enemies from its tougher exterior, the eyes of such cane are always better developed and so require less time in appearing as shoots above ground. The quality of the soil, season, etc., will determine whether the shoots become long or short and are not necessarily in any way, dependent on the seed cane joints.

Mr. Williams preferred the long-jointed cane seed and had, in my judgment, less satisfactory fields than I had from the volunteer seed. In every field, except one, I had higher yields than he had.

In the mill I was not troubled with gum, etc., to any degree, but had always a rich juice; in fact the richest ever I saw or knew of was on Spreckelsville, generally, standing brix, 19 to 20, and polarizing, 18 to 19. In Mr. Williams time, the lands being stronger may have given a more impure juice, but they ought to have given larger crops, and would have done so, in my opinion, if proper seed had been used.

But Mr. Moore's observations may lead to valuable results, and I think he should be encouraged to proceed; yet, I think, Baldwin, and planters generally, take the view I have. I consider a piece of cane rich in sugar unfit for seed, as sugar is the result of ripening changes by which the starch, gums, etc., are transformed into cane sugar, and at this stage, that is, maturity of the cane, the principle of growth is no longer required by the plant, its eyes dry up and finally die. The top, if untasseled, dies last, and many shoots issue from the upper eyes. These are the growing parts or powers of the plant, preparing to start as an independent existence.

My experience is that, as lands are more frequently planted, the juices are proportionately higher in cane sugar, but the yield of cane per acre decreases first in size of cane, then in tonnage; but in not one instance have I ever known the tonnage of cane to remain the same as Mr. Moore states his fields do, and the juice equally abundant, but of a 20 per cent. less value in cane sugar.

I ought to add a few words on changing seed from uplands to lowlands or vice versa. Upland seed is generally more fibrous has less impurity in its juice and is therefore a change for the better if taken to lands formerly planted to lowland seed. Uplands should have seed, if possible, from very vigorous tops, and a change from one locality to another is beneficial.

I ought to add that I believe our Lahaina cane has changed considerably. Twelve years ago a Lahaina cane had always a bearded top and the leaves were very full of them, so much so that one going into a thick cane field would come out covered over with them, and have hands and face frequently scratched badly. Now we do not find this nearly so much. Some cane is nearly free of it. I don't think one single man on the Islands, ten years ago, took such accurate observation of juices, sugars, gums, etc., as to be able to say how far we have gone up or down in our canes. I think the stooling power of the Lahaina cane has decreased, and so has its quickness in germinating. We all derive large yields per acre nowadays, but this is entirely due to our mills. Formerly 50 to 56 per cent. juice was the average, now we get 72 to 78 per cent. On Maui, Mr. Baldwin usually plants from 4 to 4½ feet apart in rows. Spreckelsville, while I was there, 5 to 5½ feet. On Hawaii, 6 feet is nearer the average. On Kauai, they believe in wide furrows.

Finally, experiments in some countries have shown that cane can be raised from the natural seed. Is this in favor or against Mr. Moore's views? Certainly not in favor, because the seed at that stage has not a particle of cane sugar in it.

HUGH MORRISON.

CORRESPONDENCE AND SELECTIONS.

SISAL HEMP IN THE BAHAMAS AND FLORIDA.

Enquiries have been made from time to time, as to the progress of this fibre industry in the Bahamas, and the methods of cultivation, etc.

On application to the Government of the Bahamas, I was favored with pamphlet-reports on the subject by Messrs. James M. Rae and George Preston.

Mr. Rae's Report is dated 26th January, 1891, and gives details to that date as follows:—

“There are now planted in the Bahamas, as near as can be ascertained, 4,199 acres of land with 2,633,000 Sisal plants. In addition to this number there are in nurseries 1,332,500 plants. The latter may, I venture to think, fairly be regarded as growing plants, in considering the extent of the cultivation of Sisal. The number of pole plants estimated to be procured during the ensuing six months from trees that are now in pole is 937,500 and the number of suckers or root plants, for the same period from plants now growing is 960,500.

* * * * *

In Abaco we have the “headquarters” of the Sisal industry, for it is on this island and some of its adjacent cays that the largest cultivations in the Colony exist. Beginning at Hole-in-the-Wall, Mr. J. S. Johnson, of Preserved Pine-apple celebrity, has 200 acres planted with 130,000 plants, some of which planted two years ago have leaves over three feet long. Mr. Johnson has also two other cultivations on Abaco, namely, one at East Creek, Little Harbor, of 25 acres with 21,000 plants, and another at Witch Point of 60 acres with 31,200 plants. Cotton is being planted between the rows of Sisal.

The “Bahama Fibre Co., Limited,” of which Mr. Abbott is the manager, has a field of 150 acres at Broad Creek with 73,000 plants, and another field of 108 acres at Joe Creek with 62,000 plants. These two fields also contain 264,000 nursery plants. In addition to these the Company has purchased a cultivation at Sweeting's Village, and another at Great Guano Cay, both of which were planted some years ago, and are

yielding thousands of pole plants as well as a large number of suckers. * * * *

At Marsh Harbor, I think I can, with all sincerity, say that I visited the handsomest Sisal field I have seen. This was planted by Mr. Benjamin E. Roberts two years ago, and contains 140 acres with 107,000 plants. The land is undulating, and the soil is black and abundant. The plants looked as vigorous as possible, and were most prolific with regard to suckers of which there were at least 25,000 then in the field, and Mr. Roberts assured me that he had already removed 47,000. This field was being planted with dwarf cotton between the Sisal.

Propagation.—The plant is propagated in two ways, namely, from the young plants furnished by the pole, and the suckers which are thrown out from the roots. On the plant reaching maturity, a pole 15 to 20 feet in height grows out from its centre, on which a number of blossoms appear borne on arms which extend laterally from the upper part of the pole. In about six months after the appearance of the pole, so far as I can learn, these blossoms develop into young plants varying in length from 2 to 4 inches, and in number from 1,000 to 2,500 and occasionally more. They are then gathered and set out 8 or 9 inches apart each way in nursery beds. In 6 months they will attain a growth of 8 to 12 inches, and they may then be transferred to the field. The age at which the pole is produced, when not extended by the removal of leaves, as I have elsewhere shown, is 6 to 7 years.

Suckers are plants which grow out from the roots of the parent tree, and in congenial soil are produced in 12 to 18 months. From this time, on to the third or fourth year, they appear in great numbers, many plants producing as many as 20 to 30 suckers during that period, after which they begin to decrease, until they finally cease to appear. The plant suckers much earlier, and in greater abundance in black or rocky land than in white land. This is easily accounted for. The tendency of the shoots on which the suckers are produced is to grow downwards, and the black soil being shallower than the white, the shoots reach the rock much earlier, and are then turned upwards in their growth until the surface is reached and the suckers appear. I have seen plants suckering

on black land, which I was assured had not been planted longer than six months; and at 12 to 18 months, I have seen them suckering most abundantly; while on the white land the suckers do not generally appear until after the second year.

With respect to the taking up and planting of suckers, I think it well, having regard to the speedy production of new plants, to call attention to a method which I have seen practised with very satisfactory results, viz.: In removing a sucker from the parent tree, instead of cutting or breaking off the sucker only, to uproot entirely the white shoot at the end of which it is growing, and cut that off as near the parent trunk as possible. This shoot will be found to be jointed like a sugar cane. After the removal of the sucker, the shoot is cut up into lengths of two or three joints. These bits are then planted in nursery beds, and in a short time each bit will produce as many suckers as there are joints. This method has the two fold advantage of speedily increasing the supply of the new stock, and relieving the parent tree of the support of the suckers.

Field Planting.—The system adopted by those who have engaged largely in planting varies. Some have planted as near as 6 feet each way, others 7×7, 7×8, 7×9, 8×8, and 9×9. The Munro Company at Abaco plant three rows 8 feet apart with 7 feet interval between the plants, and leave a space of 12 feet between every fourth row. The "Bahama Hemp Company, Limited," which is under the efficient supervision of Mr. Abbott, plant four rows 8×8, leaving a distance of 12 feet between every fifth row. Most planters, however, have found it advisable, owing to the rocky nature of the land, not to observe too strict regularity in planting, but while adhering as near as practicable to it, to put the plants in the most favorable spots. Most of the laboring class who have engaged in planting have observed no method at all, but have put the plants in the ground wherever a good "pot hole," or chink in the rock occurs, and have planted much too thickly.

Many planters have planted the spaces between the Sisal plants with some other crop, either ground provisions such as pigeon peas, corn, etc., or cotton. This plan appears to be attended with excellent results, and is one that I cannot too

strongly recommend, provided always that such auxiliary crops be not too thickly planted. The slight shelter they afford seems to be beneficial to the Sisal plants in their early growth, and tends to suppress the growth of weeds, thereby lessening the cost of keeping clean the field, beside yielding a remunerative crop. Sweet potatoes should not be planted in a Sisal field, at least not until the plants have attained a growth of a foot and a half to two feet, as the vines very soon cover the field and completely envelop the young plants, and retard their growth.

Cleaning.—Both Messrs. Stoddart and Preston, in their respective pamphlets, urge the importance of thoroughly “cleaning” *i. e.* paring off the roots of the young plants before they are planted in the field. The effect of this practice, however, is undoubtedly to lessen the yield of suckers after the plant has commenced to grow. Such certainly has been the experience of nearly every one engaged in the cultivation in these Islands, to whom I have spoken on the subject; and as the rapid acquisition of plants is at present of primary importance, the practice of cleaning has been discontinued. Of course when plants have been long taken from the ground and the ends of the roots have become dry, or when the roots are so numerous and bulky as to render planting inconvenient, the roots may be *trimmed* with advantage, as the effect of this naturally is to encourage the more rapid production of new roots. This is a practise constantly observed by gardeners in transplanting large rooted plants, but in the thorough “cleaning” as recommended in the above named pamphlets, the eyes which throw out the shoots that produce the suckers are destroyed. As one gentleman connected with a large Sisal Company remarked to me “it is like planting a potato after cutting out the eyes.”

It is possible that for this reason the system of cleaning is practised in Yucatan, where as I understand a large proportion of the suckers produced are treated as weeds.

Effect of different soils and aspect on growth.—I have both read and heard it broadly asserted that Sisal will grow and flourish anywhere, no matter how sterile or impoverished the land may be. My observations however do not confirm this. I do not mean to convey the idea that *really good rich land* is

necessary for its successful cultivation, but merely to remove the impression, if such there be that the plant will thrive in dry arid sand, or on rocky land void of soil. Worn out "provision" and pine-apple fields appear to be well suited to its cultivation, while on broken, rocky surfaces, containing innumerable "pot holes" and crevices, in which is deposited the ordinary black or red earth, the plant luxuriates. Nowhere have I seen it appear more flourishing than on such lands. Certain kinds of white or sandy land, found in large quantities on some Islands, also suit it admirably. One of these varieties, white on the surface from being bleached by the sun, on being turned discloses a dark colored mixture resembling salt and black pepper, and is known locally by the term "salt and pepper land."

With respect to aspect, I think the general experience is that hilly situations have a marked beneficial effect on the growth. Plants growing on the slope of a hill, especially a hill facing the prevailing direction of the wind, grow much more rapidly than those on low level land. Never mind how rocky the surface may be, if it is loose broken rock, with plenty of interstices containing a little soil in which the roots may ramify, the plants will grow rapidly and sucker abundantly. The plant is one that admittedly rejoices in plenty of air, and it is just such situation and soil that best meet this requirement.

In the preparation of the land for planting, too much care cannot be bestowed. Burning should never be performed in dry weather, or the soil, which in most cases is merely a superficial deposit of vegetable mould, will be destroyed.

Crop.—The length of time required for the production of the first cutting of leaves may, I think, safely be regarded as four years from the time of planting. A great deal depends upon the size of the plants when transplanted, but if they be of a suitable size, say from 12 to 15 inches, without doubt the leaves will attain a length of 4 to 5 feet and be fit to cut, well within the period named. I have seen thousands of plants with leaves from 2 to 3 feet long that had been growing only 2 years; and I have also seen plants, that I was told were three years old, from which leaves had been already cut.

For the present, the yield per acre with us, can be only a matter of calculation, in consequence of the industry having been so recently begun ; but sufficient positive experience has been derived, to determine this point with approximate accuracy. The number of leaves cut from many plants of four years growth and upwards, has given an average of forty leaves per tree, with an average weight of $1\frac{1}{2}$ lbs. per leaf, and a yield of 4 per cent. of cleaned fibre. With an average of 600 plants to the acre, and 40 leaves weighing 60 lbs. to each plant, the yield would be 36,000 lbs. of leaf and 1,440 lbs. of cleaned fibre. If the estimate be reduced to 35 leaves, there will be 31,500 lbs. of leaf and 1,260 lbs. of fibre, and this is certainly a very modest estimate. To guard against all possible disappointment, however, the yield per acre can be safely placed at half a ton. The plant, I firmly believe, is capable of yielding a much larger percentage of fibre than is at present obtained, if a machine can be produced that will obviate the great waste incurred by those now in use. The matter is one of such urgency, there can be little doubt that the want will ere long be supplied.

Much of the success of the industry will depend in a large measure, on the shipments of fibre being of excellent and regular quality. Too much care cannot be taken to ensure this result. If the fibre once gets a bad name, the price will rule low for years to come ; and therefore it would be most unpardonable, if by careless methods of preparation, we lost the high character which the fibre has already acquired, in the markets in which it has been introduced.

The following extracts are taken from a very interesting Report by Mr. Charles Richard Dodge, just issued by the United States " Department of Agriculture :"—

"The imports of Sisal hemp fibre into this country from Yucatan for the fiscal year ending June 30, 1890, amounted to 28,312 tons, in round numbers, worth \$4,330,300, and for the year previous the imports amounted to over 35,000 tons. This does not take into account the imported manufactures from Sisal hemp, which are considerable, the value of which can not be given. It is said that the United States purchases over 80 per cent. of the marketable fibre produced in Mexico.

The history of the introduction of the plant into Florida,

by Dr. Henry Perrine, between 50 and 60 years ago, is almost too well known to repeat here, though a few brief statements may not be out of place. * * * *

From the first introduction of the *Agave rigida* into Florida the plants spread rapidly, especially on the mainland, being commonly transplanted to the gardens of the early settlers of South Florida, chiefly for the sake of ornament. In 1842 the armed occupation act was passed by Congress, which gave a homestead of 160 acres to any person who occupied a tract five years. Mr. Robert Ranson of Titusville, Fla., makes statements in this connection as follows :

‘This resulted in a number of heads of families settling along the Indian River in the neighborhood of Fort Capron, and on nearly every one of these old settlements a small patch of Sisal hemp may be found grown into a dense thicket, descended from one or two parent plants set out over forty-five years ago. These facts are considered worthy of mention, as showing that while every other evidence of former cultivation has long since disappeared, the Sisal hemp, regardless of forest fires, weeds, and neglect, still holds its own and spreads year by year.’

As regards soil, moist or rich land is unsuitable, because of the lesser yield of fibre. Our correspondent, Mr. Ranson, writes with positiveness upon this point, as follows :

‘The fact of the plant itself flourishing better may be attributed to a combination of conditions existing both in the soil and surrounding atmosphere, principal among which I notice the presence of salt making it retentive of moisture, and of lime phosphates resultant from decaying shells. Land bordering on the Atlantic coast, which is evidently alluvium to a comparatively recent date, is generally considered too poor in the constituents necessary to plant life to make it worth while to attempt any cultivation upon it, and whilst this may be true as regards a lack of decomposed vegetable matter yet the shelly, saline sands will be found to suit such plants as the yucas, agaves, etc., both chemically and physically better than the rich, black hummack lands.’

The soil in the Merida district of Yucatan is described as stony and sterile, and composed chiefly of disintegrated lime-

rock. This region is only a few feet above the sea-level, and the whole Sisal country is described as low and flat.

During my recent visit to Florida, the bad effect of shade upon large plants was noted in several marked instances, the plants being less thrifty, and the leaves sometimes so spindling and thin as to have lost their rigid habit and to be bent and drooping.

Upon the subject of cultivation and care of the plantation, Mr. Edgar Bacon makes suggestions as follows:—

‘Experienced growers use 650 plants to the acre in rows, 11 feet by 6 feet distant from each other. This will give room for the laborers to walk between the rows without being wounded by the terrible spurs, which like a cluster of keen spears make each plant a menace to the unwary. Besides this the closer planting would result in the piercing of innumerable leaves every time the wind blew, and the consequent destruction of much fibre. Stabs and bruises mean discoloration and the expense of sorting damaged lots apart from the proportional loss would be an added and not an insignificant item in the labor account of a plantation. Many people who have caught the sisal fever are planting acre after acre expecting nothing less than the farms, when planted will take care of themselves. To be successful in this enterprise requires unceasing activity and care. One must be Argus eyed. One season of poor prices with the consequent discouragement which is apt to follow in the case of nine small proprietors out of ten, in a country where the peasantry are all negroes, will result in an overgrowth of suckers and the poling of mature plants till nothing short of absolute clearing and starting anew will save the farms. There is no cultivation where system and perseverance are more necessary to success. The dropping of the seed from a single “pole.” if not watched and attended to immediately, will produce little spears enough to destroy a hundred plants, and I have frequently seen a dozen suckers start up around and under the leaves of their parent. After such crowding, the leaves would be worthless, even could they be reached; but no man, unless arrayed in metal armour strong and stout enough to withstand the thrust of steel, would be so foolhardy as to attempt to penetrate such a growth. What I want to impress is the

fact that without that patient and systematic care which I nowhere observed as characteristic of the unled negro, a field of sisal is as valueless as a field of mullein.'

It is desirable that the young plants be set out in perfectly straight rows and upright, for if not, and they grow up at angles in all directions, there will be difficulty in getting between them when the leaves are harvested. Regarding the suckers, there is no question but that they should be removed, for to allow them to remain will be a positive detriment to the parent plants. If they are not needed for the planting of new fields they should be thrown away. In setting out these suckers in Yucatan the planting is said to be very simply accomplished: a little hole is dug and the plant introduced, after which it is propped up by a few stones and left to take care of itself until the time for taking off the first leaves. When cultivating suckers in the nursery, the practice in Florida is to set them out 10 or 12 inches apart in rows, where they remain until large enough to set out in the fields. Suckers are not relied upon alone for the propagation of the plant. When the old plant flowers it sends up a stalk, or "pole," as it is called, to the height of 15 or sometimes 20 feet. After the tulip-shaped blossoms which appear have begun to wither there now starts forth from the point of contact with the flower-stalk a bud, which develops into a tiny plant, which, when grown to the length of several inches, becomes detached and falls to the ground. Such "pole plants" as come in contact with the soil take root, and in a very short time are large enough to transplant.

In the Bahamas these flower-stalk plants are largely utilized in establishing Sisal fields, and with as good results as where the suckers alone are used. Precisely the same course must be pursued in Florida.

A single "pole" or "mast" produces from one to two thousand plants, while only a few suckers are formed at the base of each old plant.

The prohibitory regulations of other countries, from which supplies might be obtained, make it obligatory upon the people of Florida to protect themselves. In a letter from Mr. Van Buren upon this subject received last fall, he says:

'The regulations of the Bahamas make it impossible for us

to get the plants, except at a large cost, \$49 per 1,000 and a risk of fine and imprisonment besides. I have also a letter recently from the United States Consul at Honduras, stating the same facts, and that the price there would be \$50 per 1,000, the Government having imposed heavy duties to prevent their exportation. In view of these facts I would respectfully suggest that our Government should take steps to prevent plants being exported from our country.'

In establishing Sisal hemp plantations, it should be understood at the outset that small plantations, put out by individuals, isolated from each other, will not pay. A large tract is necessary for the economical production of fibre, that the work of cutting the leaves and shipping the fibre may be systematically continued, for the most part, through the year. This is the system in vogue in Yucatan and the Bahamas, and we must follow it in Florida. Mr. Cleminson, writing upon this point, says :

'With regard to my own experience in Florida, it is certainly experimental, as I have had no returns. I have 50,000 plants one year old in nursery form, and 10 acres planted out with 2 year old plants. So far as the growth is considered it is satisfactory, but it requires about 500 acres to successfully enable one to operate machinery economically.'

In the case of individual growers in a community, the desired result may be attained by co-operation, and particularly when the plantations are reasonably contiguous. This will enable securing the fibre without undue expense for transportation of the raw material to the machine.' * * *

The following is from a Report by Consul Thos. J. McLain :

'The progress made in the development of Sisal culture in the Bahamas during the past twelve months is marvellous. One year ago there was scarcely a dollar of foreign capital, and very little local, invested in this business in the colony, while to-day parties from Great Britain, Canada and Newfoundland, representing large resources, are interested in Sisal, have bought tens of thousands of acres of Government land, and are industriously engaged in clearing and planting the same to the full measure of their ability to procure the material. A local stock company styled the Bahama Hemp Company, organized and managed by Nassau capitalists ex-

clusively, has also purchased a large tract of land and is developing the same, whilst thousands of acres are being planted in every direction by individual owners of small pieces. American capital up to this date, I regret to say, for it is to its own disadvantage, has been conspicuous by its absence. One company, however, styled the Inagua Hemp Company, organized under the laws of the State of New Jersey, with D. D. Sargent, United States Consular Agent at Inagua, as manager, has lately procured about 1,200 acres at Inagua and has begun operations.

'Messrs. Munroe & Co., of St. John's, Newfoundland, have obtained a grant of 18,000 acres of crown land at Abaco, and are planting the same. Another tract of 20,000 acres has been allotted to a London company on the same island. Mr. Alex. Keith, of Edinburgh, Scotland, has taken 2,000 acres on Andros Island, and is working upon it. But the largest demand has been lately made by two London companies, who are said to be applying for not less than 200,000 acres between them.'

The Government of the Bahamas stated in July that "persons engaged in the industry are increasing their cultivation, and capitalists from abroad are still investing therein."

In order to encourage the planting of Sisal in Jamaica, the Government has imported lately from Florida 25,000 plants of the same variety as grown in the Bahamas. This is in addition to over 51,000 already supplied to planters, and to over 20,000 planted in the Hope Gardens. The plants are available for distribution at a uniform rate of £5 7s. 6d. per 1,000, 10s. 9d. per 100, 1s. 1d. for 10, or 1½d. for 1. It is thus possible for any one to obtain a few plants for experiment at a very small expense, or in large quantities for laying the foundation of future fibre farms. Application should be made to the Director of Public Gardens and Plantations, Gordon Town, P. O.—*Jamaica Bulletin*.

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It will be found that leather belting that has been used for some time, when taken off from its place or pulleys, and allowed to lie idle, will require to be stretched pretty tight when again put in use. Even then, in a few days of running, it will be found to stretch so much as to require to have a piece cut out and a new lacing made.

LETTER FROM A HAWAIIAN FROM SOUTHERN CALIFORNIA.

RIVERSIDE, SAN BERNARDINO CO., CALIFORNIA,

January 27th, 1892.

MR. EDITOR:—I am sending you a few items from here which you may find interesting enough to publish. I am delighted with everything I see, and particularly with the orange groves, the cities and towns of Lower California. Wandering among these orange groves at this time of the year is a pleasure that can be more easily felt than expressed. This is the best season to see the orchards, for now the trees are loaded down with fruit. It is ripe and ready to pick, and presents one of the finest sights that it is possible for one to imagine. These orchards are usually divided into ten-acre lots, and are protected on all sides from the wind, being entirely surrounded by very high cypress trees, and in the midst of the orange trees, nestling as it were, in the very lap of Pomona, are seen the homes of the owners. Some of these are vine-clad cottages, perfect little gems of beauty, the very beau ideal of a suburban home. Others again are larger, while some are palatial in their proportions, and wonderful in beauty. Some of the finest residences are situated upon Magnolia Avenue.

This is the finest avenue in the city of Riverside, if not the finest in the world. It is over one hundred feet wide, ten miles long, and has ornamental trees on each side, and one row in the center which forms a double avenue, and one of the most beautiful ever seen. There are quite a number of Island people located upon this avenue. Mr. George H. Dole has a fine place at one end of it. He has a twenty-acre orchard, thirteen of which are planted with choice budded orange trees, the greater part in full bearing. The rest of his orchard is planted to grape vines. The grapes were harvested in the summer, while the oranges will not attain their full ripeness till March. There is a good crop of oranges on the trees, which will net three to four hundred dollars per acre for the large trees, or those coming into full bearing. Mr. R. McKenzie, formerly of Laupahoehoe, Hawaii, has a very fine ten-acre orchard situated upon this avenue. It is a ten-year

old seedling orchard, just coming into full bearing. These seedling orchards yield the greatest amount of fruit, as the trees are the largest, strongest and most perfect in proportions. Some are so loaded with fruit as to require twenty-five props to hold up the limbs of a single tree. This orchard is valued at \$18,000, and will increase in value from year to year.

The next lot adjoining Mr. McKenzie is owned by Mr. R. R. Hind, of Kohala. It is a ten-acre lot of budded orange trees, planted mostly to navels. The advantages of the budded trees over the seedlings are, first, they come to full bearing in about five years; five years earlier than the seedlings; second, they bear a choicer fruit. This orchard is in a splendid location, and will evidently be one of the best in Riverside.

Close to these lots is another fine orchard owned by Dr. Anderson, of Honolulu. This orchard is planted to seedling oranges and grape vines. The orange trees are loaded with fruit and will yield a rich harvest, probably about ten per cent. of the first cost of the orchard.

The value of unimproved land in Riverside varies from \$250 to \$600. The cost of plowing and planting to orange trees, \$200 per acre. The cost to irrigate ten-acres orange trees, \$10, which has to be done every six weeks; the amount of water required is 100 inches (Miners' inches), and amounting to 1,728 cubic feet a day. The cost to take care of ten acres is \$20 per month, until bearing time, when the cost of picking is added to it.

To irrigate ten acres, small rows are made from top of the lot to the bottom, say about three feet apart; the water running from top to the bottom of the tract of land and watering every inch of it. These orchards are kept in splendid condition, the land is fertilized and highly plowed, and cultivated constantly so that neither weed nor blade of grass can be seen. "The Gage Canal" and "Riverside Water Co." supply an abundance of water for this valley.

THE VALUE OF ORANGE GROVES.

The value of ten-acre orange trees in full bearing varies from twelve to twenty thousand dollars. The highest price asked is \$65,000 for a twenty-acre orchard set to oranges in full bearing. The fruit now on the trees is valued at \$7,000.

The highest price realized from an acre, so far known and vouched for, is \$1,250 net. The average for Riverside last year was \$395 per acre for all classes of orange trees.

The size of the orchard varies from five to fifty acres, and a twenty-acre orchard in full bearing set to oranges is expected to bring in an income of over \$10,000 a year.

A ten-acre lot or orange grove, with pretty cottage, good barn and stable, and well-kept grounds, with hedge of cypress trimmed artistically, and situated upon one of these grand avenues, is as beautiful a sight as one could wish to see. The settlement of Riverside is the richest, is the most progressive and enterprising, has the finest climate (so I am told), and the best resources of any place in Southern California. A person seeking a home for health or comfort, or profit, nothing offers such inducement as these orange groves of Riverside.

The city of Riverside is one of the finest, if not the finest in Southern California. It has fine streets, and all its public and private buildings are upon a grand scale. It is approached by three railroads, two horse-car railroads run through it, and a cable or electric road is soon to be started. It is also lit up by electric light, but the most attractive places are the drives; these are both numerous and beautiful. Most all of the streets outside of the city are arched over with the beautiful and graceful branches of the pepper tree, while outside of them stand as sentinels and protectors the cypress and gum trees. Some of these avenues are all of palm trees, while others have a variety of all the best and most beautiful, ornamental trees known to this climate. I lately met a gentleman, a great traveler, who declared that there is nothing finer to be found in the United States than these avenues. The grand secret of success in the orange business is said to be not so much in growing them, as it is in selling them—to know just when and where to sell requires some toil.

Yours truly, G. O.

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The primal principle of economy in steam engine practice is simply to use the steam as hot and as dry as possible, and after it has done its work to get it out of the way as quickly as possible. This is the simplest way of expressing it.

DRIED BANANAS AND PLANTAIN MEAL.

The following paragraphs, taken from a report of Mr. W. C. Meaden on the working of the Convict Farm in Trinidad, may be useful to those who are thinking of trying this industry in Jamaica. Small bunches can be utilized in this way instead of going to waste.

DRIED BANANAS.

“Drying bananas in the open air proved a failure owing to dust, insects, etc.

This, however, has been remedied by the Hot Air Fruit Drier, properly known as the “Etna Pneumatic Drier,” and I am happy to report in favor of the good work done by the machine.

The fruit can be dried within 24 hours at a temperature from 130 deg. to 160 deg.; higher than this the fruit hardens. The drying is done here in the day time and the fire put out at night; any kind of fuel answers for firing, from patent fuel to cocoa wood chips. The fruit should be as large as possible, and quite ripe, the skin to be removed and the fruit then lightly scraped. Whilst in the drier the fruit to be turned twice or three times carefully to ensure an even drying.

Drying the bananas opens up a way of utilizing the fruit that no other means offers. It overcomes the difficulty of bad roads, remote districts and other drawbacks the planter has to face in getting his bananas to market. It also does away with the risk of handling and of the sea voyage.

Dealing with the first item of the account sales, below, that is, 97 boxes. This number represents the result of drying 6 bunches, weighing an average of 62 lbs. for ripe bunch. A loss of one-third takes place in the peeling and drying process. The 97 boxes contained one pound of dried fruit each, and sold for \$19.40 at 20 cents per pound box, or, after deducting freight charges, \$15.47 a fraction under 16 cents per pound.

A bunch weighing 52 pounds less one-third in drying=17 pounds dried fruits and sold for 16 cents per pound. This is at the rate of \$2.72 per bunch. A further charge of 53 cents must be considered in producing the bunch. This would cover purchase of land, clearing woods, draining, planting,

weeding, cutting, drying, fuel, boxes and packing. I have not included cost of dryer as that would be but a fraction on each bunch dried. Now after deducting the above we have a clear profit for the grower of 2.19.

An order is now on hand for 2 cwt. for London at 6d. per pound in bulk, the consignee doing the retail packing and advertising. As the fruit is something new, it is being sought after, and all that can be dried is being profitably disposed of. I may add that the fruit drier does its work well, turning out the fruit in a uniform color. Attention must be paid to this, and also that fruit is nearly as possible one size only be dried, as this facilitates packing. Small ones can be used for stock, etc.; twelve good sized fruit weigh one pound.

Account sales of dried bananas ex S. S. Portia, sold on account and risk of Gordon Grant & Co., Trinidad :

97 Boxes dried bananas at 20 cents.....	\$19.40	
1 Box do do at auction.....	1.30	20.70

Charges :

Duty \$1.45, freight per B. Lading.....	\$ 3.80	
Advertising, Auctioneer's Commission 5 per cent.....	0.06	3.86
Net proceeds.....		\$16.84
Less cost P. O. Order.....		0.21
		<u>\$16.63</u>

E. & O. E.

GEO. ROBINSON & Co.

St John, N. B., 24th January, 1891.

PLANTAIN MEAL.

“Last mail a sample of 7 pounds of meal, prepared from the Moko Plantain, was forwarded to London, and for which the correspondent offered sixpence per pound. Receipts were also supplied for preparation in cooking. Great attention has been drawn to banana meal by the observations made by Mr. H. M. Stanley in his book “Darkest Africa,” and which, as an advertisement, should not be lost sight of. No banana gives such an excellent meal as the ‘Moko,’ or so agreeable in flavor and taste. The preparation of the meal is as follows: The green Moko was skinned, sliced thin* and dried in the fruit drier; then ground fine in an ordinary corn mill, and afterwards sifted through a muslin sieve: this latter removes

* N. B.—The slicing should not be done with a steel knife.—W. F.

any fibre and leaves a delicate fine meal. The slices dry in two hours. A 15 pound bunch will yield 3 pounds of prepared meal which at 6d. per pound is 1s. 6d. per bunch. Two women could prepare 56 pounds of meal per day. The cost of production, packing, etc., has to be considered, but the price obtained must be considered a satisfactory one; at least it is better than that now obtained, which may be said to be nil."

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CONCERNING THE COFFEE BLIGHT AND ITS ENEMIES.

KAILUA, N. KONA, HAWAII, Feb. 24, 1892.

EDITOR "PLANTERS' MONTHLY,"

DEAR SIR:—Mr. R. W. Meyer, in communicating a letter to the *Gazette* from Professor (?) Koebele, awards to that gentleman the credit of discovering and introducing to the public the lady-bird, *Vedalia Cardinalis*. In justice to the distinguished Entomologist who originated and perfected the system of destroying insects injurious to vegetation by the importation of their natural enemies, it is but right that the facts of the case should be made public.

In 1870, Dr. R. V. Riley, Entomologist of the U. S. Department of Agriculture, drew attention to the destructive effects of certain *Chalcid* and *Mymarid* parasites or scale insects (*coccidæ*), and that of a *Braconid* parasite on a beetle which had been doing serious damage to stone fruits.

Acting upon these suggestions, he proposed not only the transportation of the natural enemies of insect pests from one part of the country to another, but also their importation from foreign countries. The cabbage worm (*Pieris rapæ*) which had found its way into the country from Europe without its natural checks, had, year after year, been destroying the cabbage crops of Canada and the States. Dr. Riley, after several unsuccessful attempts in 1885, succeeded in introducing on a large scale and with marvellous results a parasite, *microgaster glomeratus*, which, in its native countries, infested the worm.

When the important orange industry of California was threatened with extinction by the cottony cushion scale, Dr.

Riley went systematically to work. By painstaking and patient enquiry, extending over a period of two years, he satisfied himself that the pest was scarcely noticed, being held in check by various enemies, predaceous and parasitic. Having thoroughly informed himself on the subject several attempts were made to introduce the parasites through the medium of the mail. These failing, Dr. Riley dispatched one of his field agents, Mr. Albert Koebele, to collect a large series of specimens and to superintend their introduction into California, where they were taken in charge by Dr. D. W. Coquillett at Los Angeles. Mr. Koebele, no doubt, was very successful in his mission, but there his share in the matter ends. From inception to conclusion the credit of the entire transaction is due to Dr. Riley. I am aware that Mr. Meyer only gives voice to popular opinion. As to the article in the *San Jose Mercury*, lately quoted in the PLANTERS' MONTHLY, it is so full of errors, from Mr. Koebele's name itself to that of the parasite he is seeking for, that it is not worth noticing. Its reference to Mr. Koebele and his lady-bug is utterly without foundation. I fear Mr. Meyer's zeal has outrun his judgment, for Mr. Koebele's letter, which reads like the advertisement of a nostrum vendor, was evidently not meant for publication. When the Hawaiian Government needs scientific aid it will most probably communicate with the head of a department and not bargain with a subordinate.

In my correspondence with several gentlemen connected with National and State Scientific Departments in America, I have always found them willing to afford me all the information in their power. This is as it should be, for it is only by accumulating a multitude of facts by free interchange that definite conclusions can be drawn. Do not misunderstand me. The scientific laborer is worthy of his hire and of good hire. We most certainly want in these Islands a real live, energetic scientist, well paid and armed with the powers of quarantine officer to stop the importation of infected plants, for a grain of prevention is better than a pound of cure. What we don't want is to make a bargain with a man to pay him a lump sum for the destruction of a specific pest by a process that we can already freely avail ourselves of, if those whose duty it is would only bestir themselves. Suppose Mr. Ko-

ebele's offer is accepted, and that he succeeds in mitigating the coffee blight, and that he receives his reward, what then? Why—you know yourself that other insects may appear of which no one thinks now, but even in that case there may be means of prevention (vide Mr. K.'s letter), and no doubt Mr. Koebele will be at hand with another offer.

To those interested, the following facts may be of interest:

The white blight infesting coffee in this island, *dactylopius destructor*, is allied to the cottony cushion scale (*Icerya purchasi*). In Kona we have a little lady-bird (*Exochomus*), which feeds on the pest, but she is consumed on sight by our various insectivorous or rather omnivorous birds, and she is very rare. The same, I fear, would be the fate of any introduced. The blight insect, on the other hand, is carefully nursed and distributes innumerable hordes of untiring ants. An aphid (*Siphonophora*) is to be found on the coffee, but it does little damage. The blight, notwithstanding its popular name, is, of course, not an aphid, and it puts in its most destructive work among the roots of the tree, and it is this fact that will make its extermination so difficult a problem. Its stronghold is underground, and it is here where it must be attacked. Clear the ground by burning off every vestige of vegetation put in your plants, and if there have been infected trees growing there previously, every one of your plants will be attacked, the roots first and the leaves afterwards.

By the introduction of the internal parasites, such as *Lestophonus*, *Iceryæ* and *Coccophagus citrinus*, and of predaceous *Coccinellidæ*, as well as by the application of certain sprays and fumigations, the pest can be held in check in cultivated fields so far as the exposed parts of the tree are concerned. To reach it, when it is most destructive, the only means is by the application to the roots of a chemical or mixture which must fulfil the following conditions:

1. It must be cheap.
2. It must be capable of being easily and inexpensively applied.
3. It must not in any way injure or check the growth of the tree.
4. It must be of such a nature as to destroy the water-proof covering of the egg clusters.

I have been experimenting in this direction with gratifying results, and I have to acknowledge my obligations to Mr. Alex. Crow, Entomologist and Quarantine Officer, San Francisco, for information regarding methods adopted in California, which are entirely of the nature of sprays and fumigations.

Of lady-birds, besides *Vedalia*, we should make a trial of *Symnus restitutor*, *Exochomus marginipennis*, *Chilocorus bivulnerus* and *Anatis subvittata*. The last is one of the largest of the family and the one most likely to succeed here.

The black blight is a fungus (*Cepnodium lanorum*) which subsists in the honey dew exuded by the *Dactylopius*. It is entirely superficial but injures the health of the tree by excluding the light from the substance of the leaf.

Of *scale insects*, properly so-called, there are to be found in this district widely distributed but not in large numbers, *Aspidiotus ficus* *Aonidia aurantii*, a species of *Lacanium*, and at an elevation of over 2,000 feet, a very delicate and beautiful *Mytilaspis*.

All this seems very discouraging for the coffee enterprise; but there is another and a brighter picture. In the magnificent uplands of this district, lying at an elevation of from 1,800 to 3,000 feet, there are to be found patches of coffee planted 40 or 50 years ago. The stems of these *trees* are some of them 12 inches in diameter, they are trees in every sense of the word and last season, to my certain knowledge, bore magnificent crops, and from the dense growth of seedlings had evidently done so year after year. These trees are entirely free from blight of any kind, the *Mytilaspis* before mentioned, being found very sparing only on the guava. This is the bright picture.

I am, yours faithfully,

WILLIAM G. WAIT.

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Bearings constructed of compressed wood pulp are the outcome of some ingenious mechanic. Combined with graphite they require no lubrication, and greatly, reduce the friction. The compound can be cut or drilled like metal, and is almost as hard. A dynamo is stated to have been fitted with these bearings with satisfactory results.—*Invention, London.*

PROPOSED RESTRICTION, BY MUTUAL AGREEMENT, OF THE AREA UNDER BEET CULTIVATION.

The commencement of the year has been signalized by the formulation, on part of the *Deutsche Zuckerindustrie*, the well known, ably conducted, and influential journal which represents the interests of the German beet cultivators and beet sugar manufacturers, of a proposal for a restriction, by mutual agreement among the European nations principally concerned, of the area to be annually put under beet cultivation. Such a proposal, coming from a most competent quarter, could not fail to present features of great interest to those in any way concerned, whether directly or indirectly, in this great and important industry and branch of trade, and we had already prepared a summary of the proposal and some of the comments which it had at once evoked, whilst regarding the idea as one of those theoretically admissible, and perhaps even desirable, but doomed from the outset to failure, as *de facto* practically incapable of being carried out. We say this with no desire to throw cold water on any thoroughly well-intentioned plan (such as this undoubtedly is) for bringing about an improvement in the unsatisfactory state of a most important branch of commerce, but because we are convinced that any attempt to restrict by artificial means the development of any legitimate trade or industry must inevitably fail in the long run. The axiom is a safe one, long ago thoroughly recognised in our "shop-keeping" nation, that trade and business, to be sound and capable of proper extension and healthy development, must be unfettered, and regulated by nothing but the natural control of supply and demand. But when the conditions of regulation are subject to the consent and agreement of nations, between which the war of tariffs and fiscal interference with all the most necessary factors of a healthy commercial development tends to become more and more accentuated, then only a most pronounced optimism, or a rampant self-assurance, united to a complete disregard of patent facts and the results of often dearly bought experience, could explain the promulgation of a proposal for such a trade-union as that advocated

by the influential German journal in question. Of the latter defects every reader of the *Deutsche Zuckerindustrie* must at once acquit that thoroughly well-informed and accurate publication; we are therefore compelled to fall back on the supposition that the importance of the object in view and the undoubtedly great exigencies of the situation have for a time obscured its better judgment, and caused it to overlook the manifold, and, taken collectively, insuperable obstacles in the way of the successful carrying out or even inception of such an idea.

The last number of the *Deutsche Zuckerindustrie* has, however relieved us from the necessity of printing a necessarily incomplete review, by giving a resume of the utterances of the leading sugar journals of France and Austria on the subject of the proposal, and supplementing these by comments of its own. We shall therefore sufficiently inform our readers by giving the following translation of this article:

“The proposal for bringing about a regulation of the sugar production, by means of a regulation of the beet cultivation, has now further been taken into consideration by the French *Sucrerie Indigene et Coloniale*. Mons. H. Tardieu, the publisher of this journal, does not expressly declare for or against the idea, but he is aware of another circumstance which will set bounds to the existing overproduction. ‘The lowering of the prices of sugar will put an end to the overproduction on the day when those prices have fallen below the cost of production and nothing more remains of the premium. But until that time let us live according to the royal maxim: *Après nous le deluge!*’

“It is evident that this expert is already penetrated with the conviction that the ruin of the industry must take place; he no longer lifts his hand to ward it off: pessimism has completely overpowered him.

“For our part, although somewhat of the same opinion as regards the present position of the European sugar industry, we hold a directly opposite opinion. He who forces a catastrophe while yet possessing the means of averting it, affords a proof of unpardonable weakness if he does not make trial of the means. This applies to individual as well as to collective branches of production. Such a remedy is, in the present

case the abandonment of unrestricted production, and the adoption of limits. That the means, once put into operation, would not attain its object, has up to now not been asserted in any quarter; the consequent deduction is, that it must be tried, however gigantic the difficulties that stand in the way.

“Mons. Tardieu seems to assume that the French manufacturers will decline to agree to any such limitation. He writes :

“Mr. Herbertz, the founder of the *Deutsche Zuckerindustrie*, has frequently spoken of overproduction and its consequences; and as a means of dealing with it he recommended the abolition of the premiums which are the principal cause of the overproduction. At that time the project of a compact on this basis (that of a mutual agreement as to area of cultivation) would have met with a cordial reception in France, because the French industry had no bounties. But at present our industry is favored with fiscal encouragement, far greater than that granted to the German industry, and to restrict its production would be to restrict the benefit which it derives from these advantages. Who will venture to make such a proposition ?”

“In answer to this question, we have neither more nor less to advance than our firm conviction that the regulation of the production which we have in view would have the effect of rendering more certain the enjoyment of the premium by the sugar industry of France. The coming development of things, if we proceed further in the present direction, must surely be undoubted in the mind of every clear-thinking man. If next year we again produce more than is compatible with the capacity of absorption of the market, then prices will be correspondingly reduced. They will continue to go down from year to year, if increased cultivation and increased production go on steadily; and from year to year a larger portion of the premiums obtained by the French sugar manufacturers will be eaten away by the steadily-falling prices, and the premiums will be curtailed in the same proportion as prices approach the limit of cost of production.

“On the other hand, it is clear that with good prices the premium will remain a real premium—a second profit along with the regular profit on the production. An industry pos-

sessing a high premium will therefore, if it properly understands its own interest, strive after nothing else than to maintain the premium in its full extent by keeping up prices.

“The error to which the *Journal des Fabricants de Sucre* commits itself is quite as great when it opines that, in case of an international regulation of production, the French industry would be condemned to remain at the lower stage of development which it at present occupies, as compared with Germany, in regard to the capacity of its factories and the cost of production. The sugar industry of France is fortunate enough to work under a system of taxation which has the innate property of offering an inducement to uninterrupted progress, the very tax which our enlightened legislators, by the unlucky law of the 31st May, 1891, (which already, before coming into force, brings ridicule on its promoters) have rendered a dead letter. The possibility of multiplying the advantages granted by the Treasury will always, as long as this system exists, lend a spur to improvements in agriculture and technical management, and will tend, as was the case with us, to a reduction of the cost of production. But France possesses in her premium the most effective reducer of the cost of production, for the magnitude of this renders it much less a matter of absolute necessity for her to reduce the expenses by producing very large quantities than is the case in other countries where the industry is scantily or eventually not all provided with premiums.

“But if people are of the opinion that we are proposing in future to go below the rate of the present production, and want to make out that we are simply advocating that in coming years less sugar should be produced than now, then we have not been fully understood. We counsel regulation of the production in the quarter in which it is the most suitably attainable, viz., in the cultivation; but whether this regulation, calculated in conjunction with what must be regarded as the growing consumption, will lead to the result that for a long time a smaller quantity must be brought into the market than is the case at present, is by no means yet a settled question. It rather seems as if it would suffice for the restoration of matters to a sound state, if we were to content ourselves for a short time with the present extent of

cultivation, and then to proceed step by step in a forward direction, keeping an eye on the consumption. The fear, that France would be excluded from the possibility of participating in the advantages arising from the production of larger quantities, has then no justification whatever.

“The last issue of the *Prager Zuckermarkt* devotes to our proposition a communicated article, received from a personage of the highest consideration (hochachtbarer Seite), which it reproduces with the request that those connected with the trade would take part very numerously in the discussion of this most important question, which cannot be settled all in a moment. The communication is as follows: ‘The *Deutsche Zuckerindustrie* deals, in its issue of the 8th inst., with the beet sugar industry in Europe, and points out the dangers connected with a further increase in the production—dangers which, even with the area at present under cultivation, must have arisen if there had been an abundant crop.’ ”

There is certainly no doubt that a rich beet harvest, that is, rich in both quantity and quality, in the year just past, would have inflicted heavy damage on the sugar industry of these countries, perhaps for many years, and that such a danger might be removed by a mutual agreement as to sugar production—or, preferably, of the area under beet cultivation—if such an agreement could include all Europe.

But such an agreement seems almost entirely out of the question under the circumstances prevailing here with regard to the sugar factories themselves, for it cannot be thought that, with the really mad race after beets, any but a very insignificant portion of them would honorably pledge themselves to a reduction.

Supposing, however, that such a general abstention on the part of the factories could be obtained, how should we go to work? The quantity of production depends only on the amount of the raw product on offer, and this mainly on the price offered, while this latter again depends on the prices which can be got for sugar. There is naturally only one way of reducing the quantity of beets at disposal, and that is to offer such prices for beets as will lead to a portion of the growers ceasing to cultivate beets.

But, taking things as they are at present with us, is it in

any way to be supposed that it would be possible, with high sugar prices—the obtaining which would be the very aim of any mutual agreement—to keep down the prices paid to the agriculturists? Or can it be thought that the beet growers, without being asked, could be portioned out among the factories, and the latter in their turn should fix for every grower the extent of ground to be put under beets?

At the present moment we have our hands quite full with endeavoring, under the present movement, to defend ourselves against the unwarrantable demands of the farmers, and this often with very doubtful success; how can it then be thought that we could prevent this new and gigantic edifice, even for a short time, from being swept away. It would collapse like a house of cards and leave behind it an intolerable enmity between beet growers and the sugar factories.

Unfortunately it can be supposed, that the regulation of demand and production can be effected by any other than the natural way; good prices for sugar will result in good prices for beets, and these in an increase in the cultivation, and this increased production have as its consequence a reduction of the first-mentioned, of the prices of sugar and all the following factors, and this continual play of equilibrium between production and consumption will go on recommencing, regulated by the increase of population and the power of consumption of the individual.

It would seem, that any power of coalition possessed by our sugar manufacturers and their representatives must go down before an arrangement so in accordance with natural laws.

“Even an outburst such as this cannot convince us that we are on a wrong path. Besides, the communication itself admits that agreement as to area of cultivation, once carried out, would avert the dangers which are menacing us. The rejection of the plan, to which it commits itself, is purely based on the difficulty of carrying it out.”

The *Deutsche Zuckerindustrie* combats, at some length the conclusions of the article, pointing out that the assertion that the quantity produced depends only on the quantity offered by the cultivator does not agree very well with the

preceding assertion that the Austrian factories are running wild after beets, but even if the remark were true, the remedy would lie in quoting lower prices for the beets, and thus reducing the cultivation, and keeping to this till a more equable proportion was established between production and consumption. After further discussion and arriving at the conclusion that consumption, however great faith we may have in its capability of expansion, will fall year by year further below the production, and that this natural remedy will not suffice, but an artificial means must be sought to bring about an equilibrium, the *Deutsche Zuckerindustrie* continues:

“In his daily report of the 19th inst., Mr. Licht, of Magdeburg, also touches on the regulation of the cultivation, and says: ‘In various quarters of late the attempt is again being made to artificially limit the cultivation of beets. It is to be hoped that the experience of 1885 will not be overlooked, for the benefit of higher prices, obtained by restriction of the beet cultivation, extends also to cane sugar, and so the beet cultivator, in limiting the cultivation of beets, is just handing over to his opponent the weapons which facilitate the conflict between sugar beet and sugar cane not in favor of the former.’

“Now, if this were really *bona fide* meant, it would be an outburst of most complete nonsense. We are warned against advanced prices of sugar! An advantage, and an amelioration of the situation, is to be thrown away, because this advantage and amelioration would at the same time benefit others. Mr. Licht may take his own view of the well-being of the German beet sugar industry, but we hold that with advanced prices for sugar it would do very well in spite of the competition of the cane. Mr. Licht seems to be afraid of the agriculturists and manufacturers bethinking themselves and bringing about an advance in prices, and tries to work against this, but he has not done this very cleverly.”

The *Deutsche Zuckerindustrie* finishes by thanking the specialist journals for taking up the matter, and declares that the universal notice which the proposition has attracted, shows that they have hit the right nail on the head, and that practical men will certainly continue to pursue and try to throw light on the subject.—*The Sugar Cane.*

THE POSSIBILITIES OF OUR SUGAR INDUSTRY.

CHARLES R. BUCKLAND.

The abolition of the duty on raw sugar has made a very material difference in the quantity of refined sugar consumed in the United States. It was not until April 1, 1891, that we had free sugar, yet the consumption during 1891 was by far the largest in our history. In a measure this was no doubt due to the prolific fruit crop that taxed the capacities of our canneries to the utmost but still more largely to the low price of sugar. An idea of the enormity of the sugar business can be gathered from the following table showing the total consumption of the United States for the past three years, as also the annual increase or decrease, and the average consumption *per capita* of our population :

CONSUMPTION OF SUGAR IN THE UNITED STATES.

Consumption in tons of 2,240 pounds.	Increase or decrease.	Consumption per capita.
1891.... 1,885,994	23.86 per cent.	67.46 pounds
1890.... 1,522,731	5.08 "	54.56 "
1889.... 1,439,701	1.21 "	52.64 "

Of this great quantity of sugar consumed last year, 1,619,-704 tons were imported foreign-grown sugar, leaving only 266,290 tons of our own domestic growth, or about fourteen per cent. of the whole.

What a magnificent opportunity is here afforded to our agriculturists. Our government offers a premium, or bounty, of two cents per pound on all the sugar grown at home, or \$44.80 upon each ton of 2,240 pounds. If we could only grow the whole of the sugar that we consume this would be a distribution of about \$80,000,000 annually, among our farmers. And there is no reason why we should not grow it. But first let us look at our domestic production for the past three years. Thus:

PRODUCTION OF SUGAR IN THE UNITED STATES.

In tons of 2,240 pounds.

	1891.	1890.	1889.
Louisiana crops	200,000	175,000	145,000
Texas and other Southern States	7,000	7,000	6,500
Molasses sugar made in United States	31,320	53,439	48,243
Maple, sorghum, beet.	27,970	30,000	25,000
Totals.....	266,290	265,439	224,743

These figures show but little increase in the growth of sugar as an agricultural industry of the United States. But, with the stimulus promoted by the bounty offered by our government, a material increase is expected. There is yet an extensive area in the Southern States that is adapted to the further cultivation of cane sugar. Especially is this true of Florida, where there is a large breadth of land that is believed to be as well adapted to the sugar cane as the famous Hawaiian plantations, and it is even said to be more fertile than the Sandwich Island sugar soils. There are millions of acres suitable for the growth of the sugar beet, and now that government aid has been directly guaranteed there should be no lack of capital to promote and foster the increase of both cane and beet sugar at home. In this connection it is of interest to see from what points our large sugar supplies are mainly distributed. There are no imports of sugar except at New York, Philadelphia, Boston, Baltimore, New Orleans and San Francisco. Taking the four eastern ports we find their imports of sugar for the past three years, together with the amount actually refined therefrom, as follows, in tons of 2,240 pounds:

	Imports.	Refined.
1891.....	1,534,987	1,505,948
1890.....	1,212,910	1,181,539
1889.....	1,008,810	1,057,802

At San Francisco the imports in 1891 were 158,614 tons, and at New Orleans 88,928 tons, the largest ever recorded. More than half the eastern imports are at New York, Philadelphia being second in importance, and Boston third.

The foregoing table shows us that almost eighty-two per cent. of the sugar that we consume is imported at, and distributed from, four eastern cities, New York, alone, distributing more than one-half. Notwithstanding this important fact, little effort has been made of late years to grow domestic sugar in the Eastern States, except the small quantity of maple sugar, which is annually less than 20,000 tons. With our large eastern area of agricultural lands and the complaints of non-paying crops, there should now be ample room for the growth of sugar-producing plants on a large and remunerative scale.

We find that in all parts of the Western States active efforts are being made to produce sugar, especially from sorghum and the sugar beet. Until a few years ago there was only one sugar-beet factory in the United States, at Alvarado in California. But at the close of last year, three such factories had been in operation in California with the following results:

BEET-SUGAR PRODUCTS IN CALIFORNIA IN 1891.

FACTORY AT	Product in pounds.	Bounty earned.
Alvarado	1,782,982	\$ 35,660
Chino	1,946,000	38,932
Watsonville	4,340,556	86,811
Totals	8,069,538	\$160,403

These figures, showing the actual bounty earned by beet-sugar factories in California last season, should bring the matter right home to our farmers and capitalists. For producing 4,000 tons of sugar the government pays the Californians \$160,000. The success of these three factories is stimulating others in the west. A fourth company is being organized at Anaheim, Cal. There is a beet-sugar factory in Utah, at Grand Island and Norfolk in Nebraska; and companies are organizing at Decatur in Illinois, Omaha, and at several other western centers the beet-sugar movement is making active progress. At present we are consuming, *per capita* of our population, fifty-nine pounds of foreign sugar every year and only nine pounds of home growth. I hope to see the day when these figures shall be reversed, and we shall not be dependent upon any foreign country for our supplies of what has become one of the necessities of life. The actual cash paid out of the country, last year, for foreign sugar exceeded \$100,000,000. Add to this a bounty of two cents per pound on the 4,224,000,000 pounds of sugar that we consumed last year, and which we might produce ourselves, and we have a further sum of \$80,000,000, the whole of which \$180,000,000 might be circulated and distributed throughout the length and breadth of the land.

Dr. Wiley's able article in the semi-centennial issue of the *American Agriculturist* gave a good idea of the beet-sugar

industry as viewed by the farmer. What he says about the difficulty that farmers experience in growing beets at a profit for the prices offered by the sugar factories, may account for the rumor that the present increase of \$25,000,000 in the capital stock of the American Sugar Refining Company is to enable it to engage in the sugar-beet growing on an enormous scale. Whether political exigencies will lead to a repeal of the bounty on domestic sugar is also a disturbing factor, but, not questioning the wisdom of this act, it can hardly be repealed with any degree of equity or justice. The principal sufferers by our sugar bounty are the Hawaiian planters. Heretofore they had all the benefits of protected reciprocity. They received for their sugar, on which no duty was paid, the full market price of duty-paid sugar in New York, less a percentage deducted by the refiners in California. In other words, the United States practically subsidized the Hawaiians to the extent of two cents per pound on all the sugar they raised. The cost of Hawaiian sugar landed in San Francisco is not less than three cents per pound, consequently it will readily be seen that our unrestricted reciprocity is no blessing to the Pacific islanders. It reduces them from a position of affluence, when receiving a profit of about \$40 per ton from the United States on all their sugar product, to one of comparative penury, with their profit wiped out, and rigid economy and retrenchment necessary in order to secure an evenly-balanced ledger. The refiners in San Francisco, having amalgamated their interests, are well secured against loss, and it is difficult to see how the American Government can make any discrimination in favor of Hawaiians without adding them to the Republic and thus entitling them to the benefits of the bounty, practically restoring them to their *statu quo ante*.

At this juncture sugar can hardly be raised profitably in the United States without a bounty, and Louisiana planters will abundantly testify to the uncertainty of their crops in the past as a paying investment. It is a moot question, moreover, whether at the expiration of the term for which the bounty has been guaranteed, sugar-growing would then be profitable without either bounty or duty. This, of course, will depend upon the question of future supply and demand.

Wages here are higher to a degree than in the other sugar-producing countries, but there is ample time for American ingenuity to contrive improved mechanical appliances that may more than offset any competitive disadvantages under which we are now laboring from that fact, which cannot and should not be deplored.—*American Agriculturist for March.*

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SEEDLING SUGAR CANES.

From the *Bulletin* of the (Royal Gardens, Kew.)

The systematic propagation of the sugar-cane from seed is as yet in its infancy, nevertheless some facts of interest and importance have been discovered which are worth briefly summarising here. Since the time that the re-discovery, at Dodd's Botanical Station, Barbados, of the seminal fertility of the cane was authenticated, realizing its potential importance, systematic experimental work has been carried on at our own Botanic Gardens, as our columns have before disclosed. That the very earliest varieties of sugar-cane can reach maturity the first year of their growth from seed has been shown as possible under favorable circumstances this season at the Botanic Gardens; though it must be admitted that even with these very earliest varieties both the proportion of canes in a stool and of plants to a bed of the same variety which flower the first year is small. Seed of the variety *Karakarawa*, which is one of the two earliest kinds in the Colony, was sown on 1st October last year. Three months later the young plants were taken from the seed boxes and pricked out in baskets, five or six in each basket. Six weeks later again they were shifted on singly into larger baskets, which were about six inches deep and wide, and in which they remained till they were from one to one and one-half feet high, when, on the 19th April last, they were planted out in the open ground. At that time each plant consisted of a solitary shoot, none having begun to sprout from the base. A few weeks later, however, they began to tiller freely and to grow rapidly, and by the middle of September the more advanced plants were in flower, thus completing the cycle of growth. As, when they were planted out in the ground in April, the young plants were only in an equivalent

stage to that of a cane top put into the ground at the same time, the record above given shows that seedling sugar-canes of the earlier varieties make rapid and vigorous growth once they get past the tedious period of infancy, which occupies from four to six months. Only, however, the very earliest varieties mature the first year ; all the rest, though they may be only a month or so later in their period of flowering, miss the first season of arrowing, and consequently have to go on to the following autumn before the chance of performing that function occurs again ; so that for the great majority of varieties it may be said that two years are required from the time the seed was sown for the seedlings to mature, or from 15 to 18 months from the time they were strong enough to be planted out in the open ground. This is a sufficient proof, if any were needed, that the idea of resorting to seed for propagation in field agriculture is impracticable, and that the present methods of propagation by cuttings or stumps will have to be adhered to in the future as in the past, if only for economy in time. But, of course, the insuperable obstacle to using seed in field propagation, even if time could be regarded, as the Indian regards it, as of no consequence whatever, is the delicacy and slow growth of the sugar-cane in infancy. In the climate of Guiana, field propagation of the cane by seed would not yield an average of one plant per acre.

As we have emphasized before in these columns, the only useful way of employing the knowledge we now possess of the sugar-cane's seminal fertility, is in nursery propagation, with the object of obtaining new varieties. Of this method of propagation and its results we have now had two seasons' experience, and short as the period is over which the experiments have extended, the information gained is highly interesting and instructive. Numerous facts, naturally of varying importance and practical interest, have been discovered, two of which are of great value because of the promise they hold out of ultimate economic improvement in the sugar-cane by this method of propagation. The first of these important revelations is the wide variation that occurs in seminal generation in the sugar-cane ; and the second the marked tendency to improvement shown in this variation. As was naturally to be expected there are numer-

ous instances of retrogression, but the general tendency is clearly on the lines of improvement in each particular variety that has been so far successfully tested. The progress in improvement is gradual of course, and the degree naturally in direct proportion and relation to the character and quality of the parent canes. The inferior varieties, for instance, do not produce large varieties in a single generation, but as with better kinds, few or many of the progeny show a decided improvement on the parent stock. In the majority of instances the improvement, though evident, is not great, but occasionally an instance occurs that is a striking advance. This is the ground of encouragement in pursuing this method of reproduction. If among the seedlings of a variety is found in the first generation a plant twice or thrice the size of the parent plant, we are justified in excepting that by selecting this larger plant and breeding from it again we shall get still further improvement, to be repeated again and again in succeeding generations. This, we may note, is one of the points already achieved. By recording the name of the variety from which each lot of seed was gathered, when it was sown last year at the Botanic Gardens, this possibility of improvement has been established with certainty, so far as the evidence afforded by a few varieties in a single generation can be taken as a guide, and we know of no reason against its acceptance. We have mentioned the occasional improvement observed in size in the seedlings of these carefully recorded parent varieties; but the variation in color and form and other external characters is more general and conspicuous than that in size. In the majority of instances there is an evident approximation in physical and morphological features to the characteristics of the parent, but the departure from this typical state covers the entire range of variation possible, from the least to the widest extreme. Of this wide range too many instances have occurred to leave any room for doubt on the ground of possible error of record as to parentage that might arise from mistakes made in gathering and sowing the seed, or the subsequent course of growth. In many instances the variation is slight, but in several cases purely white or purely green canes have been produced by dark purple ones. We have said that in the majority of the

seedling there is a general approximation to parental likeness does not bear a very great proportion to the whole variation.

The degree of approximation varies in the different kinds, the smaller inferior canes producing a larger number like the parents than the larger and superior ones. Of one of the larger kinds of which many plants were raised, not one appears to have come absolutely true. This variety, called *Muni*, is a long-jointed claret-colored cane, and the widest departure it has made in its varied-colored progeny is to a short-jointed white cane. If this instance stood alone, as we have before intimated, it might be thought that a stray seed of some other kind had got into the stock, but, as we have also before intimated, the several instances of the kind that have occurred are too many to require or to justify resort to any such explanation. It seems not improbable in fact that if any one of the inferior varieties, possessing a fair degree of germinating power upon which success largely depends, were taken in hand, that by seminal propagation and careful selection from the seedlings, as many varieties, showing as wide a range of size, color, quality, etc., might be procured from it in a few generations, as all the kinds of canes collected from all sugar-growing countries, which we now possess, show! This impression, gathered from our brief experience, justifies sanguine hopes of improvement in the future of the varieties we now cultivate, and imposes the obligation of zealous endeavor to realize this improvement. Another encouraging feature of seedling canes is that the features they first present appear not to be their best or permanent ones. During the first two years, at least, the period seedlings have been under observation here, there seems to be a steady general improvement in character. Where the first shoots have been slender, subsequent ones have come double the size, and where in the earlier canes the joints have been short and often bearded, in the later ones they have been long and clean, and a higher gloss and glow have also developed in the color. So that as two full years are in most instances required for seedling canes to reach maturity, so also this period is necessary for them to develop their true character. The inference may be taken from this that if the cultivation of the seedling canes first discovered in Barbados had been

extended, the objectionable features for which they were discarded and destroyed would have disappeared ; in which case we should probably not now have to lament the loss in the experimental working of this potent discovery of the 30 years which have elapsed since that time. Though we have described the wide variation and improvement that might possibly be realized in a few years in breeding and selecting from one of the poorer varieties of cane, we have intimated as well that our object—that is obtaining an improved variety of cane to any now existing—would no doubt be earliest realized by breeding from the better kinds. The primary qualities required are—first, large size, to give weight of cane from the fields, and—second, sweetness to give yield of sugar from the canes. These may be regarded as the primary and absolutely essential qualities of a good cane, while it is admitted at the same time there are several important minor qualities, which, though dispensable, are also desirable. These pertain to the habit of growth, resistance to drought, earliness, flowering or non-flowering, degree of itch to the leaves, of fibre in the cane, etc., etc. In selecting breeding stock it must be admitted that we have much to learn on the subject of the transmission of qualities in seminal generation in the cane. We have described to some extent the evidence we at present possess of the considerable variation that takes place in descent in the physical and morphological features of the cane ; whether the sweetness will vary to the same extent sufficient time has not elapsed yet for us to determine. This character is equally as important as that of the size and physical nature of the cane, and in our experimental work demands equal attention and regard. The few analyses it has been possible yet to make seem to point to the fact that external physical variation is accompanied by internal chemical variation. But we must wait another year, till our pedigreed seedlings have matured, before we can speak with assurance on this point. However, the uncertainty need not affect our present action ; there can be no question, whether the saccharine quality varies or not in descent, the best stock to breed from is that possessing in largest degree the qualities, separately or combined, of weight of cane and of sugar. There are three possible ways in which we may look for improvement in the sugar-cane. We may

obtain a variety that will give a larger weight of cane per acre, though it may contain no more sugar per ton of cane than the better kinds we possess now. Again, we may obtain a variety yielding a higher percentage of sugar, though the weight of cane be not increased. This is what has been accomplished in regard to the sugar beet. Thirdly, we may obtain a cane containing both increased yield of cane and of sugar. Which would be the most desirable would depend upon the degree and relative proportions of bulk and percentage of sugar in the cane. Sufficient has been said to show what is sought in propagating the sugar-cane from seed.

We shall not get an ideal cane; but Mr. Neville Lubbock gave the writer one day a rough ideal toward which we may successfully strive. "What we want," said he, pointing to a plantain stalk 15 feet high and as thick as one's thigh, "is a cane as big as that containing 20 per cent. of sugar." Whether we shall ever attain to the size of cane or degree of sugar contents just mentioned may be left to conjecture and the result of future work, but it is along the lines leading to those ends that we confidently look to make progress. The *Scard* seedling gives an indication of what is possible. This is a plant of unknown parentage and fortuitous birth in Barbados. It was among the earliest natural seedlings discovered there by Messrs. Harrison and Bovell. When an inch or so high, and when nothing whatever could be known of its character beyond the facts mentioned, it was taken by chance from the nursery at Dodds by Mr. Bovell and sent here. It has turned out an entirely unknown variety, and a giant of its race. A few months ago it fell down of its own weight, when ten canes were broken off which collectively weighed 122 pounds without the tops. In spite of this loss it is still 18 feet high and 12 feet in girth of stool, possessing 24 canes which will probably weigh when cut 200 pounds, half as many more having been killed by borers,—pests that have been unusually prevalent this year.

To sum up. Though the work done in Java undoubtedly anticipated that done in the West Indies by Messrs. Harrison and Bovell, it attracted but little general attention. The discovery of these latter gentlemen has been termed "accidental." Even if true, that is no demerit. Most discoveries in

some sort are accidental. They often lie, so to speak, under our eyes, and only reveal their significance to those who are ready to appreciate it. This Messrs. Harrison and Bovell did, and the greatest credit is due to them for the fact. All that Kew has done in the matter was to put it on record and give it a scientific verification. For my part, I have no doubt, looking at the whole history of the improvement of cultivated plants, that the discovery, for so I think it, of Messrs. Harrison and Bovell has been the starting point of a new era in the cultivation of the sugar-cane, and with time and patience I do not see why even the aspirations of Mr. Neville Lubbock should be realized. But it will require both.

At the moment of sending this paper to press I have received the following important communication from the Director of Forests and Botanical Gardens, Mauritius. It shows that the advice given from Kew in 1886, as to the possibility of effecting something for the improvement of the sugar-cane by taking advantage of "bud variation," though based upon theoretical considerations, was fully justified. I do not, however, pit one method against the other. I simply point out that the cultivator in quest of new varieties has, so to speak, two strings to his bow.

W. T. THISELTON DYER.

ROYAL BOTANICAL GARDENS, MAURITIUS, to ROYAL GARDENS, KEW.

The Gardens, Curepipe, Mauritius, 9th December, 1890.

DEAR SIR: * * * * * Raising canes from seed to get improved varieties will be a long and tedious affair, and there will be many disappointments before a really good hardy sugar-yielding variety will be obtained. I think it probable that more and better results will be obtained by good cultivation and by new varieties from bud sports. Of these last we have eight or nine in Mauritius alone, some of them are very fine canes and they are extensively planted. Most of them are hardier than their parents and yield more sugar. They are mostly obtained from new canes recently introduced. The sudden change of climate, soil, and other circumstances cause them to be thrown off. More of them might be obtained if the planters were more observing than they are, and closely followed the cane cutters when cutting the canes. Thus they would range all their fields over, perhaps, areas amounting to 1,500 acres, matching each cane as it is seen cut. As things are, a new variety is only observed should it chance to spring up in an outside row.

Yours, etc.

(Signed)

JOHN HORNE.

W. T. Thiselton Dyer, Esq., C. M. G., F. R. S.

VARIETIES OF SUGAR CANE PRODUCING SEED.

NAME.	WHENCE OBTAINED.	Percentage of Flowers which Formed Seed.	Weight of a Seed Grain in Milligrams.	Percentage of Germinating Seeds.
Yellow cane (Lahaina ?).....	Hawaii	3.00	0.20	16
Tebœ batoeng.....	Borneo	6.00	0.16	15
Tebœ koening.....	Borneo	4.05	0.10	6
Branche blanche.....	Mauritus	31.00	0.15	35
Loethers.....	Mauritus	0.37	0.20	..
Tebœ rapooh.....	Java	0.23	0.22	..
Tebœ soerat balie.....	Java	0.36	0.20	..
Tebœ soerat redjoe.....	Java	13.07	0.11	3
Tebœ idjoe.....	Java	0.08	0.20	20
Glonggong.....	Java (wild).....	8.05	0.16	..
Glagah.....	Java (wild).....	24.00	0.34	..

“Thus, in a spikelet of Branche blanche we found the greatest number of seeds, out of 100 flowers there were 31 on the average which had formed one seed each. In the case of Tebœ rapooh we found the fewest seeds, as there was only one seed to 435 flowers. The seeds are exceedingly small, those of Glagah being the largest, and those of Tebœ koening and Tebœ soerat redjoe the smallest.”

A very large number of the seedlings perished; only from the yellow Hawaii cane did Soltwedel (in 1887) obtain *strong plants which grew to 2½ metres*. In the year 1888 he divided these into cuttings, and obtained from them in the following year plants of 3½ meters high.—*Bulletin, Royal Gardens, Kew.*

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REMEDY FOR THE COFFEE BLIGHT.

EDITOR PLANTERS' MONTHLY,

DEAR SIR:—I notice in the *Hawaiian Gazette* of Feb. 16th, a letter in regard to the blight known as “White Aphis,” which affects coffee. Of course it would be a great blessing to the coffee growers of this country if a natural enemy could be found which would destroy this pest. I have run across a recipe, from the “Farm and Fireside Magazine,” which might, in the meantime, be some assistance to them. It is sure death to “White Aphis,” and does not injure the tree in the least, when properly made.

EMULSION:—Take two (2) parts of kerosene oil and one (1) part of soft soap (or dissolve hard soap in hot water until

consistency of soft soap) and stir together until they unite. If found that they do not unite readily, add boiling water until they do, and no water is seen to float on top. The solution, if properly prepared, should have the appearance and be of the consistency of condensed milk, when mixed ready for use.

2. Take now one part of this emulsion and mix with two parts of cold water, then apply with a spray pump, or any other way found convenient. I have found this emulsion to be certain death to the "Aphis." It turns to a sort of leather color almost immediately, and when dry resembles cork dust to the touch. It is advisable to shake the tree after spraying so that no surplus stuff may be left on the leaves.

We have tried this on coffee, orange, lime, cocoa and lemon trees, and if properly made and applied, it does not affect the most tender shoots, even the opening blossoms of coffee. We have also tried this recipe on black-blighted lime and guava trees. There is no black blight on coffee here that I have seen, but it does not seem to affect that blight at all.

Some people are under the impression that "White Aphis" is simply a forerunner of "Black Blight;" but I think this is a mistake. I consider them entirely separate diseases, as there are many trees black-blighted that never had a particle of "White Aphis" on them. It seems to attack trees of sluggish growth and might be remedied by cultivation; whereas "White Aphis" will attack the most vigorous plant. I have noticed that dry seasons cause "Black Blight" here on the ohia, guava and mountain apple trees.

The cost of spraying plants, two feet high with twelve or fourteen primaries, is about one dollar per acre, with Japanese labor at \$18.00 per month. We spray anything that has the slightest particle of "Aphis" on it, and the coffee looks vigorous and healthy, and is doing exceedingly well. This is no experiment, as we have been using it three months, and I can confidently recommend it, even to the ladies for their rose bushes. I have heretofore neglected marking the trees sprayed so as to ascertain how soon it returns, but am doing so now.

Respectfully yours,

ROBT. RYCROFT.

Pohoiki, Puna, Hawaii.