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The yield of the Kohala Plantation on Hawaii for 1892, has been 2,400 tons.

The price of sugar in New York remains the same as last quoted in June.

Paia Plantation has earned eight per cent. dividend on this season's crop, and carries forward a balance of earnings suf-sufficient to take off and market the crop of 1893.

The Onomea Sugar Company's Mill at Papaikou has closed its work for 1892, with a splendid crop of 6,450 tons of sugar, equal to four and a half tons to the acre for plant and rattoons. This is the largest and most satisfactory yield of any plantation on Hawaii for 1892, and speaks well for the management.

The first year's output of the Ewa Plantation has been 2,845 tons of sugar, or about 4¾ tons per acre. A yield of five tons per acre was looked for, but owing to various circumstances, as usual with a new mill and a new plantation, the outcome fell off about eight per cent. from what it should have been. 1,300 acres of cane are coming on for the second crop, and if everything works well, 6,500 tons of sugar may be reckoned on.

There has been a considerable falling off in this year's yield of sugar, equal to at least ten per cent. on some plantations, which is attributed to the cold weather during the winter of 1890–1, which checked the growth of the young cane that matured and was ground this season. The European beet crop of 1891 suffered from the same cause, and to fully as great an extent; the beets maturing in the same year (1891) while the cane, requiring twenty months growth, did not mature till 1892. Hawaii and Maui suffered more in this way than did Kauai, owing probably to their high mountains, which greatly affect the temperature of the air lower down.

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The most important lawsuit that has ever been brought before the Hawaiian courts, in connection with sugar plantations, will be tried during August. It is that of the Waikapu Plantation, on Maui, represented by Col. Geo. W. Macfarlane, versus the Hawaiian Commercial and Sugar Company, represented by Col. Claus Spreckles. The first named party claims one million dollars damages as its share of the profits derived from the sugar manufactured from cane grown on the land known as the Waikapu Commons, which is owned jointly by the contending parties in the suit, the cultivation of the land having been carried on solely by the defendant, under protest, as is alleged, from the party bringing the suit. The principals in the suit are now here, and the ablest lawyers in the kingdom have been retained.

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HIGH PRICED SUGAR IN CALIFORNIA.

In the article quoted from Willett & Gray's Circular, page 315, reference is made to the high price of refined sugar in California over that of New York, and the reason is assigned that this is on account of the American Refinery losing heavily on a very large stock of Sandwich Island sugar in San Francisco, purchased before the McKinley bill went into force, and the price of sugar is still kept up on this account. This purchase of Sandwich Island sugar was made during the three months from January to April, 1891, and a considerable portion of it was refined and sold during the same three months at the correspondingly high prices which then ruled. The balance of high priced Sandwich Island sugar on hand

April 1, 1891, was understood to have been some thirty millions of pounds—perhaps a four months' supply. This high-cost sugar was probably all sold during the following six months at the high price then and still obtained in San Francisco over the New York price, and there does not seem to be any just reason why the price should now be any higher in California than in New York. It is maintained solely by the high freight charges on shipments of sugar made westward on the railroads, which are kept at the highest point possible to exclude European and Asiatic sugars. As viewed from this standpoint, it is an injustice to the people of the Pacific coast.

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WITH OUR READERS.

We would call attention to the valuable collection of choice articles presented in this number of the MONTHLY—some from local correspondents and others gleaned from the best sources of information in every sugar producing country. These selections are not picked up hap-hazard, but are obtained only by diligent search among a large number of the best periodicals received at our office.

Our legislators will do well to read the paper (page 318) on the economic value of good roads, which are so much lacking throughout the islands. The new volcano road is the first and only good work of this kind on Hawaii, and though its first cost is large, it can be kept in good repair at a small cost, if properly looked after. Two or at most three men can keep it in first-class condition at not over twelve or fifteen hundred dollars cost per annum.

As a specimen of really good road work in our city, we may refer to King street, from Punchbowl to the bridge near Mr. Jaeger's residence. This was constructed four years ago, of macadam work, and by constant care in sprinkling and occasional repair, it is now in as good order as when first made. The same care will keep it in condition for ten years to come. The writer referred to, says "It costs less to properly care for a mile of good macadamized road each year than it does to keep a horse."

Grape growers will find the latest authentic information about the diseases and enemies of the grape on page 321, and

the article following it applies to the same subject regarding other plants. They are both from the most recent and very high authorities, and give as good remedies as can be found anywhere.

We are pleased to learn from a letter on page 330 that our friend, Mr. Koebele, is meeting with unexpected success in his romantic mission to the South Seas and Australia. He has undertaken at great risk to solve a question which scientists have long been disputing about—whether garden and orchard pests have their natural enemies, and if so, where are they to be found? Mr. Koebele's mission is likely to prove worth millions of money to the fruit growers of America and Europe. We trust he may be as successful as the writer of the article referred to predicts.

When the American sugar bounty Act was made a law, some two years ago, American papers maintained it would require $15,000,000 to pay this bounty. Commenting on it, we stated that the bounties called for would be less rather than more than nine millions of dollars. The statistics lately published (page 332) show that all the claims for the first year have amounted to $7,224,601.88, instead of fifteen millions.

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PAST AND PRESENT.

In looking over some old documents, the following circular was found, which shows on what a limited scale planting enterprises of twenty-five or thirty years ago were carried on. As compared with the Spreckelsville, Ewa or Makaweli estates, each of which involves an outlay of millions of money, thousand of acres of cane lands and eight to ten thousand tons of sugar as an annual output, the Challamel enterprise was boy's play. Yet Mr. Challamel was unable to raise even the twenty thousand dollars which he sought, to start his sugar plantation:

The undersigned proposing to inaugurate a Joint Stock Company (Limited Liability) to carry on a Sugar Plantation on the Island of Maui, (Kaanapali,) begs to call your attention to the following considerations:

Proposed Capital $20,000, with the right of augmentation to $30,000, to be divided into 200 shares at $100 each, payable in 20 monthly payments of $5 each.

The necessary agricultural operations requiring some twenty months

to bring the canes to maturity, this division of share payments, while effective in regard to the enterprise, will enable the smallest capitalist to invest.

It is expected that even at the minimum rate of the market prices, this enterprise, in the run of five or six years, will pay no less than 40 per cent. per annum on the investment. At last year's rate, the profit would be much more; whilst only the prospect of the first crop would augment the share value at 25 per cent.

The undersigned proposes to base the Company upon the following conditions, viz: in consideration of his being appointed sole Superintendent of the Company's Plantation, at a salary of $1,500 per annum, should the capital remain at $20,000, or $2,000 per annum should the capital be increased; that, in consideration of certain Leases hereinafter described, with all the rights, privileges and moneys now invested by the undersigned, twenty shares be allowed him by the Company. Ten more shares to be assessed from the salary of the undersigned, would be taken by him—a clear proof of his confidence in the future success of the undertaking, and he has been long and widely known as an experienced planter and sugar-boiler.

The Leases to be transferred to the Company are as follows:

90 acres of cane land, 675 acres pasturage and wood land.

Lengths of leases are: 3 acres of cane land for 40 years; 49 acres of cane land for 10 years; 40 acres of cane land for 30 years; 675 acres of upland for 30 years. Total rent for the whole, $277.50.

Native landholders in the vicinity, of some 200 acres of cane land, are extremely desirous of cultivating sugar cane, as soon as sufficient inducement is held out of realizing their industry through the agency of a mill.

The soil of these lands is rich, the pasturage excellent, and firewood abundant. The estate possesses a capital landing. At a trifling expense, irrigation of the cane land can be easily effected.

Three acres of fine cane, now matured, are on the spot, kept as seed. This cane would give four tons of sugar to the acre.

The favor of your patronage for one or more shares is respectfully requested. M. C. CHALLAMEL.

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IMPROVING SEED CANE.

The interesting letters from Andrew Moore, Manager of the Paauhau Plantation, and Prof. Hilgard, of the Agricultural Experiment Station, connected with the California University, which will be found on pages 297, 298 and 312, all relating to the seed cane question, will be read with profit by every agriculturist, be he planter, farmer or fruit grower. It will be remembered that it was Mr. Moore's letter, printed on page 6 in our January number, that first called attention to this very important statement that the yield of sugar has not increased in equal ratio with the area of cane cultivated, while

the facilities for extraction of juice from cane and the manufacture of sugar have largely increased. Mr. Moore maintain our seed cane must be improved, and this can best be done by planting cane grown expressly for seed, as he is now doing, thereby using the best cane for this purpose that can be produced. And he is unquestionably right in this claim. It may be an expensive remedy to guard against deterioration, but it is no doubt the safest, if planters can make up their minds to submit to the cost.

There are other considerations, however, equally important, which will be attended with probably good results. One is a change of seed—from one plantation to another—or what is better still, from one island to another. This has been tried, in several instances, and always with good results, where good cane only has been obtained. But seed from foreign countries should not be imported, so long as the dangerous cane diseases now existing in other countries continue.

Another and equally important remedy is to allow cane lands that have been cropped several consecutive years, to lie fallow for as long a period as may be deemed necessary. Even if the land has been well manured while growing cane, some of the elements of the soil needed by the cane will have become exhausted, and poorer crops will be the natural result. Some plantations have so limited an area of cane land that the temptation is to plant and replant for ten, twelve, and even fifteen years, without rest, and then the planter wonders why he does not obtain as much per acre as formerly.

The letter of Prof. Hilgard is a valuable contribution in this discussion concerning the deterioration of seed cane. It will be seen that he coincides very decidedly with Mr. Moore in the position taken by him that the *whole of the stalk* of the choicest cane—and especially that which contains the most sugar—should be used for seed, giving his reasons for it, and also his experience with grape cuttings and other plants.

In one point, however, we think that the Professor has mistaken the argument advanced by one writer in the PLANTER, who maintains that the older joints of cane, which are generally short or close together, producing very little juice, while the eyes are seldom perfect, should be generally discarded as seed. Like the unripe on the top of the cane,

they make uncertain seeds and are generally thrown out. The central three-fourths of the stalk in length produce the most juice and are the most valuable for sugar.

Aside from the letters referred to above, two other articles bearing directly on this very important topic of deterioration of seed cane, will be found on pages 299 and 306. The former relates to beets as well as cane, and shows how beets have been improved by careful selection of seed and by judicious fertilizers, and also how much more attention is paid to these in Europe than by cane planters. On page 303, the writer well states that "the hope for the cane industry lies in that the production can, in many instances, be advantageously increased from fifty to one hundred per cent. by resorting to intensive culture."

The article copied from the *Mackay Sugar Journal* is written in the interest of cane tops as seed, or such portions of the stalk as "are considered as unfitted for production of sugar." This writer recommends exchange of seed with other plantations—a plan which should be adopted wherever it can be carried out, even though the exchange necessitates considerable expense.

Altogether the articles which we present in this number, on this interesting topic of improving our cane, and thereby maintaining the high standard of the Lahaina variety, will show the necessity of greater care in its selection at a time when all our energies should be concentrated on the one object of producing a larger quantity of sugar from the same acreage or tonnage, at the smallest cost possible.

In this connection, while referring to cane seed and cane crops, we may refer our readers to an article taken from the *Mackay Sugar Journal*, relative to the low yield of sugar per acre there, which is stated to be 1.50 to 1.75 tons per acre, taking the average of all the plantations in the colony. This is certainly a very poor showing; and if they can make the business pay on that small yield, certainly our planters, who average three to four short tons of sugar per acre, ought to be able to secure fair dividends on the year's work. We commend this article to our readers here, as it will show them that in yield of sugar per acre, they are more highly favored than planters in other countries.

DOMESTIC EXPORTS.

The Custom House statistics showing the domestic exports for the first half of 1892 have been published, and though the exports of sugar for the period have not been so large as in 1891, yet this may be explained by the fact that in 1891, extraordinary efforts were made by the planters to manufacture all the sugar that could possibly be made before the McKinley law, as regards sugar, took effect on April 1st, 1891. It is hoped that the total exports for the current year will be fully up to what they were in the previous. Several plantations, however, counted on a considerable increase in their crops, which has not been realized :

DOMESTIC EXPORTS, HAWAIIAN ISLANDS, SIX MONTHS, 1892, COMPARED, WITH CORRESPONDING PERIOD, 1891.

ARTICLES.	1892.	1891.
Sugar, pounds	212,744,667	228,266,931
Rice, pounds	4,017,295	1,119,400
Hides, pieces	12,301	14,906
Bananas, bunches	44,791	58,319
Wool, pounds	105,210	----------
Goat Skins, pieces	1,175	2,975
Tallow, pounds	792	27,225
Molasses, gallons	27,574	46,242
Betel Leaves, boxes	102	150
Coffee, pounds	9,129	500
Sheep Skins, pieces	3,637	4,125
Awa, pounds	3,885	----------
Pineapples, boxes	900	----------
Watermelons, pieces	179	----------
Plants and Seeds, pkgs	6	----------
Sundry Fruit, boxes	133	----------
Bones and Horns, pounds	15,520	----------
Curios	1	----------

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A fine stick of cane has been on view at the Queensland National Bank. In length it was about 13ft., but there was no less than 36 joints on it. Towards the centre the joints are quite close together, while at either end they are much further apart. It looks as if the spell of dry weather had checked the growth at some time or other. The cane comes from a field of Rose Bamboo belonging to Mr. J. Gallanty, Habana—*Mackay Mercury.*

CORRESPONDENCE AND SELECTIONS.

REGARDING SEED CANE.

HAMAKUA, HAWAII, H. I., JUNE 16TH, 1892.

EDITOR PLANTERS' MONTHLY: It is with a great deal of satisfaction, that I now furnish you with a communication from Prof. E. W. Hilgard, of the University of California, in which he gives his opinion of the causes that have led to the deterioration of the sugar cane, as experienced, and noted by me; in my letter published in your January issue.

My letter caused more, or less thought on this subject, and led to the publishing of several others by prominent planters, the majority of whom recommended the top of the cane as being the natural, and therefore the best part of the stalk for seed and very successful results were cited as being obtained from these and from volunteer cane when used for seed. Receiving but little encouragement to follow up my theory, from the published letters, (excepting that written by Mr. J. M. Horner), or from those with whom I had conversations on the subject, and thinking my theory right, although not able to prove it, I decided to refer the several communications to Prof. Hilgard, a recognized authority on agriculture, for his opinion, and who, as will be seen by reference to his letter, supports my theory.

If on the other plantations, the cane has deteriorated as at Paauhau, the seed question as considered with Prof. Hilgard's opinion, is one of vital importance to every plantation on the Islands.

If, by a careful selection of our seed, we can improve the quality, and quantity of our cane per acre, any increase in the quantity of sugar, means to some plantations so much profit, and to others, a material, and welcome assistance to help them withstand the damaging effects of the McKinley bill, on the only supporting industry of the Hawaiian Islands.

Most of the plantations have made all of the improvements possible to enable them to cultivate their lands, harvest their crops, and manufacture the same into sugar, at the least expense, and all that remains to be done, is to improve the

productiveness of the cane. This may be accomplished by the introduction of new varieties, and by the judicious selection of the seed from the cane we have.

Yours very respectfully,

A. MOORE.

AGRICULTURAL EXPERIMENT STATION,

BERKELEY, June 3, 1892.

EDITOR PLANTER'S MONTHLY: I note in your issues for January, March and April a discussion on the causes of the admitted deterioration of sugar cane when continuously planted on the same ground; a process which in Louisiana at one time threatened to extinguish the sugar industry, and is now illustrated by a comparison of the "creole cane" with the better varieties imported from other countries and largely planted in Louisiana.

Permit me to say that among the causes of deterioration alleged by your several correspondents, none strikes me as accounting for the observed facts so well as the propagation from the tip ends of the cane, as described by Mr. Moore. This practice runs directly counter to all that we know of the means necessary to maintain or improve the quality of any cultivated plant. "Weak and immature wood" used in cutting or grafting is well recognized as being the bane of a large portion of the improved varieties of culture plants when first thrown upon the market, when it is common practice to use green stems and single eyes for propagation, under the stimulus of heat and extra care and fertilization. It usually takes several years to overcome the weakness of the strain consequent upon this injudicious practice, and this fact has been urged in support of the proposition to "copyright" new varieties for a term of years, in order that such deterioration may not be incurred for the sake of quick propagation before others obtain the variety. In the case of certain varieties of grapes, it is a well-known fact that unless strong mature wood is used for cuttings or grafts, the vines will never bear remunerative crops. I have had personal experience in this very line with a grape that was very scarce when I planted it and of which therefore every little stick was used. I can

to-day, eight years from planting, tell the vines that grew from such weak cuttings; they are practically unproductive.

From all past experience with other plants, therefore, we should expect deterioration of the cane as the result of this mode of propagation. A weak bud, like a weak seed, will make a weak plant; we would no more expect to maintain good quality in the cane than we would if we were to use buds or cuttings from "water sprouts," instead of well-matured wood.

One point advanced by one of your correspondents is certainly not well taken. He says that the older joints of the cane, in which the sugar is in full proportion, must be considered as "mature" and therefore effete and less adapted to making a vigorous plant than the growing tops. Unfortunately for this view it is a well-known fact that sugar is the very substance upon which rapid growth is fed in almost all plants, very many of which lay up a sugar supply for that very purpose. Such is the case with the sugar maple, the sugar beet, the mescal or century plant, and many others; while most plants lay up starch for the same purpose (e. g. the potato, yam, taro, and the bulk of seeds); converting the starch into sugar as soon as growth begins. Sugar is therefore the natural food of young plants of all kinds, and when it is lacking the seedlings or cuttings languish.

Doubtless there may be other causes of the deterioration of the cane; and in fresh lands of great native productiveness, the effect of the injurious practice may not be felt for some time. But that it constitutes an artificial selective process for the survival of the unfittest, can in the light of universal experience hardly be questioned.

E. W. HILGARD.

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THE AGRICULTURE OF BEETS AND CANE.

[THOS. MANN CAGE, IN LOUISIANA PLANTER.]

The statistics of beet, as compared with cane sugar production, according to the recently published estimate of Mr. Licht, who puts the former at 3,500,000 tons and the latter at 2,680,000 tons for last year, is portentous to cane culture, if efforts are not made to retrieve the position formerly

occupied. What are some of the most potent influences which have brought about the change, and how can they be counteracted, are questions of incontrovertible moment to tropical cane-growers the world over.

One must revert to first causes, and fully realize that agriculture is the art or science of cultivating the soil, by which operation the teeming millions of the human family are in great measure fed and clothed, and that its advancement is the foundation of the prosperity of the rural populace, whereas primitive and exhaustive tillage will, if persisted in, culminate in mortgaged homes, occupied by an impoverished people, regardless of the kind and character of the crops cultivated.

Unfortunately the majority of the older cane sugar growing estates have been treated as the wheat areas in new countries, taxed to exhaustion by the production of the same crop from year to year with little or no intermission. Compare the acreage yield of wheat in the west in America with what is had in France, and it will be found that the former is not one-half of what is harvested in the latter.

In the one instance a system of depletion has been practised, and in the latter one of recuperation has been followed. The agriculture of the beet and cane is strikingly contrasted in this, that the former has been the recipient of profound and prolonged research with many chemists of high repute, and with agriculturists of noted scientific and practical attainments, and their combined efforts have made it the dangerous rival of the tropical cane, the typical sugar producing plant, probably known to and utilized by man in prehistoric ages.

That the one is far in advance of the other in general practice cannot be denied, and the great hope for the future of the cane sugar industry lies in the immense possibilities which may be realized by persistent and intelligent efforts in the line of improvements in the methods of field manipulations, based on sound scientific and agricultural principles.

The mechanisms and processes which have been gradually perfected to fabricate sugar from the two plants, although germane to the subject, will not be considered in the present article (yet it may be stated that the probabilities are that at

no distant date centrals will be erected on cane sugar estates with plants as effective in every detail as those now operated in the beet growing countries); their relative positions will be viewed only from an agricultural standpoint.

Careful seed selection and the propagation of new varieties have been important factors in the gradual development of saccharine in the beet, and now that canes are being produced from seed, many and valuable varieties may be grown in the future, although the production of crops directly from such will probably never become an accomplished fact, due to the exceeding delicacy of the young canes thus reared as compared with those springing from the eyes of the parent stalk.

Wherein differs the agriculture of cane sugar estates from that of the beet farms of Europe, and what modifications in present methods must be practised in the future to enable proprietors of the former to successfully compete with the latter in the marts of the world in the sale of their respective products? Although beets are cultivated from Italy and Spain in the south to Denmark in the north, and from France to Russia inclusive, yet an immense area of arable land (on farms where beets are grown) in that vast domain is not adapted to the remunerative growth of the plant, and is therefore seeded to other farm crops.

Thin, hungry, sandy soils are thus treated, as those for beets must be of sufficient depth, and possessed of physical conditions such that a friable seed bed can be had in the early spring time. Sandy loams are preferred and selected, and cold, heavy clays are avoided as being unfit for the profitable production of beets. Many thousand acres of tenacious clays, low lying and ill drained, are annually planted in cane, yielding very frequently crops unsatisfactory in financial results, which had better be relegated to the pasturage of goats or other animals, rather then incur the expense of cultivating them.

When such were virgin soils and sugars high-priced, with slave labor to cultivate the fields, paying crops may have been produced, but under existing conditions, tile drainage, and possibly irrigation, may have to be resorted to to insure large acreage yields of products thereon. When soils of

known and desired quality and texture are selected, then that system of rotation, seeding and fertilizing is adopted which will tend to the development of saccharine, not inordinate size in the beets.

For their successful production, viewed financially, not only must the physical condition of the soil be brought up to plant requirements by drainage, tillage, etc., but its *manurial* condition must be so manipulated by rotation, and the application of *suitable* fertilizing ingredients, that roots of relatively small size, with a tonnage yield generally not exceeding fifteen per acre, will be produced, experience having demonstrated that large roots and heavy tonnage are incompatible with a high sucrose content in the plants.

Thus it is simply the combination of the known with the subtile mysteries of the chemistry of agriculture, wherein the field for improvement aud the acquisition of truths is vast, as man's knowledge of what transpires from season to season in nature's great laboratory, the earth, is at the present time exceedingly meagre and defective. In past ages, long before agricultural chemistry became a science, practical experience, gradually acquired from generation to generation, taught the tiller of the earth that the growing of the same crops of grain or those of like character from year to year on the same land rapidly exhausted it, and to render it again productive, plants such as clover, lucerne, vetches, beans, peas, etc., had to be grown in the rotation from time to time.

Since the advent of agricultural chemistry, and careful microscopic observations, we have been furnished with a rational explanation of how the leguminous plants derive their nitrogen from atmospheric sources, and store it in their leaves, stems and rootlets to be in a measure utilized by the cereals, and grasses (of which cane is one) which may follow in the rotation. The study of the problem of the development of microbes may yet prove of great value in an economic sense, and revolutionize agriculture, in that the major portion of the nitrogen required for the successful growth of farm products may be had by the agriculturist through his acquired knowledge of their rapid reproduction under certain conditions.

To produce remunerative crops of beets, the farmer first selects a well drained, suitable soil, then prepares it by a judicious rotation with other crops, which rests and recuperates it, and, the autumn preceding the seeding, deeply ploughs it, and subsoils where necessary. Great care is taken to put the seed bed in a fine state of division, as the first essential to success is an abundance of healthy plants, which withstand the vicissitudes of climatic conditions infinitely better than puny ones in poor land, as the latter languish if the weather is somewhat dry in spring, and have no recuperative power later on.

The selection of suitable fertilizers is of prime importance, and therein the aid of the scientist is sought, and his recommendations followed as to quality and quantity to be applied per acre. Chemicals, having their plant food in a soluble form, are used, and those ingredients containing potential nitrogen (such as tankage, cotton seed, linseed, and rape cake) are generally avoided, due probably to the uncertainty that the nitrogen will be available just when the plants require to develop most rapidly, it being a well established fact that during droughts or the prevalence of rains decomposition is too slow (heat and only humidity being requisite), and the want of the essential plant food retards the growth at that season when it should be accelerated. When the young plants have attained sufficient growth, cultivation, somewhat shallow in character, is assiduously continued until the crop requirements are complied with.

Admitting that considerable progress has been made in draining, cultivating and fertilizing numerous cane sugar estates in different countries, in recent years, by their progressive proprietors, yet the annual output on the great majority clearly proves that the agriculture has been far from what it should be to produce maximum yields. The hope for the industry lies in that the production can be in many instances advantageously increased from 50 to 100 per cent., by resorting to intensive culture.

Where the culture is adequate, with other condition, favorable, and the tonnage yield still inferior, it is proof positive that the soil is deficient in one or more of the constituents of the cane, and more than likely ammonia will be found want-

ing more than any other element, as it is the most rapidly exhausted. To supply at least a portion of it, and partially restore fertility to the soil, a leguminous plant such as the invaluable Carolina cow-pea, so very advantageously rotated with cane in Louisiana, should be grown from time to time, and ploughed under as a green manuring, if possible.

To continue the cultivation of old and woody ratoons is to still further exhaust the lands of the estate, and materially decrease the average tonnage yield. To cultivate the older estates in most countries and insure a profit, it is imperative that the fields be recuperated from time to time with manures of some kind, always striving to procure and use those which will give the best financial results for the needed outlay. The system of drainage, where needed, should be that which will best enhance the productiveness of the property. As to the width of rows, methods of planting, etc., experiments carefully conducted can alone decide which is the most advantageous, as what may prove best for one estate and a certain quality of soil may be ill adapted for others where conditions are dissimilar. The progressive planter is ever on the alert to acquire information as to how best improve his fields.

To successfully compete with the growers of beets, producers of tropical canes must plant only in fields which will yield a relatively large tonnage annually. To accomplish the end in view, the soil should receive a thorough preparation by deep ploughing, and if the upper stratum of earth has not sufficient depth, subsoiling may be advantageously resorted to in many instances.

To insure the germination of the eyes of the parent stalk, and the rapid growth of the young sprouts, the land should be thoroughly prepared *prior* to planting.

There can be no fixed rule as to the cultivation of young canes after they appear above ground; quality of soil, geographical position, climatic conditions, character of extraneous vegetation, and many other things will govern varying circumstances. With the numerous new implements being constantly put on the market, there is every reason to believe that cane culture will be materially revolutionized when the character of the soil, etc., will permit of their being used.

Large proprietors may have splendid estates, well stocked

and equipped with implements for cultivation, and the administrator or manager may be possessed of superior intelligence, and had long experience, yet maximum yields in field and factory never will be had until there are resident chemists who will devote, say, nine months of the year to the study of the causes which develop saccharine in the cane in the field, and its conversion into sucrose in the factory.

Not only must the effects of known fertilizers be studied and noted, but the influences of drainage, varying meteorological conditions, and the methods of tillage, etc., in all their ramifications. Careful records should be kept of each field—how prepared, planted and cultivated, also the quantity of fertilizer applied, with a correct analysis of same. The development of saccharine should be tested at intervals, and when the crushing season arrives, estimates should be made of the available sugar per acre, the object being to arrive at how to obtain maximum yields per acre in sugar at the minimum cost per pound.

The necessary researches will be new to most chemists, and the results of first investigations may not come up to expectations; but experience will soon familiarize them with their new duties, and many of the errors now committed from want of knowledge will be avoided, and not only the average tonnage be increased per acre within reasonable bounds, but the saccharine strength of the juice will be such that the yield of sugar per ton of cane will not fall below a point where it will prove profitable to the producer. It may prove more profitable to secure an acreage yield with 180 pounds of sugar per ton than attempt to get less where 220 pounds may be had, from the fact that where canes are subjected to the vicissitudes of climate, such as droughts, followed by prolonged periods of heavy rains, those grown on the richer soil will withstand the trying changes better in the one instance than in the other.

To obtain a relatively large tonnage yield with no marked diminution of saccharine strength in the juice will be of great advantage, and to augment the sucrose content even a half degree in polarization over and above what is generally had with the same tonnage will, on a large crop, more than compensate for the outlay in salary to the chemist. The above is

deemed of such moment in France that we are informed: "Manufacturers have paid higher prices for beets than in 1891. They have settled generally on the basis of 28 to 29 francs per ton for a density of seven degrees, with an increase or a deduction of .75 franc to 1 franc per one-tenth of a degree above or below seven degrees."

The chemistry of agriculture, as pertains to the tropical cane, is in its infancy, and the time has arrived when every encouragement should be given to its study in the field in conjunction what that of its juices in the factory.

Without seeking and being benefited by the aid of scientists, cane sugar producers cannot expect to successfully compete with the beet sugar industry, although they grow a plant by nature superior to the beet, easier cultivated, and at less cost, and one capable of yielding annually much larger amounts of marketable products per acre.

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ABOUT CANE PLANTS.

[FROM THE MACKAY SUGAR JOURNAL.]

MR. EDITOR:—In your issue of the 15th March, an argument is put forward by one of your correspondents as being the rule to be adopted by the farmers when they intend planting. "One goes to a little expense to breed a good foal or two, also to improve a few head of cattle. Apply the same rule to cane plants, none but good juicy plants with full eyes and *not* too long in the joints." This gentleman surely pointed out an admirable law of physiology, but I am sorry to say, I think he has not fully explained what I am sure he meant to say, about reproduction of species. I know very little about stock breeding practically, but I have a little knowledge of physiology, and I believe that the main point in breeding is to get full grown animals in healthy condition. Does it matter about the fat? Well, commonly speaking, I shall consider the abundance of good juice in canes, juice *fitted* for the mill as the vegetable fat of the plant. I am led to believe I can make this assertion when I contemplate the experiments of Hales, the Englishman, those of Liebig, the German, and later on of Dr. Icery, the Frenchman, on vegetable physiology; the last specially as regards canes. Those

authorities explain to us perfectly well what is required in a seed to make it germinate. As long as it contains the elements necessary to produce the principal organs of vegetable life, a root and a stem, a subterranean and ærial organ, that is all that is required. Sap, which is the vegetable blood, is nothing else but water taken by the roots from the soil, and which contains in solution the fourteen (14) inorganic elements (or part of them) required for the growth of plants. Leaves also absorb water by dew. In its ascending state the sap mixes with the juice contained in the cells of the plant and goes on to the top where, thanks to the wonderful structure of the leaves, a chemical transformation mainly due to the action of the air, takes place and the sap is then transformed into nourishing juices. Experiments on cane growing in different countries have proved that density of the juices and consequently their richness could be improved by a certain system of culture, by manuring, etc., etc., and that is another strong argument in favor of the theory that sugar is artificially produced. Consequently I do not see why only good juicy canes, canes as it is stated by your correspondent fitted for the mill, should be employed as plants. I think the farmer is perfectly entitled (and he does there the most sensible thing in my opinion) to use for plants the sound part of canes considered unfitted by the mill manager for production of sugar in the factory.

What I have said previously is based on the theoretical rules of vegetable physiology; now I will try to explain what I know as a practical grower of sugar canes. By analysis of the canes it has been stated that very little of the crystallisable sugar, comparatively speaking, is contained in the head of the cane. On the other hand, the quantity of uncrystallisable is 30 per cent. more in the head than in the body. Practical sugar manufacturers have then been led to severely exclude from the factory the tops of canes. But according to the structure of the cane, and to what analysis has revealed in the composition of the top's juices, they have eagerly sought for those tops of canes as being the best means of reproduction of the species. As long, of course, as the eyes are fully developed, which is ordinarily always the case with tops and very seldom with matured canes, they contain all

elements required to produce a root and a stem. Care must be taken to exchange plants from localities, as they degenerate when grown again and again in the same place. The tops are cut two inches below the bunch of leaves, that is the limit determined by analysis as being the one where the glucose begins to overpower the crystallisable sugar in the canes. And you know that if mill-owners are so severe on cane tops before the crushers it is because in introducing glucose in their juice they augment considerably the quantity of mucilagenous and melassigenous matters, and add to the difficulties of treating juices, and consequently, if the farmer is led to believe that, in planting with tops he is going to ruin, there will always be difficulties arising between manufacturer and grower. The aim of the last one being to obtain the heaviest crop possible to the acre he will always attempt to cut the canes at the highest point, and this will compel the mill manager to refuse the canes. On the other hand, if you can induce the farmer to take the tops, the difficulty will disappear. When he cuts his cane it will be also an economy for him to cut so as to suit the mill manager, as the decided delay caused in clearing the leaves away for a very high cut will not be required. The leaves thus left on the top protect the eyes of the future plants which can easily remain lying on the fields for two weeks. When the ground is ready for planting boys are sent into the fields to gather the tops. Within my experience 6,000 tops, tied up in bundles of 50, stacked in the road around the fields (say fields of 10 acres superficial) at the nearest points for the convenience of carting, is the average work performed by a colored laborer in a day of eight hours. Planting with tops (but exchanging system as above described being adopted) ought then to be the rule of planters. They will thus save a few acres of canes good for crushing which they must now preserve as plants. They will also secure for the future in the top a better propagating medium. Seeding of canes is talked of as advantageous, but if it is highly interesting in a scientific point of view it has not proved practicable. Many reforms precede its general adoption.

In conclusion let me quote the following lines from "Sugar Growing and Refining," a book which I believe is consulted

as an authority in Queensland: "Where there is room for choice, however, preference is usually given to the few upper joints nearest the leaves, unusually termed the 'cane top.'" The very juicy plants have great faults. Fermentation sets in too strongly, and they are far more eagerly sought for by the insects, thanks to their richness and sweetness. E. T.

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LETTER FROM A HAWAIIAN PLANTER.

BAHIA, BRAZIL, MARCH 24TH, 1892.

DEAR SIR: The Central Factory system is a most important feature in the Brazillian Sugar industry.

They are most numerous in the province of Rio Janeiro, but owing to the prevalence of yellow fever in Rio, I was prevented visiting that part of Brazil as I had hoped to do.

The most important factories in the province of Bahia are those of the Bahia Central Sugar Factories, limited, an English company which some years ago obtained a special concession from the Brazillian Government to erect four large factories, with several miles of railway (metre guage) connecting each with the surrounding plantations. Very powerful and complete machinery was supplied by Messrs. Duncan, Stewart & Co., limited, of Glasgow, whose well-known hydraulic regulator is in use at the Hilo Sugar Co.'s mill.

Messrs. Duncan, Stewart & Co. were by the way the original inventors of the system of applying hydraulic pressure to sugar mill in any form.

In the two largest of these factories the rollers are 42 inches in diameter by 78 inches long driven by a powerful horizontal engine with very heavy double gearing. The juice passes through a strainer and is pumped to a sulphur box placed over the clarifiers; before entering the clarifier the juice passes through a large open juice heater divided so that the juice entering at the top flows down through the tubes on one side and up to the exit on the other side. This juice heater is furnished with exhaust steam, and is large enough to heat all the liquor passing through it to the boiling point, or whatever temperature may be desired. Being open at the top it is easily kept clean and may be sponged out every night in a

few minutes. A cock at the bottom admits of all the juice being run out whenever the mill stops.

From the juice heater the juice passes into clarifiers of 1,200 gallons capacity, six in number. Under each clarifier are two large filter presses, so that after treatment in the clarifiers the whole of the juice can be passed through the presses before being drawn into a large eight foot triple effect containing 7,000 square feet of heating surface.

In addition to the filter presses there are four Taylor filters for use after the juice has been concentrated.

There are two Vacuum Pans nine feet by eight feet diameter respectively capable of making ten and eight tons of dry sugar per strike.

Under the pans are two large mixers into either of which either pan can be struck, and under the mixers are eight four-foot centrifugal machines. The clarifiers, triple effect, and vacuum pans, are all in line on an iron platform with handsome brass railing in front. As may be supposed the appearance is very handsome especially at night when the numerous incandescent electric lights shine on the polished brass and illuminate every corner of the building.

An important adjunct is the distillery attached to each factory. In each there are large vats for mixing molasses, and setting up wash to a capacity of 1,000, 00 litres, and an improved continuous still to convert it into rum of any desired strength. In this way all the molasses, filterpress and tank-washings, and sweet-waters of all kinds, can be converted into a valuable marketable product. All machinery in these factories and connected with them, except the locomotives, is of Messrs. Duncan, Stewart & Co.'s own make, from special designs; great strength, superior workmanship and convenience of arrangement are the most prominent features.

There are some Central factories owned by Brazillians. Of these the largest is the Bon Success factory at Bom Jardim which is described in Lock's "Sugar." The machinery is French, by the Compagnie de Fives Lille, and though of good design lacks the substantial appearance of that emanating from Glasgow.

The mill is 52 by 30 inches but there are nice triple and two vacuum pans each six feet in diameter, eight centrifugals,

and six charcoal filters, besides filter presses. The sugar manufactured here is practically refined sugar and finds a ready sale for local consumption.

The San Bento factory is a small but very profitable little concern, owned by an exceptionally enterprising Brazillian. Most of the cane for it is grown by the proprietor or by "labradors" (share planters) and is superior in quality to what is purchased by Central factories that have no control over the growers. This factory has Babcock Wilcox boilers and likes them. The mill is a five roller one on Thompson Black's plan, made by McOnie & Co., Glasgow and does excellent work. A very nice little factory is the Usina Santo Antonio. It has two mills each 22 by 48 inches; the older one of these is driven by a 30 foot water wheel but as water is not always forthcoming it has been supplemented by a beautifully finished mill and horizontal engine made by Messrs. Duncan, Stewart & Co., for the Jamaica exhibition, but purchased from them before it was exhibited. The pans and other machinery are French from Lefevre Fils St. Quentin and Cail & Cie and the Compagne de Fives Lille. The juice after clarification is passed through large filter presses with leaves four foot square and after concentration is boiled up again in circular cleaning tanks and skimmed. The boilers are tubular, and the ashpits are enclosed, so that no air is admitted except heated air, which has passed through special heating flues between boilers. This seems to work well and no fuel besides the megass is required.

I am just leaving Bahia and do so with a certain regret as I have found the country and climate pleasant and certain of the people most hospitable and agreeable. A Hawaiian planter cannot but be struck with the facility with which cane can be grown without the heavy expenses of the Hawaiian Islands, the great advantage of cheap negro labor, and the superiority of a settled population compared to the ever changing aliens that Hawaiian planters depend on for labor. It is a real pleasure to see the many dirty but happy children that surround each negro hut, and give it a homelike air, that one may look for in vain amongst the Chinese and Japanese quarters of the islands.

With the soil, climate and other advantage of this country, a little enterprise combined with a small amount of capital judiciously invested in cane growing, cannot fail to produce lucrative results.

Yours faithfully,

R. A. MACFIE, JR.

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DETERIORATION OF SUGAR CANE.

[The following letter was not written for publication, but to more clearly point out to the Editor, why the writer of it called attention to the matter of Seed Cane. His arguments are so strong and so well stated, that its publication will do good. and demonstrate to every one interested in cane and sugar, that something must be done :]

EDITOR OF PLANTER: You state that "tops" from plant, or rattoon cane have made your best seed. They are the safest no doubt, although I cannot say that I have ever been troubled in growing cane from any kind of seed. Our soil is loose, absorbs moisture readily, and on this account seed of any kind planted in dry weather even, will start without any rain to speak of, as shown this year. I do not think there is another district on the Islands where seed will start under such unfavorable conditions as here. So my article was not caused by reference to what seed would be safest to start, cheapest to procure, or which would raise the finest growth of cane. I explained the *fact* that our cane had gradually deteriorated as a sugar producer, and assumed as a cause for this fact, that I thought it was the continual raising of our cane from its weakest sugar producing part. I stated what I proposed to do to overcome what I assumed to be the trouble—you know the result of the publication of my letter. Everybody disagreed with my opinion, except Mr. Horner, who thought that cane should be improved as well as anything else in vegetable or animal life. Now I had tried to think of what cause to assign for this gradual falling off for several years, and the "top" business ran across my mind all at once. The more I thought of it, the more satisfied I became that there might be something in it, and I decided to lay the matter before Prof. Hilgard, and as you know with very satisfactory results to me, where so many Island people had disagreed with me.

Now I have taken such a stand in this matter that I am probably a bit of a crank on the subject, and try to think of anything that assists my side, and would like to know from those who claim no deterioration of cane, why the Island output has not increased during the last seven or eight years, proportional to increased acreage cropped ? I do not know the figures, but eight years ago the crop was about 120,000 tons, this year with 50 per cent. more acreage, it is about 120,000 tons. This is a guess only, but not far off. Now we all have improved mills, pans, mud presses, triple effects, etc., each improvement at the time having claimed for it five to ten per cent. of a saving of sugar. Lots of money has been spent on fertilizers to keep up the lands.

The cultivation of land is better now than eight years ago, through the introduction of about $300,000 worth of steam plows. So it begins to look to me as if the millions spent on improved machinery, the hundreds of thousands on fertilizers, and the same on improved cultivating machinery, have not enabled the Island producers, or planters, to keep pace with the gradual deterioration of the cane ; the amount of crops being kept up by increased acreage.

Now as all the plantations, during prosperous times, made all the necessary improvements to unable them to cultivate harvest and manufacture their cane at the least expense possible, and with the very best results, and at present prices are scarcely able to exist, the only hope I see for them is to improve their cane, either that which we have, or try new varieties. The cost of raising an acre of cane, whether to produce two or six tons of sugar is virtually the same, so that if plantations can exist now, and by any improvement in cane bring in five, ten, twenty, fifty, or even 100 per cent. better returns, why they can start in and pay dividends again.

The above results can better be brought about through a station for experimenting on cane and sugar in the hands of thoroughly educated scientific men, and the sooner plantation owners realize this fact and start one, the sooner they will get dividends.

I have gone into this subject at some length, so that you would understand how I think and feel on the cane subject. I may be entirely wrong, or my ideas may be terribly exagger-

ated, and when so few older and more experienced plantation managers coincide with me, I sometimes am led to think I may be a little off, but time will tell.

The future prosperity of the country depends entirely on its plantations, and in my way of thinking, the plantations depend on some means of improving the productiveness of their cane.

Yours truly,

A. MOORE.

Paauhau, Hawaii, June, 1892.

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THE AMERICAN SUGAR REFINING CO.'S PROFITS.

[WILLETT & GRAY'S SUGAR CIRCULAR.]

When we gave in our "Statistical" of July 9, 1891, an estimate of the business of this company for the six months of 1891, showing profits of $3,500,000, we made no estimate for the last six months of 1891, except to say: "We have no doubt the refining will be done at a profit." One party at least assumed that we estimated $3,500,000 profit for that time also, making $7,000,000 for the year, and he wrote us the following anonymous letter:

BOSTON, MASS., July 10, 1891.

Messrs. WILLETT & GRAY, New York.

Gentlemen:—I have read with much interest your Sugar circular, recently published, and notice your estimate of the profit made by the American Sugar Refining Co., during the past six months. While the showing is certainly very handsome, I consider your estimate very much below the actual figures. It is possible you have not made allowance for the extra profit made on Cut Loaf, which I am advised on excellent authority amounts to $1,000,000 per annum. Then again, you may have over looked the fact that in New Orleans the company obtains fully one-half cent per pound, and in San Francisco one cent per pound more than in either New York or Boston. The capacity of the New Orleans refinery is 4,000 barrels per day, and that of the San Francisco refinery 3,000 barrels per day. If these figures are correct, and I am informed by one or two parties who ought to know that they are, you will have to add to your estimate as follows:

For Cut Loaf extra	$ 1,000,000
For New Orleans, 4,000 bbls. per day, at $1.50 extra, equal to, for 300 days	1,800,000
For San Francisco, 3,000 bbls. per day, at $3.00 extra, equal to, for 300 days	2,700,000
Total	$ 5,500,000
Add *your* estimate	7,000,000
	$12,500,000

If I am correctly informed, and I think I am, the profit for this year (1891) will be nearer $15,000,000 than $7,000,000.—Respectfully,

A SHAREHOLDER.

Here was an undoubtedly honest stockholder, who knew nothing about the Sugar trade personally, who was not willing to accept our knowledge, who added $3,500,000 to our figures without our consent, and who added $5,500,000 more on information from "one or two parties who ought to know," and then further added $2,500,000 profit as his own estimate on his personal belief that he was correctly informed, making $15,000,000 profit for 1891. The actual result of the American Sugar Refining Company's business for 1891 was given in our "Statistical" of January 14, and proved to be $5,073,002 profit, or say $10,000,000 less than he believed it would be. As he gave us no name, we could not set him right, but any sugar broker could have told him his error, viz: the small percentage of Cut Loaf Sugar sold in the United States would not amount in value to very much more than he placed the extra profit. Also that the American Sugar Refining Company held a very large stock of Sandwich Islands Sugar in San Francisco, on which they lost the principal part of the duty taken off, and that apparent prices quoted in the public prints, on which he based his extras in New Orleans aud elsewhere, are subject to rebates and discounts of which he never heard. The latter cause is still the basis for daily misrepresentation. To this instance of an honestly mistaken belief, we will add an example of special pleading, or wilful misrepresentation. In the preambles to a resolution recently introduced in the House of Representatives, is the statement that for the year ending June 30, 1891, 3,949,490,995 pounds sugar was consumed in the United States, on which the American Sugar Refining Company were able

by means of the McKinley Bill to take ½ cent per pound, or $19,782,454 from the consumers of sugar. Also by means of depressing the price of raw sugar "from the cane plantations of the South" and "the beet farmers of the West," they took from those producers nearly $20,000,000 more, or say a total of about $40,000,000. Now, the McKinley Bill did not go into operation until April 1, 1891,—the total production of sugar in the United States for the campaign year 1890–91 was but 246,290 tons, which at a valuation of 3½ cents per pound, is but $19,309,136, and the entire net profit of the American Sugar Refining Co. for 1891 was $5,073,002, giving a surplus of $1,323,002 after payment of dividends. Here are three gigantic misstatements in a single preamble, wrongfully accusing the American Sugar Refining Co., before the House of Representatives, of the virtual stealing of $40,000,000 from the people, and very likely some members, as well as many people of the United States not familiar with the sugar trade, believed that at the least there was some ground for the statement. We give these two examples, and the papers are full of others of like description, honest or otherwise, for the purpose of showing how falacious all such estimates prove to be. Many of the honest mistakes come from a misunderstanding of certain figures on which the estimate is based. For example, current quotations of raws and refined are used as a basis of calculation without making the necessary reductions to a parity basis for a correct estimate. The current quotation for Centrifugals is for a sugar of 96 degrees test, while the quotation for granulated is for a sugar of 100 degrees test, there being a large difference between the two in the commercial value which must be considered in an estimate. Again Centrifugals are quoted at net cash, while the quotations for refined are subject to several deductions to bring them to the same parity. Most estimates which we see give 3⅛c. as the present quotation for Centrifugals, and 4⅜c. as the quotation for Granulated, a difference of 1¼c. per pound; but in bringing these grades to the same parity this difference must be reduced by one per cent. trade discount, one per cent. cash discount and one per cent. brokerage on the Granulated, also 1-16c. per pound extra concession to grocers, and by the difference in value of Centrifu-

gals above, amounting together to about $\frac{3}{8}$c. per pound from $1\frac{1}{4}$c. leaves $\frac{7}{8}$c. per pound, out of which amount the American Sugar Refining Co. must pay the cost of refining, the heavy expense of barrels which equals $\frac{1}{8}$c. per pound, the loss of weight, which is important on Muscovados and low grades, the cost of storage on a carrying stock, averaging 50,000 tons all the time, loss of interest on cost of same, and what may some day prove more important than all else a possible decline of $\frac{1}{8}$c., $\frac{1}{4}$c. or even $\frac{1}{2}$c. per pound in market value of this carrying stock, plus 25,000 or 50,000 tons sugar which they may have bought and not arrived. At the present time, with current quotation at $3\frac{1}{8}$c., they may be carrying raw sugar in stock, which they bought at a recent valuation of $3\frac{3}{8}$c. per pound. None of these things are considered in any estimates we have seen. Mr. Leon Say the greatest sugar refiner of France, once told an American gentleman that when his days' sales of refined were made he covered them with purchases of raws before he went home at night, thus taking no risk of the market. He is able to do this through the Sugar Exchanges which exist throughout Europe, but the American Sugar Refining Co. have no such means of protection; but must go to all parts of the world and buy raws largely in advance of actual requirements, taking all the risks of important declines. Within a very few years, when the European markets were unduly stimulated by speculation, a sudden drop of 2 cents per pound was made within a month. Keep these facts in view and bear in mind that the McKinley Bill prevents any advance in refined from present prices, without bringing in foreign Granulated, and that even now Scotch Refined are daily arriving, and that whatever profits the American Sugar Refining Co. can make out of the protection allowed, are subject to all the charges and contingencies named; and it seems to us if they earn sufficient to pay their dividends with a moderate surplus, they will be doing as well as can be expected. Thus far, under the McKinley Bill, they have not done as well as this. The fact is, the recent movement was founded on misrepresentations of the most glaring description, and there isn't a wholesale grocer or a member of the sugar trade but who is disgusted with the unfair and unjust treatment of a leading industry of the country.

ECONOMIC VALUE OF GOOD ROADS.

[WILLIAM M. KING, IN AMERICAN AGRICULTURIST.]

There is no more economic question of importance to the American farmer than that of good roads. No branch of public work is so neglected, although as an investment there is none that pays the people at large so well as the maintenance of as perfect a roadway as possible. Both state and national aid are desirable, but the idea of state aid seems to meet with the greatest favor. The people most interested must take energetic measures to awaken enthusiasm on this vital subject. It is only by the earnest discussion of the economic bearings of this subject that the skeptical can be aroused from their apparent lack of interest to enthusiastic action. Without the presentation of facts and figures the enthusiasm which is so essential to progress cannot be aroused.

The very general complaint of hard times arises in part from the existing condition of our public highways. When the roads are well nigh impassable, then it is that the prevailing scarcity in the leading city markets forces up the prices, and for the lack of good roads the farmer is unable to supply the market. Roads, to be of the greatest value to the farmer, must be kept in such condition that he can market his crops during those seasons of the year when he has most leisure from pressing farm work, or when the highest prices prevail. The loss which frequently results when the farmer is cut off from all markets because the common dirt roads have been converted by the open, wet winter into almost impassable morasses exceeds, in many cases, the amount of his annual taxes. There never has been so much need of well-directed co-operative effort on the part of the people of the townships and of the towns and cities as now. It will be easier to secure the passage of a macadam law now than it will be in ten years. Capital is on the look out for localities in which toll turnpikes can be built. Why pay 6 or 7 per cent. annually in tolls for the use of a pike, and 3 per cent. or more in addition for keeping in repair, merely because we cannot agree to work together and build our own roads on some equitable co-operative basis.

Prof. Lewis M. Haupt, who is at the head of the engineering corps of the University of Pennsylvania, recently made the following graphic statement of the relative progress we have made in common road making as compared with the results attained in the construction of our great railway lines: "While we have built our magnificent roads of steel across and up and down the continent, over which we ride at the rate of a thousand miles or more a day, and transport millions of tons of freight, the common roads at our doors, leading to our railroads, remain much as they were a century ago, and the farmer still plods along, his wagon nearly hub deep in the mud, between the farm and the station, taking half a day to make the trip that should be made in half an hour."

It has been well stated that the excessive wear and tear of wagons and teams destroys nearly all the profit that otherwise might be derived from a crop, and the delay and vexation attending such wretched modes of transportation are extremely trying to the temper and patience of the cultivators of the soil. We complain of the high prices charged by the railway corporations, while in point of fact the greatest expense is that required to convey our produce over bad roads to the nearest station. Poor roads cost the husbandman altogether too much. It requires three or four horses to haul to the nearest market what two could easily haul on any good road. The fact is, we are supporting thousands of horses to drag loads through holes that ought to be drained and filled. We have the unremitting inconvenience of bad roads, and actually pay a premium for them. Poor roads are invariably inexpensive, and good ones a sure source of profit.

It costs less to properly care for a mile of good macadamized road each year than it does to keep a horse. If the keeping of a horse costs one dollar per week, and the service of the animal can be dispensed with by the building and subsequent care of a good road, there is a clear saving of this amount annually, which, if used in road construction and repairs, would cut down expenses in other directions, enhance the value of our farms and add to the attractiveness and comforts of our homes. There are no public works whose benefits are more evenly distributed among the masses of people than good roads, and yet there are none in this country for which taxes are more grudgingly paid.

The most common, crooked, unworked roads in the most obscure localities are, nevertheless, the arteries through which a large per cent. of agricultural products finds its tedious way to the market. Their inferiority is a reflection upon the wisdom of state and national legislation. Road-making has heretofore received so little attention that road engineers are by far too uncommon. Good roads, that is, the best for the cost, may, can and should be built without unnecessary delay. There is no question as to the resulting profit. They are a necessity. The meandering dirt road, unpainted houses and dilapidated fences are inseparably connected. Carelessness in this direction runs through a whole neighborhood like an epidemic. It is contagious. But as soon as a turnpike with its smooth and comparatively straight roadway is built there comes a change for the better. The house is repainted, the fences repaired, and neatness in the home surroundings at once takes place. Smooth, hard roads are a financial blessing, and tend to promote the educational and social advantages of the community. Purchasers of farms would seek such pleasing neighborhoods, and lands would sell quicker and at higher prices ; education and refinement, in connection with the increase in the attractions of home, would give a higher position to life in the country, and a great number of our most enterprising young men and young women would prefer a refined agricultural home to the turmoil and anxiety incident to town or city life. Good roads tend to nurture sociability and friendly, profitable intercourse between neighbors and neighborhoods. When the roads are poor, a farmers' club or grange is always at a disadvantage, and a full attendance is the exception instead of being as it should be the rule. Good roads are needed far more than costly country buildings. Good roads are due every American citizen, and each should work and vote for good public roads, and, if needs be, demand that they be built and properly cared for. It will pay to be liberal in the expenditure requisite for public roads. Good roads are a permanent advertisement of the character and enterprise of the people. No better legacy in material or lasting form can be bequeathed to posterity than good public highways. If they are properly built and properly kept in order by the present

generation, they will stand as a perpetual object lesson, showing to succeeding generations the good sense and good taste which charactized preceding ones. Good roads are intimately connected with our prosperity as a nation.

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DISEASES OF THE GRAPE.

[BY HOWARD EVARTS WEED, IN N. Y. INDEPENDENT.]

For several years the grape industry in this country has been greatly checked by the appearance of several diseases, which not only lessen the yield of fruit but destroy the vitality of the vines. Among the diseases of the grape may be mentioned the downy mildew or brown rot, powdery mildew, black rot and anthracnose. These diseases, while similar to each other in many respects, are very different in their attack and action. Until a few years ago these grape diseases were unknown, and even now some few isolated vineyards are free from disease. Fortunate, indeed, is the grape grower in whose vineyard the grape diseases are unknown; but, unfortunately, such vineyards are to-day of extremely rare occurrence.

The cause of the diseases of the grape is the development within or upon the vines and fruit of small microscopic, vegetable organisms known as fungi. Thanks to the mycologists of the United States Department of Agriculture and others, we now know the manner of development and workings of the fungi which cause the diseases of the grape. While development and distribution of grape diseases has been rapid, the introduction of fungicides and spraying apparatus, by which these diseases may be kept in check, has fully kept up with the rapid distribution of plant disease.

In order to understand the effect which fungicides may have upon fungi, the mode of development of the latter should be known. The foremost disease of the grape is the

BROWN ROT.

This disease attacks both wild and cultivated varieties of grapes, and probably existed upon the former many years before its appearence upon the latter. The cause of this disease, as is the case with other plant diseases, is a small parasitic plant which develops within the tissues of the plant

causing blighting of the leaves and decay of the fruit. The fungus attacks all the green portions of the vine, and reproduces by means of small organisms known as spores. These spores reproduce only under certain atmospheric conditions favorable for their development. When a fungus spore falls upon a leaf where there is sufficient moisture, it sends out a small tube which penetrates the inner portion of the leaf. When inside the leaf this tube continues its development by forming what is called the mycelium, or vegetable portion of the fungus. A leaf is composed of various cells surrounded by cell walls. The mycelium forms small projections, which push through the cell walls and absorb the contents of the cells.

After a short period of development within the leaf the mycelium are ready to send forth new spores. These are sent through the leaves through what are called the stomata or breathing portion of the leaves. The part of the rot which is visible to the unaided eye consists of the spores which have pushed through the stem, leaf or fruit. As these only develop under certain atmospheric conditions, the rot may be present in the vines and still show no external evidence of itself. This explains the reason why the rot sometimes appears in a single night.

Besides the spores which have been mentioned and which are produced in the summer season, and are hence called summer spores, as winter approaches there is developed another set of spores by means of which the disease lives over from one season to another. The latter are known as the winter spores.

Having considered the nature of this disease we are now ready to consider the effect it may have upon the vine and its fruit. In early spring small brownish spots may be found upon the new shoots as they put forth. These are the spores which are sent out by the mycelium portion of the fungus. They spread rapidly from leaf to leaf and from plant to plant. When the fruit is formed the spores appear upon this, causing a shrinkage of the fruit. The fruit turns brown or black, dries up, and falls off. Upon the leaves the disease appears in spots at first, and the leaves finally turn brown as the disease spreads.

Such is the effect produced by the disease known as the brown rot, and the other diseases of the grape are so similar in character that the brown rot may be taken as a fair example of the others.

There is a great difference in the different varieties of grapes as to their susceptibility to disease. Again, some varieties may be attacked in one locality and not in another even though the disease appear in both places. A good example of the latter was noticed here last year. The Duchess variety here last season produced little or no fruit owing to the rot, while in other parts of the State it is said to be almost entirely free.

The Scuppernong, Flowers, Thomas, and others of a like type are little if ever attacked. These varieties seem to withstand attack completely owing to some peculiarity of their make-up. The Delaware, Perkins, Triumph, Herbermont, Lindley, Bacchus, Niagara, Ives and Warden varieties rot but little, while Berckmans, Brighton, Lady, Excelsior and many other varieties rot badly.

REMEDIES.

Many remedies for the fruit diseases have been tried, the most successful being the application of various compounds of copper. The experiments with the copper compounds were first begun in France and the success attained there in the treatment of many of the disease led to their thorough trial in this country. The United States owes much to its Department of Agriculture for first conducting experiments with the copper compounds and other fungicides in this country. Some of the first successful experiments with the copper compounds in this country were made in 1885, and since then grape growers throughout the country have proved beyond a doubt that the brown rot and other diseases of the grape can be effectually kept in check by the application of the various compounds of copper.

There are several fungicides used in the treatment of diseases of the grape, the best of which are Bordeaux mixture *Eau celeste* and ammoniacal solution of copper carbonate.

The original formula for making the Bordeaux mixture is as follows: Sulphate of copper, six pounds; lime, four pounds;

water, twenty-two gallons. The copper is first dissolved in a few gallons of hot water in a wooden vessel. The lime is put into another vessel and water added until a thin white-wash is obtained. Fresh lime is much the best. After the copper is thoroughly dissolved the lime water is poured into it by straining through a coarse cloth that no lumps may lodge within the force-pump afterward. Now add water to the solution enough to make twenty-two gallons. This is the formula as originally recommended, but experimenters last season found that equally good results may be obtained by using a solution of one half the strength of the above; that is about forty-five gallons of water is used instead of twenty-two. The weaker solution is thus now considered best as it gives equally as good results and the cost is much reduced.

The *Eau celeste* is made as follows: Sulphate of copper, two pounds; strong ammonia, three pints; water, fifty gallons. The sulphate of copper is first dissolved in six gallons of water.

The ammoniacal solution of copper carbonate is made according to the formula; Carbonate of copper, five ounces; ammonia, three pints; water. forty-five gallons. Dissolve the copper carbonate in the ammonia and then pour it into a barrel of water.

These solutions are all effective in the treatment of diseases of the grape, but preference is given to the Bordeaux mixture and the ammoniacal solution of copper carbonate. The vines should be sprayed with either of these solutions about every two weeks during the growing season up to near the time of the ripening of the fruit. The first spraying should be done when the leaves are beginning to come out, and the sprayings can be stopped when the fruit begins to turn. Thus, five or six sprayings will be needed thoroughout a season. The cost of spraying is but little, and with the proper apparatus it will take but little time to go over a large vineyard. Just enough of the fungicide is applied to a vine to make a thin coating over the leaves and branches. A beginner is apt to apply too much of the mixture to a vine, thus causing a waste of material. It takes, as a rule, about fourteen days for the proper development of the fungi which cause the grape diseases, and this is the reason the fungicide should

be applied about every two weeks. However, should the weather remain dry, the fungi will not develop so rapidly nor will the fungicide applied be washed off, so that under these conditions the fungicides will not have to be applied as often.

The fungicides are applied to the vines with force-pumps, a large number of which are upon the market at prices ranging from two to forty dollars. The best pump for spraying vineyards is what is known as the "knapsack" pump, which is made to be strapped to the shoulders. The pump holds about six gallons of liquid, and most of them are made of brass so as not to corrode. There are various styles of knapsack pumps, all of which sell for the uniform price of fourteen dollars. For spraying very large vineyards the larger pump, especially the "orchard and vineyard" pump, will be needed. The cost of the pumps is but little when the loss of the crop is considered.

By spraying the vineyards, as described, a very large per cent. of the rot can be prevented. The second year's treatment will be still more beneficial than the first, as preventing the rot one year will not give the spores as good a start the next season.

Much has been said about damage in the way of poisoning from sprayed grapes. Especially was the report spread near New York City last September, that grapes sprayed with the Bordeaux mixture were unfit for food. These reports originated with persons either ignorant of the fact or as a direct injury to rivals. In a recent and timely circular the United States Department of Agriculture has shown how impossible it would be for poisonous effects to follow the consumption of sprayed fruit. Not only that a single case of such poisoning has never been known, but that the salts of copper themselves are not known to be poisons, or a least it is a much disputed point. To prevent the fungicide from showing on the fruit, it is well to spray at first with the Bordeaux mixture the first of the season and with the copper carbonate solution the last two or three applications. Spraying with the copper compounds has come to stay, and it is a perfectly safe preventive for grape diseases.

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INSECTICIDES.

BY HOWARD EVARTS WEED.

The term fungicides is used to designate those substances which kill low vegetable organisms known as fungi, and in like manner, substances which are used to kill insects are known as insecticides. Fungicides, as a rule, consist of compounds of poisonous chemical substances, while insecticides may consist of similar combinations, as in Paris green, or simply powdered plants, as in pyrethrum. Some substances may act both as fungicides and insecticides, and in some cases we may combine an insecticide with a fungicide, so as to be able to kill plant diseases at the same time we kill injurious insects—thus killing two birds with but a single stone.

Insecticides may be divided into two general clssses: (1) those which kill by external contact, and (2) those which kill by internal contact. The external contact class are applied directly to the insects, killing them either by closing the breathing pores, as is the case with pyrethrum, or by producing an irritation of the skin, as is the case with kerosene. The internal contact class kill by being eaten, and are applied upon the plants being destroyed by leaf-eating insects.

Insects destroy plants in two ways: (1) by sucking the juices, and (2) by eating the leaves, according as to whether their mouth parts are formed for sucking or for biting. Insects which suck the juices from plants have the various parts which form the mouth prolonged into a beak, and are known as *Haustelate Insects.* Those insects which eat the leaves of plants are provided with more or less well-developed mandibles or jaws by which small particles of the leaves are eaten off and taken into the stomach. These are known as *Mandibulate Insects.*

The external contact class of insecticides are applied to the haustelate insects, and the internal contact class to the mandibulate insects. Sometimes, however, it may be convenient to apply the external contact class to the mandibulate insects; but the internal contact class are never used for the haustelate insects. Thus we may apply Paris green to any true bug and it will have no effect.

Pyrethrum is a substance made by powdering the leaves and flowers of the pyrethrum plant. This plant grows in tropical and semi-tropical climates, and is especially cultivated in California and Persia. The pyrethrum grown in California is known as "Bubach," while that grown in Persia is sold under the name of "Persian Insect Powder," or "Delmation Insect Powder." Although made from the same plant, the California product, "Bubach," is much stronger in its action, owing, no doubt, to the fact that the Persian product is probably diluted to make it cheaper. Bubach sells in the drug stores for about seventy-five cents per pound, while the Persian Insect Powder sells at thirty-five cents.

Pyrethrum belongs to the external contact class of insecticides, and kills by closing the breathing pores of the insects. It is a perfectly harmless substance, not being poisonous in any way, and for this reason is most used to kill insects upon plants where we would not wish to apply poisons. Hence it makes an excellent remedy to kill the green worms upon cabbage plants, and is largely used for this purpose. It can be applied dry by means of a hand bellows, or mixed with water, a tablespoonful to the pail, and applied with a common sprinkler or a force pump. When applied dry it can be advantageously mixed with three times its bulk of flour. It is a good application for plant lice when applied as a liquid.

Tobacco belongs to the external contact class of insecticides, and is used to destroy plant lice, various caterpillars, and lice upon domestic animals. It consists of the powdered leaves and stems of the tobacco plant, and may be applied in the same manner as pyrethrum. Refuse tobacco can be obtained through a drug store at a cost of little more than the freight, and this if ground or cut into small pieces will make an excellent insecticide for many purposes. When the tobacco is used to destroy lice upon domestic animals it is applied by washing the skin with a decoction made by soaking or boiling the tobacco in water. Tobacco is also useful as a repellant whereby insects are kept away from plants; *e. g.*, by putting it upon cucumber hills the striped cucumber beetle may be kept away.

Hellebore kills by both external and internal contact, and, hence, in some cases is a very useful insecticide. It is a

vegetable poison, consisting of the powdered roots of the white hellebore plant. It is applied in the same manner as pyrethrum, and sells at about twenty-five cents a pound. Hellebore is especially used for the well-known imported currant worm.

Paris green is an arsenite of copper, and contains about fifty-five per cent. of arsenic, the proportion being somewhat variable. It belongs to the internal contact class of insecticides, and sells at about thirty-five cents per pound.

London purple is a by-product in the manufacture of analine dyes, placed upon the market by the Hemingway London Purple Co. of London, England. Its action is nearly the same as Paris green, and it contains nearly the same amount of arsenic.

London purple and Paris green are known as the *arsenites*. They are used in a dry form or they can be mixed with flour to advantage in many cases. The arsenites are practically insoluble in water, the particles remaining suspended. The proportion generally used is one pound arsenite to 200 gallons of water. If too strong a proportion is used, the foliage to which the arsenites are applied will be scorched; hence, for tender foliage, such as the peach, a weaker mixture, say one pound to 300 gallons, should be used.

Damage to foliage, however, can be almost entirely prevented by mixing a little lime water with the arsenical mixture. We owe this discovery to Prof. C. P. Gillette, of Colorado, formerly of the Iowa Experiment Station. If lime water be added to the mixture the arsenites can be safely applied to the most tender foliage, when used in the ordinary proportion of one pound arsenite to 200 gallons of water.

The arsenites are used to destroy any of the mandibulate insects, and kill by being taken into the alimentary system. Eleven years ago they were first brought forward as a remedy for the well-known coddling moth. Spraying with the arsenities for this pest is now practiced by all the more progressive farmers of the Middle and Eastern States, and any fruit growers who do not practice it are annually losing a large per cent. of their crop through a neglect of this simple operation.

Kerosene emulsion is the best insecticide of the external

class. Kerosene itself cannot be used upon plants infested with insects as it would kill the foliage, hence it must be diluted if it is to be used as an insecticide. The idea of diluting the kerosene with soap suds probably originated with Mr. Henry Bird, of Newark, N. J., in 1875, and two or three years later an emulsion was made by Prof. A. J. Cook, of the Michigan Agricultural College, and Dr. C. V. Riley, Entomologist of the United States Department of Agriculture. It was first practically used and recognized as a valuable insecticide by Mr. H. G. Hubbard while conducting some experiments upon scale insects in Florida under the auspices of the Department of Agriculture. During the last three years the kerosene emulsion has come into general use.

There are two formulæ for making the kerosene emulsion now in use. The one is known as the Hubbard-Riley formula and the other as the Cook formula, the difference between them being that the former contains eight times more kerosene to the same amount of soap and water than does the latter formula.

The Hubbard-Riley formula is made as follows: kerosene, two gallons; hard soap, one-half pound; hot water, one gallon. The soap is dissolved in the hot water, and, while still hot, should be poured into the kerosene and thoroughly mixed by pumping through a force pump, when the soap suds will unite with the kerosene, forming a thick, creamy emulsion. The emulsion thus formed can be put away in bottles for use at a future time, or can be used at once. When used it should be diluted with about nine times its bulk of water.

The Cook emulsion is made in a similar way according to the following formula: kerosene, one quart; hard soap, one-half pound; hot water, one gallon. The soap is dissolved in the hot water, and the kerosene mixed with it as before. When ready for use it is diluted with two or three times its bulk of water.

A good emulsion is one in which the kerosene will not separate; and either of the above, if made properly, will be found excellent for use against any insect, where we wish to kill by external contract.

Bisulphide of carbon is an excellent insecticide for some purposes. By means of volatile fumes of this substance we can

reach many insects, which cannot be well destroyed in any other way. It is especially useful in destroying ants and grain insects. To destroy an ant-hill, by means of a crowbar or stick, a hole is made in the center of the hill, into which a small amount of the bisulphide is poured. The hill is now covered with a wet blanket, to allow the fumes to penetrate all parts for a few minutes, when the blanket is removed and a match applied. The fumes are explosive, and the odor will effectually destroy all ants within the hill.

For grain insects the bisulphide is used to destroy various weevils and moths found within stored grain. This is done by putting the grain into a bin as tight as possible, in order that the flumes may not escape. In such a bin the bisulphide is put into an open dish on top of the grain, and allowed to evaporate. As the fumes are heavier than air they will penetrate to the bottom of the bin.

There are many other insecticides of greater or less importance, among which should be mentioned whale-oil soap and carbolic acid, both of which make an excellent wash for trunks of apple trees, to prevent borers.—*Corr. N. Y. Independent.*

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A CALIFORNIAN MEETS MR. KOEBELE IN AUSTRALIA.

MELBOURNE, May 11, 1892.

TO THE EDITOR:—It will doubtless be of interest to many of your readers to learn of the success of Professor Albert Koebele of the United States Department of Agriculture, in discovering in this country parasites or beneficial insects preying on our most troublesome fruit tree enemies.

I accidently met him in Sydney, New South Wales, April 27th, and as I knew his mission here, I urged him to show me his specimens, which he did on the following day, and I can assure you they are a welcome sight to those interested in horticulture. I asked him to give me a short account of his work and success, as I had heard conflicting reports in San Francisco and Los Angeles before I left there.

Since he left San Francisco he has been in the Sandwich Islands, New Zealand, Queensland, New South Wales, Victoria, South Australia, and he is now in the Fiji Islands or New Caledonia. In all, he has traveled over 16,000 miles, and has prosecuted his work in the driest portions of Australia, as well as in the tropical regions, and in heat of 116 deg. in the shade at one time, experiencing at another time a rainfall of 17 inches in one storm; but in spite of hardships, he looks in good health and is enthusiastic over the value of his discoveries of beneficial insects since he left San Francisco. Up to the time I saw him, he had secured in all over 60 parasites for our most troublesome scales, and is "positive" that, with their successful introduction, our fruit growers, *in five years, time*, will be saved the trouble and expense of spraying and gasing their fruit orchards, and why should this not be so? The Australian beneficial insects or parasites have enemies in this country which they will not have in California, as they are not indigenous there, and should have their natural increase, which should be like the increase of the "cardinalis," which has proved so valuable for destroying the cottony cushion scale.

The lady-bird, *Orcus Australis*, of which he has specimens, is a *general feeder* on all *scale* and *aphis*, and should prove one of the most beneficial insects. He has found a large variety of enemies to red scale (including one fungus) preying exclusively on it. He has also found many enemies for the San Jose and black scale, and besides the above, many varieties of moths and fungus that live on all our California scale and aphis, and three insects that prey on grasshoppers, but the season was so late when he found the latter that he could not make successful shipments of them.

Several shipments of beneficial insects have already been as successful as he desires, but he will continue to forward by steamer duplicate shipments, and with the hearty co-operation of his co-laborers, he is confident of their successful introduction. So far, he has not found a parasite for the codlin moth, and is of opinion that it will be found in Europe, as it is a native of that part of the world. There is where he wants to go and look for it, and he should certainly have the opportunity presented to him by the fruit growers of California (if not sent by the Government).

It is to be hoped that he may be spared to the world to carry out his life's work, which has begun so successfully. The trip he is making to New Caledonia is a dangerous one for his health, particularly on account of his enthusiasm, which will expose him where, in ordinary pursuits, there would be but little danger.—*Chas. E. Blake, in Pacific Rural Press.*

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THE SUGAR BOUNTY.

C. A. C., the correspondent at Washington of the *New York Commercial Bulletin,* writes as follows to that journal on May 21:

"The payments of sugar bounty under the McKinley law have been practically completed for the present fiscal year, and the amount is $7,224,601.88. A small amount of wagon sugar will probably be presented for bounty, and nearly all the maple sugar bounty has yet to be paid. It is estimated, however, that only about 5,000,000 pounds of maple will obtain the bounty of 1¾c., making an additional payment of $87,250, and that 1,000,000 pounds of wagon sugars will draw the bounty of two cents per pound, making an additional charge of $20,000. These additions will carry the total payment for the year to $7,331,826. The actual production of sugar, according to the reports which have reached the commissioner of internal revenue, has been as follows:

		Pounds.
Cane sugar		346,237,520
Florida	921,667	
Texas	8,989,567	
Louisiana	336,326,286	
Beet sugar		12,004,838
California	8,175,438	
Nebraska	2,734,500	
Utah	1,094,900	
Sorghum sugar		1,105,286
Kansas	1,105,286	
Total		359,347,644
Wagon sugar		8,030,306
Louisiana	7,653,566	
Texas	219,000	
Florida	157,749	

These figures fall a good way below the sanguine estimates of the producers when they filed their applications for bounty with the commissioner of internal revenue. The producers of cane sugar alone figured on a production of 572,-106,880 pounds, for which they have to show 346,237,520 pounds. The greatest shrinkage is in Florida, where the estimates call for 3,588,500 pounds, and the actual production returned is only 921,667 pounds. Internal Revenue Commissioner Mason, when he prepared his annual report in November, reduced the estimate of the producers of cane sugar to a probable production of 465,000,000 pounds, but even this proved 120,000,000 pounds too large. The bad season had much to do with reducing the production, but the experience of the new law shows that the estimates of producers will always represent their extreme possibilities, and that a liberal discount must be made to reach the probable production. The production for next season, if the season is a good one, may call for an expenditure of $9,000,000, but it is not likely to much exceed that.

The maple sugar producers have not applied very generally for the bounty, and even some of those who have taken out licenses have failed to have their sugar weighed in compliance with the law. The last census gave 62,000 as the number of producers in the United States, of whom 23,533 made over 500 pounds per year. This is the limit below which licenses are not granted, but only 4,240 of these large producers took out licenses.

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BEET SUGAR.

The following items, gathered from various sources, largely from *Sugar Beet*, indicate to some extent the wide spread and growing interest in beet sugar in all parts of the world. The Spaniards are going into production of beet sugar. Ten factories have been established in the province of Grenada, and thirteen more are to be erected soon.....Dr. Wiley of the U. S. Agricultural Department, compiled a valuable resume of all current knowledge concerning beet culture and beet sugar manufacture, and the Government is about to publish it.... Japan is to have a new beet-sugar factory; the machinery

therefor has been sent from Germany, and the first campaign will commence this year.....The total European beet-sugar production was 1,256,000 tons in 1874–75 and 3,448,000 tons in 1889–90. Of this latter Germany produces 34 per cent, and France 21 per cent.....Over 500,000 acres in France were devoted to beet raising last year with a yield of 6,700.000 tons beets. The sugar production is estimated at 750.000 tons, and exportation 267,000 tons, with a consumption of 1,100,000 tons coal. At one time German and Belgian sugars —owing to their cheapness—entered the country in great quantities; since 1884 they have been kept out.....The question of the importance of sugar-beet cultivation in England is again being agitated; the excessive humidity of the British islands is an argument against the future of beet-sugar extraction in the country.....The cultivation of the sugar-beet is receiving a great deal of attention in Canada. From Quebec to Manitoba it is one of the prominent topics of agricultural interest ....Mechanical harvesting of beets is becoming popular, as there is very much less danger of bruising the roots than by any hand method, wich always corresponds to a loss of weight. Preservation is then not only difficult, but not advisable, in some silos, with good healthy roots, as by contact the waste soon increases. In France hand harvesting costs $4.80 per acre, while by harvester, including wear and tear of implement, it is $1.40.....The German sugar industry continues to be in a most prosperous condition; the combined interests of farmer and manufacturer have effected much towards this success. If beet cultivators are interested in producing quality rather than quantity, the profits are double compared with when only one object is sought, *i. e.*, beets of large size. The sugar production of last campaign is said to be 1,260,000 tons, the exportation, 600,000 tons.

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THE LOW RETURN PER ACRE OF CANE.

It is fully time serious attention was paid to the increase of the production of the acre of cane. No one will deny that, if the returns made to the Government are correct, the amount of sugar obtained from an acre of cane is extremely

low and we cannot be more profitably employed than in considering the remedy for this. Unfortunately we are unable to ascertain the average yield of sugar per acre for a large number of years over the whole colony, but for the last three years we know that it has been 1.36 tons, 1.75 tons, 1.55 tons, respectively. Taking the Mackay district only we know that the return has varied from 1.75 in 1879 to .50 tons in 1888, and there is no evidence that of recent years an increased output has been made. And what is true of Mackay is more or less true of the whole colony. And what after all was the splendid result per acre of the 1890-91 crop?—1.75 tons. In other words the average of canes to the acre was about 16 tons. Yet there was hardly a grower throughout the colony who would have admitted anything under 25 tons. If we turn to other countries we seldom find a worse return than that we show, and we often find a far better one. A tonnage of sugar amounting to three or four and even as high as eight tons to the acre is shown in Honolulu, the first figure being taken as a very moderate estimate. This means only 27 tons of cane to the acre, and surely that is not excessive, The average return per acre for seven years amungst the farmers growing cane on the Herbert for the Victoria Mills was 31 tons, or over three tons of sugar to the acre, and, as other places can show equally good returns, there must be something radically wrong about the general result. We have spent thousands of pounds upon improved machinery, we have reduced our loss of available sugar in the cane from 50 per cent. to 25 per cent. and even less, and yet our output per acre has not increased materially and in most cases has decreased.

The natural conclusion of the careful observer is that the work of cultivation has been neglected and that consequently as the land deteriorates in value our improved appliances, though extracting more from the ton of cane, fail to obtain more sugar per acre under crop. To have to turn to perfecting his cultivation, to manuring, and, perchance, to irrigation while he still has millwork to check and all his attention and time is devoted to the manufacturing department must seem at first to the planter somewhat bewildering. And it will always be so, unless he takes the earliest oppor-

tunity of separating the two processes—cultivation and manufacture. No man can serve two masters, and hope to compete with him who can devote his whole care to one. It is not our intention to enter just now into the question of manures and other matters pertaining to cultivation, but we wish to point out that, judging by past experience, there are many who while gaining an extra ton in the mill are losing it in the decreased return of the acres they cultivate. It costs just as much to plow the acre that will bear a 15 ton crop as one that will yield 30 tons; it costs less to keep down the weeds on the land with a big crop than with a small one; it costs more per ton of cane to harvest a light crop than a heavy one, other things being equal. Surely then it will pay the planter to at once see that his cultivation maintains its standard, or if want of time or capital forbids to see that other men take in hand the work of supplying his mill with the raw material. To the manufacturer who buys his cane by the ton, so long as it is clean and well-grown it matters not whether it comes from a 15 or 30 ton crop. What he saves he puts into his pocket; but if he cultivates poor crops himself what he saves in manufacture is spent in the additional cost of growing the cane. We direct the very serious attention of all engaged in the sugar industry to this question, as it appears to us that the improvements being made in manufacture are largely discounted by the falling off in the returns of cane for each acre cultivated. There is of course one argument at times suggested to account for the unsatisfactory yield to which we have referred and that is that the returns of acreage supplied to the Government are frequently overstated. If such is the case cane growers have themselves only to blame if they remain in a state of ignorance as to how much better or worse their results are from year to year. We cannot think, however, that any willful misrepresentation takes place and we urge all those making returns to see that nothing put down may even by accident lead to a misunderstanding of the facts with which we have to deal. In sugar, as in everything else, mystery is a sign of weakness and selfishness. The industry never promised so well as of late years, when planters have been more inclined to help each other and less anxious to keep their doings in the dark.—*Mackay Sugar Journal.*