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Cuban Centrifugals, 96° test, were quoted in New York, Nov. 14, at 5.53. Trust certificates, same date, 53.

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The statement is made that Russian beet sugar factories in 1889 averaged a profit of 25 per cent. Probably cheap labor and government subsidies are the causes.

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The Spaniards are going largely into the production of beet sugar. Ten factories have been established in the province of Grenada, and thirteen more are to be erected soon.

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We have received from the E. W. Ross Co. of Springfield, Ohio, a pamphlet descriptive of the "Ross Comminutor" for the preparation of tropical sugar cane for diffusion or the mill. It is fully illustrated.

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Brazil is determined to have a flourishing sugar industry. A law has been passed granting 6 per cent. interest for twenty-five years on capital invested ($5,000,000) in creating several central sugar factories. Some of these are to be worked by diffusion.

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The consumption of sugar in the United States in 1889 was 1,457,661 tons, of which 403,715 tons came from Cuba, 39,435 from Porto Rico, 68,213 from Brazil, 48,263 from Demerara, 124,088 tons from other West India Islands; 132,947 tons from the Philippine Islands, and 120,000 tons from the Hawaiian Islands.

WITH OUR READERS.

We present in this number of the PLANTERS' MONTHLY, a variety of reading matter which cannot fail to interest every one engaged in agricultural pursuits. While sugar is our leading branch of industry, it must be borne in mind that the true prosperity of the country demands a diversity of industries, to suit the various localities, means and experiences of the cosmopolitan population of our group. In short, the minor industries are those which need and should receive the most encouragement, as they are also those in which people of small means can best engage and find a healthy and adequate support.

The author of the communication about tobacco, page 489, desires us to correct the statement made in the opening lines of his article, that no report on tobacco was presented at the Planters' Convention. He left the city before the close of the convention, and it was only on the last day of the meetings that the report was presented and read.

The article on sugar-house waste, taken from our esteemed contemporary the *Louisiana Planter and Manufacturer*, contains much useful information relative to every day matters in boiling houses, which from familiarity are too often overlooked, though a little attention would lead to stopping the leaks pointed out. No sugar boiler's knowledge is so perfect, but that he can gather information from the experience of others, even in trivial matters.

Among the many cane sugar-growing countries, there is none that so nearly resembles Hawaii as does Mauritius. Of volcanic origin, with its rocky hills and luxuriant plains, its wet and dry localities, it formerly turned out from one hundred and fifty to two hundred thousand tons of sugar annually, but of late years the crop has averaged about the same as ours. The editor of the *Philadelphia Sugar Beet* recently visited that island, and published his observations, which will be read with interest by every one. Judging from his account, we are vastly ahead of the Mauritius planters in our mode of cultivation, and in the manufacture of sugar. But they have a great advantage in the cheap labor which they obtain from India, costing them only three or four dollars per month and board.

Many of the details given are more full than have recently been published in any form.

Following the above, on page 506, is a communication relative to fertilizers, and the question as to who shall bear the expense of providing them—the planter or the mill owner—when both share equally in the benefits derived from their use. It is a subject well worthy of discussion.

In the PLANTER for September, (page 406,) we printed an article on "Scientific Education" as related to agricultural pursuits, and more especially to cane planting. In this number we insert the second article by the same writer, copied as was the first from the *Barbadoes Agricultural Gazette.* It is rarely that we have read a treatise written in such clear and intelligent language, that any farmer or planter can comprehend not only the argument advanced by the writer, but the cause, the why and the wherefore of every proposition stated and explained. No one can read it without becoming convinced of the necessity for a thorough knowledge not only of plants, how they grow and produce the various products obtained from them, but also a thorough knowledge of the soil best adapted to each plant. In language and style and clearness of argument, these articles are most remarkable compositions.

If any one doubts that diffusion "has come to stay," the perusal of the article by Dr. Dannenmann, originally in the *Louisiana Planter*, will go a long way towards solving his doubts in favor of diffusion. The evidence is each year accumulating, and it cannot be many years before every planter must see that "no sugar planter can afford to work without diffusion." As stated by him no one who has tried diffusion can ever be induced to return to mill grinding.

It is the object of this Monthly to encourage every branch of agricultural industry, and with this in view we insert the very interesting account of the success attending a new ramie manufactory in Mississippi, where it appears from the article that the cleaning and spinning of the ramie fiber is brought at last to perfection. Since this article was put in type, we have received from a gentleman in Boston an account of successful experiments at Topham, Mass., in connection with ramie, which

shall be inserted in our next issue. The only trouble now is to obtain enough of the fiber to keep the factories at work. Ramie will grow no where better or more abundant than here, and we look upon this as one of the most hopeful of the minor industries of Hawaii, which may yet be developed to become a very important one. Let us have the decorticating machines, to insure perfect cleaning of the fiber, and there is no reason why the business may not at once be engaged in by cultivators of small means.

Cane culture and sugar making in Java and Texas are described on pages 518 and 520, and a perusal of the sketches given will indicate that sugar planters in Hawaii are in some respects more favored than their brethren in those countries. In Java, for instance, Europeans are forbidden by the Dutch Government purchasing more than eighteen acres of land. He may lease, but a leasehold affords a poor tenure for what should be permanent investments.

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BEET SUGAR IN THE UNITED STATES.

Henry T. Oxnard, the Nebraska sugar-beet grower, is enthusiastic over the future of that product. He says: "The science and experience of all sugar-producing countries are bent on securing a greater production of sugar, which is, of course, the way to create lower prices. In 1870 the sugar-beet only contained 5 per cent. of sugar to the weight of the beet, and ten years ago 9 per cent. was a good average, while in 1888 an average of over 14 per cent. has been obtained. All this has been brought about by cultivation. Now, every increase of one per cent. means an increase of twenty pounds to the ton of raw beet, of about three hundred pounds to the acre, so that the refiner, with the same labor and fuel, the same plant and capital, obtains 100 pounds more sugar than he did ten years ago. The result is, of course, to decrease the cost of sugar to the producer and, eventually, to the consumer, and this process of selection and breeding in the next fifteen years will give 20 per cent. of sugar to the weight of the beet. There are to-day five sugar-producing States—Louisiana, Texas, California, Kansas and Nebraska. These have an area more than the total area of France, Germany and Austria combined. And there are

other States in the North just as well adapted to the growth of the sugar-beet. We get better results from European seed than they do over there. Claus Spreckels has made an average of 17 per cent. In California the reports, which I verified myself by observation, showed an average of 18 per cent. In 1887 we produced from the sugar-beet about 200 tons of sugar; in 1888, about 1,800 tons; in 1889, 3,000 tons, and this year will see a production of 12,000 tons. Before 1900 I expect to see beet-sugar manufactories established in every Northern State. —*S. F. Bulletin.*

MINOR INDUSTRIES.

Among the wise words that have fallen from the lips of England's "Grand Old Man" are those contained in an address to Scotchmen, where agriculture was greatly depressed. His remarks are equally applicable to Hawaii nei. He asked them why they did not engage in putting up jams and jellies for the city markets, which are generally supplied abroad. He pointed out that the small fruits from which these luxuries are made would grow well in their soil, and that for such goods there was always a good market. The Tory editors laughed at Mr. Gladstone's kitchen economy, but the Scotch farmers took the matter seriously and have found their profit in it. A large and productive industry has sprung from the old statesman's suggestion. It is along some such lines as these that the farmers will most surely draw to themselves a larger share of the surplus wealth of the country. That surplus is abundant, but all sorts of people with keen wits and strenuous energies are competing for it. Those who have it are ready to exchange it for gratifications of various sorts. The problem is to please them. Within the bounds of innocent and wholesome delectation there is a wide range for the exercise of invention by the food producers of the nation. If they confine themselves to the business of raising corn and wheat and sugar and rice, their market will be narrow; they can widen it, almost indefinitely, if they will devote to their business the same kind of ingenuity that manufacturers of all classes are constantly exercising in their efforts to attract to their own coffers the abundance of the land.

IRRIGATING AT MANA, KAUAI.

Messrs. Faye & Co.'s pumping machinery at Mana was successfully started last week to the satisfaction of all concerned. The plant was built by the Risdon Iron Works, the engines being of the compound condensing fly-wheel pattern, with outside packed plungers, and is a good example of the modern high duty pumping system. The pump plungers are 15½ inches in diameter, and have a guaranteed capacity of 4,500 gallons per minute, to a height of fifty feet, and will irrigate about 800 acres of cane. The boiler is horizontal tubular, 5 feet in diameter, and 16 feet long, the steel shell being in two plates only.

A new system of delivering the water to the ditches from that usually practiced has been introduced here by Messrs. Faye & Co., and in place of lifting the water to a flume which reaches the highest point of the land to be watered, a 24-inch steel pipe, 3,000 feet long, is layed on the ground, with gates at suitable intervals, so that the water is lifted only to the height required, effecting a great saving in fuel, independent of the cost of trestles and flumes. Mr. Dyer also informs us his firm is constructing a compound direct-acting pump for the Waimea Sugar Co. for irrigating purposes, to lift the water to a height of 80 feet from the Waimea River.

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RECIPROCITY.

Now that free sugar is to become a certainty after April 1st, 1891, as a result of continued agitation for several years, the people will turn their attention to some other great advantage to be derived from making their wishes known. The next great subject for agitation by the people, and for the people, will be reciprocal trade between the United States and other nations. Congress foresaw the coming demand, but without making reciprocity a means to "free sugar," which would have given reciprocity the first place, and delayed "free sugar" indefinitely, gave "free sugar" the first place, as demanded by the people, and has provided that "free sugar" shall be a

means to reciprocity, by the clause in the tariff bill, given in full in our special issue of October 2d. Reciprocity is being daily discussed at home, and brought prominently before our people by the prominent speakers of both political parties. Certain laws now in operation in some countries running for a few years, may prevent an early consumption, but, as far as known, the subject is received with favor in the cane sugar producing countries, and Cuba and Brazil are especially interested in devising ways and means for opening their markets to the exports of the United States. Cuban merchants and planters have already petitioned the home Government for special privileges for the United States trade.—*Exchange.*

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BEET CROP.

Mr. Licht's latest report 1890, gives the following estimate of the European Beet Sugar production of the 1890–91 campaign, (the crop now being work up) as compared with preceding campaigns, as follows:

		1890–91	1889–90	1888–89
Germany	Tons.	1,250,000	1,264,607	990,000
Austria	"	780,000	753,078	525,000
France	"	800,000	787,989	470,000
Russia	"	530,000	465,000	510,000
Belgium	"	200,000	221,480	140,000
Holland	"	50,000	55,813	45,309
Other countries	"	75,000	80,000	55,000
Together	"	3,685,000	3,627,967	2,735,000

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THE AMERICAN SUGAR MARKET.

The future of the sugar market is a subject of considerable speculation among sugar men in the United States as the present time. The price of raw sugar in New York as the latest date was five and a half cents, which is rather above the average of the past few years. The new tariff abolishes the duty on low grades, averaging about one and three quarter cents per pound. It is not likely that the price of free raw sugar will fall below what it would be with the duty off from the present price, or three and three quarter cents a pound. When

it drops to four cents, with granulated at 4⅜ cents, to 4½ cts. (at present 6 cents), its cheapness will stimulate consumption very rapidly, and tend to check its further decline.

The sugar consumption in England, where sugar is free and the price is about that named above,—4⅜ cents—averages about 75 pounds per head of the population. In the United States, it averages about 50 pounds. May it not reasonably be expected that the consumption there will rapidly increase till it equals and perhaps exeeds that of England? This certainly looks plausible.

The sugar consumption in the United States for 1889 amounted to 1,457,661 tons. Free trade will stimulate this very rapidly, so that, within two or three years at the farthest, the amount required to meet the demands of its then 65,000,000 population, will be at least 2,200,000 tons. This increased demand will tend to keep up the price, fluctuating perhaps between four and four and a half cents for good raws, and possibly higher, under speculative influences.

The European beet crop of 1889 exceeded that of the previous year by about 600,000 tons, and yet before the close of the season this large surplus rapidly melted away under the influence of increased consumption in Europe and America.

It must be borne in mind that beet sugar has not the sweetened strength of cane sugar. Mr. N. Lubbock, of London, the best authority extant on this subject, says that cane sugar is worth ten dollars a ton more than beet. Any one who has lived in England, where beet sugar is universally consumed, will recall the old saying so common there, when sweetening tea or coffee, "one cube cane sugar, or two cubes beet sugar." All housekeepers well know the difference from experience, that beet sugar is inferior to cane sugar, and that for some purposes, cane sugar alone can be used. The only inference that can be deduced from this is, that it will require much more beet sugar to supply the wants of the United States, and that, if it consumed free beet sugar only, it would require a total on the present basis of population of not less than 2,500,000 tons, and perhaps much more. In whatever light we look at this question, the consumption of free sugar in America, will require a very large increase in the quantity, and more likely exceed than fall short of the highest estimates made.

CORRESPONDENCE AND SELECTIONS.

CONCERNING TOBACCO CULTURE.

To the Editor of the Planters' Monthly:

One of the Committees that was to have reported to the Planters' Meeting last October was that on Tobacco.

No report was made and owing to the pressure of other business no discussion was had on the subject, but the Secretary, after making some remarks of an apologetic nature for saying anything in favor of the weed, continued to argue that people *would* use tobacco, and it would therefore be for the interest of the country, instead of sending so many thousands of dollars away yearly for the foreign product, to keep it in the country by encouraging home culture and manufacture.

Now I am perfectly well aware that in saying anything against the use of tobacco I shall go contrary to the opinion of the majority of the learned gentlemen who were present at that meeting, as exemplified by their own habits, for the most of them use it more or less, although it is pleasant to know that there are quite a number of them who do not use it in any form.

But I know they will not object to the advancement of views contrary to their own, properly presented, and I would like to ask these representatives of the intelligence, industry and wealth of the country whether they think it is right and whether they think it is to the credit of the Planters' Company, composed as it is of such representative men, to countenance or in any manner to encourage the production or use of the weed?

Using it to the moderate extent that it is to be supposed the most of them do, they would probably argue that thus used the article was harmless, but were they to express their own candid opinion, would they not admit that it were better on the whole if they had never learned to use it; and have not some of them felt a twinge of regret as they first took notice that their sons were following in their footsteps and striking up an acquaintance with the cigar or the quid? Or would they not prefer to see them let it alone? What is there to be said in favor of the habit?

I claim that the arguments used in favor of tobacco will apply in a greater degree to opium.

A certain class of people *will* have it, you *can't* stop them, and the profits to be made in dealing in the drug will far outstrip anything that can be made in tobacco.

Now, instead of allowing so much money to go abroad for this commodity, and tempting the avarice of men by enacting laws of restriction against so profitable an article of commerce, why not introduce the poppy plant and legalize its production here? So only that we fill our own coffers and use but little or none of the drug ourselves, and hope that our sons will be equally abstemious, what matters it if alien consumers suffer and die by the thousand?

If we raise opium and tobacco, we must have a market for them somewhere, and somebody must consume our products to keep the market active, and somebody must suffer for it.

Can we afford to delude ourselves with such fallacious arguments?

Can we advance such arguments and not think the less of ourselves for doing so? E. C. Bond.

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SUGAR HOUSE WASTE.

[More concerning vacuum pan foaming and entrainement.]

Some weeks ago, in a previous article, I treated the subject of entrainement and foaming in the double effect vacuum apparati. Kind endorsement of the views therein expressed by some of our most observant and scientific sugar planters inspires me to rise to make a few further remarks on the subject of foaming, entrainement, and overflow in the finishing vacuum pan of the sugar house, factory, or refinery.

The vacuum pan is, by compulsion, as it were, provided with far less evaporating or heating surface than the final pan of a double effect in the same sugar house. Hence, with this diminution of heating surface must come a corresponding increase of steam pressure (practically heat) on the coils of the pan. Naturally, less heating surface is required even with the same steam pressure applied in the coils of the finishing pan than that required in the tubes of the final pan of the double effect. This is because less water has to be evaporated in the finishing

pan. But with the diminution of evaporation comes the greater difficulty of evaporation from a more condensed solution. Therefore, compared with the double effect, the heating surface of the finishing vacuum pan should be as great as possible.

However, it is, all things considered, almost practically impossible to properly proportion the heating surface of the finishing pan to that of the final pan of the double effect, using the same steam pressure in both.

For instance, when the heating surface of the first pan in a double effect is subjected to a five-pound back pressure in most of our double-effect establishments, which really signifies an equivalent of atmosphere pressure of fifteen pounds + five = twenty pounds steam pressure, in fact, the final pan of this effect, say, with a vacuum of 10″ in the vapor chamber and vapor pipe of the first effect, has a steam pressure of ten pounds applied to its heating surface. That is, its steam pressure represents atmospheric pressure of fifteen pounds—five pounds already exhausted in the first pan.

While the final pan of the double effect has only ten pounds of vapor pressure applied to its heating surface, the coils of a low-pressure finishing pan have at the least ten pounds steam pressure plus the equivalent of fifteen pounds atmospheric pressure=twenty-five pounds of actual vapor pressure. High pressure vacuum pans with proportionately limited heating surface in coils are worked all the way up to 100 pounds steam pressure, with the addition of fifteen pounds for total vapor pressure.

The heat thus in a finishing vacuum pan is locally more intensely applied in a much more limited space. Hence the spraying or atomization directly over the coils is apt to be greater in a more vigorous ebullition.

Before the concentration of this syrup, which we will say commences to boil in the vacuum pan at 20 degrees to 25 degrees Baume, there is apparently considerable entrainement going on. This is plain to the eye in any working pan properly provided with eye glasses and side glasses and brightly lighted within by electric lights placed in convenient position against these illuminating glasses of a well appointed vacuum pan.

In a rapidly working pan this spray rises to particles, forming a mist almost as fine as fog. It can plainly be seen ascending into the vapor pipe in spiral lines, or in miniature columns playing over the boiling surface of the liquid in the form of miniature water spouts, or dust columns raised by whirlwinds in dry weather.

The proportion of loss in this entrained spray or mist of course can never be definitely or accurately ascertained. It has been satisfactorily enough determined at least to enforce the application of helix and other forms of separators to the vacuum pans of refineries. If these find it worth while to save such waste by the application of separators it would seem that the vacuum pans of sugar plantations might be supplied with this modern saving invention with equal advantage, or with comparative advantage at least.

The objectionable foaming of vacuum pans is produced from several causes. Apparently among the most important of these are air leaks in the joints of the shell, discharge valve, and other valves, imperfectly clarified syrups and frosted material.

As to air leaks: All air entering a vacuum pan instantly expands enormously in volume. Unlike the vapor of steam, it fails to burst the bubbles it forms by vigorous and active heat. It forms a swelling froth of bubbles above the boiling surface of the liquid, and flakes of this froth are constantly flying up the vapor pipe to be lost in the condenser.

That fault from this cause may be remedied simply by tightening up every joint and valve in a vacuum pan, which the sugar maker and engineer should at once lay aside their respective differences of opinion and conspire to do.

Badly clarified syrups from green or ripe sound cane foam because they have had the benefit of too little lime in the clarifiers to neutralize sulphurous acid gas, or to coagulate the vegetable albumen in the cane juice. The presence of this albumen causes a gummy consistency in the syrup, prevents the prompt and lively breakage of the surface bubbles, and sends up to the condenser and down to the hot well an undue quantum of waste in froth, which may represent a few or many thousand pounds daily.

Foaming, due to badly frosted cane, is almost unavoidable.

It comes from inverted sugar, the vapor of vinous fermentation formed at a lower temperature than water vapor, acetic fermentation, or other general decomposition of the stuff being handled in the pan. This kind of foaming can partly be obviated by the use of several barrels of tallow daily, or by liming the product treated to the point of alkaline destruction. In such stuff as our sugar houses had to handle in December, 1877, it would be a good plan to save the foam and let the ballance of the stuff go in the skimming ditch, or to drop science and adopt the maxim of "sauve qui peut."

Yet another and a very important cause of foaming is found in the employment of raw juice-settling tanks, and settling tanks for syrup. Raw juice should be pumped, if possible, right from the mill through the sulphur machine into the clarifiers, and cleaned as soon as possible. Common sense and our numerous district or sugar house chemists will tell, and have told, the reason why. Syrup directly from double effects sent into settling tanks at a temperature of 130 degrees to 140 degrees F., shows signs of fermentation in one-half the time in which the same syrup will show similar signs if heated up to the boiling point in open pans before delivery to the settling tanks. In the heated atmosphere of our sugar houses, germs or spores of fermentation are floating about all the time, falling in and corrupting our settling juice and syrup. The effect of this oversettling is often visible in the foaming of vacuum pans, and the marked inversion of sugar. The vacuum pan should be worked as close as possible up to the evaporating apparatus, and the excess of injurious settling tanks might profitably be sold for junk.

All of the foregoing conditions being conspicuously absent, with cane untouched in bed or stock by frost and still growing, with a polarization of from thirteen to fifteen, I have heard several of our prominent planters complain that they had heavily lost by overflow of their vacuum pans. One of these, no longer than last year, expressed the firm conviction that he had lost from this cause no less than 200,000 pounds of sugar in three or four weeks' work.

For some time it appeared to me as if this "vacuum pan overflow" complaint was worked to account for the woeful falling off in the boasted probable yields of pet patches, plats,

or fields of cane. But those favorite acres generally gave, nearly equalled, or even exceeded their expected tonage; the hoped for quantity in gallons of juice came out all right, or very nearly so, while the degree of ripeness came up to the desired or hoped for work. Yet with all this, sugar house returns emphatically indicated the fact that something was missing somewhere.

With all due deference to planters and factory operatives an explanation is herein suggested for the loss of part at least of this mysterious waste.

Careful and close observation in several of our largest sugar houses showed me, in respective individual instances at least, where a large part of this loss came in. The same cause or fault was witnessed in every case, unnecessary to cite, and in every case on dry vacuum pans capable of attaining a vacuum of 27½″ to 28″.

To illustrate: The sugar maker, somewhat crowded with syrup and anxious to work away from the mill or diffusion battery (both classes of establishments are here involved), charged his pan with its starting quantum of syrup, or about half full, as soon as he had sufficient vacuum to draw from his charging tank. With his pan thus charged and his vacuum gauge in the various instances marking from 18″ to 22″ (being as stated in a hurry to get out of the way of the rest of the house) turned steam on his coils.

Now, with the vacuum at 18″ to 22″ a considerable quantity of air was still left in the pan. At the point of ebullition of the liquor under this low vacuum, the heated air in the pan vastly expanded, in fact far more rapidly than the air pump could exhaust it. This air expansion sent the vacuum back or down from 4″ to 6″. Before this heated air could be exhausted by the air pump, the syrup was brought to a boil under a reduced vacuum of from 12″ to 18″, representing a boiling temperature of at least, or nearly, 200 degrees F. About the time that the vacuum had been reduced so low, and the boiling temperature of the syrup raised correspondingly so high, the heated air, unaffecting the temperature of the condensing water in the condenser, was pumped off. With the air all exhausted, the full steam of condensing water acting on the vapor of the syrup, instantly raised the vacuum from 5″ to

10″. This, with several pounds of pressure, instantly removed from the surface of the boiling liquid, that liquid suddenly developed an immense volume of vapor to meet the requirements of this quickly augmented vacuum. A large part of the syrup hence violently foamed up in the pan, filling the overflow chamber and going off in the condenser, air pump and hot well. It was actually thrown up en masse by the sudden removal of pressure from the surface of the boiling liquid.

I have seen more than once a pan half full of raw syrup nearly emptied by this process. involving the loss of several thousand pounds of sugar in a few minutes of overhurry or carelessness in starting a pan. I have seen at least twenty such instances in a limited experience, assisting in or directing sugar house work.

Our grinding season of 1890 is close at hand. If any of our planters feel enough curiosity to demonstrate this proposition, or to witness this natural phenomenon in the next two or three months. let them try it in their own or their neighbor's sugar houses.

Charge a vacuum pan to half or two-fifths its capacity in raw syrups. When the vacuum rises to 20″ or 22″ turn on a full head of water in the condenser and open up half steam or full steam on the coils. When their own, or better, their neighbor's syrup reaches the boiling point they are more than apt to see the practical illustration of a very pretty and interesting point in the science of thermo-dynamics. It will cost something, but we live and learn.

It is but just to our model sugar makers to say that the above fault is usually the handiwork of hopeful and ambitious sugar makers.

It is usually the duty of the assistant in a hard worked house to charge the vacuum pan, start it boiling and stiffen its material down to the strong point before he turns over his baton of temporary office, the proofstick, to his talented superior. Then the superior goes through the mysteries of grain formation and finishing the delicate and expert part of sugar making. The ambitious assistant feels that it is his mission to get away from the mill or the battery with the syrup on hand, and sometimes he, in his worthy zeal, gets away from the house even through the top fixings of the vacuum pan.

To prevent this evil I would humbly suggest the following:

When a vacuum pan is capable, through proper pumping apparatus of maintaining 27″ or 28″ vacuum (which should be exacted as a guarantee from its builders) don't turn steam on it in starting until the mercury gauge registers 26″ or 27″ vacuum. A pan will nearly always gain an inch in steam or boiling vacuum over cold or air vacuum.

Commence with barely-opened steam valves, and don't turn full steam on a pan until it is boiling just above its original liquid level, with a comparatively level and foamless surface.

If there be a marked tendency to foam in spite of all these precautions, try a little pure lard oil through the butter cup, or three or four gallons of clear lime water through a one-half-inch corrective pipe, with which every good vacuum pan should be supplied.

With well-clarified juice from good cane, syrup uncontaminated by long settling, and well-proportioned heating surface and pumping machinery, and supplied with a good separator to return entrained syrup, no vacuum pan should cause a material loss by entrainement, foaming, or overflow. It should give satisfacfory and first-class work to all first-class workmen. —*Louisiana Planter.* ANDREWS WILKINSON.

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MAURITIUS SUGAR PLANTATIONS.

The editor of the *Sugar Beet*, published at Philadelphia, Pa., having visited Mauritius, we make the following extracts from his lengthy description of that Island:

We learn from official sources that $30,000,000 are invested in the sugar industry of the island, representing half that of the entire West Indies. In the latter, sugar plantations have, from a financial point of view, been for years in a very sad condition, most of such plantations being heavily mortgaged, etc. This is not the present situation at Mauritius, on the contrary, improvements are being urged, and a desire to keep up with the progress of the hour is more strongly felt from year to year. It has been suggested that prizes be offered for the most improved methods of extraction.

The fall in price of sugar throughout the world, owing to beet sugar competition, had important influence on the energy of planters. While this depression of prices has continued, the consumption has increased and been met by an increased production. The prices of sugar being variable have not affected in any way those factories having limited capital and good management. The most important sugar buyer of the island purchases for ready cash when a favorable opportunity offers, but those who are simply commission merchants are at a disadvantage.

The Hindoos, year after year, are managing their own sugar interests. Considerable wealth is found among them. They being satisfied with small profits, competition under such circumstances is difficult. A skillful expert, however, is equal to the emergency, and by one means or another he is frequently able to corner the market without being suspected.

During our visit to Mauritius the campaign 1889-90 had nearly terminated. The total sugar manufactured was greater even there than it had been for many years past, and an increased exportation to India continues. As for Great Britain the falling off has been 50 per cent. during the first six months of the foregoing sugar campaign, as compared with 1888-89, '87-88. Shipping in the direction of Australia has also increased very considerably.

The movement of sugar from Mauritius has not been falling off, as is frequently asserted. Once there were many more vessels in port at the same time than there are at present, but this is explained by the fact that steamers have now the carrying trade instead of sailing vessels, as formerly. The value of sugars exported may be estimated at over $10,000,000. The main centers are India and Australia. During 1888, the total sugar made and shipped in Mauritius was 130,066,518 kilos., of which 65,986,606 kilos were sent to India (mainly Bombay), and 31,601,956 kilos. to Australia; to England, only 11,953,148 kilos. The United States received 6,269,837 kilos. Ceylon, Hong Kong, Madagascar, etc., are centers receiving various amounts of Mauritius sugar.

The yield of Mauritius sugar per acre is marvelous, and at first sight would have a very discouraging effect upon one about to invest capital in sugar enterprises in the United States. We

learn that such and such a manufacturer extracts 9 or even 10 per cent. sugar from his canes, and that the sugar yield is from 5,000 to 6,000 pounds per acre. We contrast these results with those of other cane growing centers, and at once conclude that owing to a recent general use of *triple effects* and vacuum pans, combined with many other improvements introduced of late years, the yield has been doubled (?). Progress in the past is only one step towards perfection, and technical skill and management of the future may still further increase the quantity.

If we admit that 5,000 pounds of sugar per acre is an average in Mauritius, this is obtained after twenty months from time of first planting; after the third year the yield is 3,000 pounds, fourth year 2,000 pounds, a total of 10,000 pounds. Then follows a rest of one or more years; consequently during a period of five years the average annual production per acre is about 2,000 pounds.

It is to be regretted that so few factories of Mauritius employ chemists, as it is so customary in all important beet sugar factories; the planters too frequently look upon these questions of science as having little practical value. We venture the assertion that important progress will not be made until the entire sugar manufacture is in the hands of men who have made the chemistry of sugar a special study. Every detail, from the mill to the very last process, if worked according to technical rules and laboratory control, would pay several times over the salary of an expert. We would cite one case in Mauritius, where the sugar extracted had for years been only 6 per cent., but when worked according to laboratory tests, etc., it yielded 9 per cent.

The so-called creole declines working in sugar factories. The experience of planters here is exactly the same as that described in a letter from West Indies to *Sugar Beet* some years since. Labor is imported from India; a system of contract for several years, with wages at $2 to $3 a month, but the workmen are taken care of, fed, clothed, housed and furnished with medical attendance. These laborers may, when the contract expires, either return to India or remain on the island. Many remain, and whether this is a mistake is a difficult question; one fact is certain, they do not have the best of influence on new comers.

During their working hours the men render excellent service and appear faithful and steady. Some of them are able to handle vacuum pans with great success; this and other work seems to suit them. A mystery in may cases is how and where they obtain the technical skill they appear to possess in an emergency. Every detail, under the guidance of a single European, is in their hands. In most cases factories do not run at night, if they do the hands receive extra pay. It has been, in most cases, difficult to have separate gangs of men for night and day work.

PLANTING.

Very few changes have been made in the methods used in planting "tops" for future crop since the early introduction of sugar cane into Mauritius. The vertical planting, as has been suggested of late years, has not met with the expected success. The same may be said of planting two "tops" slotting or crossing each other. The old style horizontal method will continue for many years to come.

Canes are replanted every three, four or five years, depending upon system of cultivation adopted. Harvesting of first or second "repousse" is frequently followed by planting, in which case 2,800 holes are made per acre. These are in straight lines, and alternating with those previously existing. With the view of having the crop uniform, these holes are made several inches deep and wide, and are dug from time to time, while planting at once follows. This requires but a few days, the requisite fertilizer being introduced simultaneously with the cane cutting. Such hand working of the soil is tedious.

The *Revue Agricole* published some time since several interesting facts relating to the comparative cost of hand and mechanical methods. For example, taking out stubble by the hour costs $3 per acre, by oxen and plow, $1.60; second operation, holes for "tops," 20 inches long and 12 wide and 20 inches apart, rows 4 feet apart, $3, by delver, $1.12. These figures are sufficient to show beyond cavil that there is, from an economic standpoint, great advantage in mechanical appliances over the old method. When machinery is generally introduced it will be far easier, even than at present, for Mauritius sugar to compete with the world.

The Mauritius sugar factories, taken as a whole, compare favorably with those existing in any sugar cane island, either in the West Indies or elsewhere. The processes adopted are in many cases the outcome of circumstances. For example, sugar sent to India must have been extracted without using animal substance. This is a religious demand of that country. As a consequence the use of bone black has become almost a question of the past. Sulphurous acid is employed, and is said to have the desired decolorizing effect. As in all these methods of working mill juices, there is a constant conversion into glucose. Excellent results have been obtained in efforts to prevent this, by using pure phosphoric acid. Ehrmann has been the main mover in this direction.

Phosphoric acid appears to have less inverting tendency than sulphurous acid. The latter is very frequently transformed into sulphuric acid. The phosphoric acid does not affect the taste of final sugars.

Pumps, *monte-jus*, etc., are in very general use, and were noticed in factories visited. In several cases new filter presses are being introduced. Centrifugals are placed in rows, and we noticed that a spray of syrup is added during swinging out, the intention evidently being to produce a high grade of sugar with low color for countries where the Dutch standard is in vogue. In some factories they have tried the experiment of making a very large crystal for the Australian market. These are mainly for brewers' purposes, and are not profitable to the manufacturer, owing to the time and care required for their production. On the other hand, small grain grades are very popular. The location of many factories is too far from a suitable water supply, hence the necessity of cooling the water after leaving the exhaust, with the idea of using it over again.

A few figures relating to Highlands will give an idea of the condition of that factory during our visit:

Average sugar per diem	pounds,	45,000
Total sugar made up to Dec. 21, '89	"	5,060,000
Working days, July 17 to Dec. 21, '89		110
Average sugar yield per acre	pounds,	4,289
Average juice per cask	gallons,	55
Average sugar per cask	pounds,	7,061
A portion of same crop was weighed	"	2,352,852
The resulting juices from same	casks,	5,394

Total sugar from same	pounds,	378,960
First sugars from 67,739 cubic feet masse cuite	"	1,598,550
Defecation, etc., were used, sulphur	"	12,864
" " " " superphosphate	"	14,450
" " " " quick lime	"	34,442

At the Britannia estate:

Men employed		748
Total acres of cane cut		807
Total sugar made (from virgin canes, first and second repousse)	pounds,	3,800,000
Average per acre	"	5,000
Average daily extraction	"	43,000
From Aug. 14, '89, to Jan. 18, 90	"	323,572
Quantity of sugar shipped	"	3,383,313

It is very difficult to obtain the exact cost of manipulation in the mill; 13 Rup. per 1,000 pounds of sugar is very near an average, representing about ½ cent per pound. Total expense, including purchase of cane, etc., 77 Rup., or 2.9 cents per pound.

DIFFUSION.

For many years past Mauritius sugar manufacturers have watched with keen interest the results obtained by diffusion at Almeria (Spain), Louisiana, Java, etc. While the sugar yield in these experiments was greater than by any of the manufacturing methods hitherto applied to sugar cane, the cost of plant, the evident increase in quantity of fuel needed for evaporation, combined with other more or less complex reasons, have considerably retarded any financial encouragement towards these innovations, though strongly urged by the agricultural and other societies on the island. The Oriental Bank sugar estates will be the first to move in the direction of progress. The Britannic factory will have for the coming campaign a battery which will be of the very best Five-Lille type. We are informed that the agreement is that the apparatus shall be returned if not satisfactory after several years' trial.

If the experiments at the Britannic prove a success (as they most certainly will under the management of a director, who has a thorough knowledge of sugar in all its phases), they will create a new era in the history of sugar in Mauritius. The average sugar extraction would be raised 2 or 3 per cent., and other countries would be likely to follow the example given. This will not be realized without certain difficulties, for very few sugar men of the island have ever seen a diffusion battery

working, either upon cane or beet. Those who have are not financially interested in this new venture. We cannot, at present writing, discuss the most desirable way of assuring success; one fact is certain, the work could not be in better hands.

It is very doubtful if the bagasse of an ordinary mill will be sufficient to meet the requirements of the case, for additional fuel will be required. The surplus expense and details of the practical results obtained, after first campaign, have been promised us. We can then judge exactly what has been accomplished and what may be expected in the future. The best methods of working a mill in Mauritius consist in having sufficient bagasse left over with which to commence the campaign the following year.

The burning of this fuel in the Godillot furnace on several estates has given satisfaction. It was estimated that there would be considerable saving of time and labor to run the refuse from mill into furnace direct, without preliminary drying. On the other hand, it was a question whether there would remain over any bagasse when the campaign was ended. On several estates visited by the writer the large sheds filled with this dried refuse attracted considerable attention. The ash from furnaces—as in all cane growing—is used as a fertilizer. Enterprising capitalists discuss from year to year the profits that might accrue from manufacturing paper from bagasse. The question remains to be proved whether the value of paper made would be equal to the expense of fuel required at the mill.

SOILS.

One of the most interesting questions relating to sugar in Mauritius is the great variety of soils suitable to cane growing. Planters vary in their views respecting the most desirable conditions, combining yield and quality of cane raised. By many it is asserted that the lower levels near the sea are warmer, better protected and give the richest canes. It is, however, sure that sections of this island, yielding some years since excellent results, have now been abandoned, either from the fact of the soil having been nearly exhausted, or that irrigation in certain instances has been difficult and frequently impossible.

Soils at different elevations not only vary considerably in their composition, but in moisture, the outcome of frequent rains; for example, we saw canes growing with satisfactory results where the annual rainfall was 200 to 300 inches, and in other localities the yield and sugar percentage was even better with but a fraction of the above-mentioned rain. The soils in those very wet districts are porous, and a few hours after a rain are almost dry. The fact that such rapid infiltration should exist, necessarily causes great difficulty in retaining the fertilizers at a depth where they are most needed. These are therefore often carried to lower levels, belonging perhaps to another planter, who derives benefit at the expense of his neighbor. The use of fertilizers in small amounts, and in frequent doses, overcomes to a limited extent some of these difficulties. The cost of labor for this method is greater, but the increased yield more than compensates for the extra expense. The temperature varies with the latitude, and has a most important effect, resulting in variable maturing periods. Frequently two years are required before cutting, and it is doubtful even then if the canes are in the desired condition for working. It remains to be demonstrated if complete maturity is ever attained in these special cases. Those who have never visited Mauritius are frequently too hasty in expressing their view respecting the future of this important sugar island. The slow or hesitating ideas of planters towards the general introduction of agricultural implements now in vogue elsewhere are the outcome of circumstances.

One need only examine the difficulties to be contended with to at once appreciate the advantages, in many cases, of existing primitive methods of working. We very much doubt if in the whole history of agriculture an instance can be cited of attempting the growing of a crop on solid rock, but such are the practical efforts in many cane centers which we visited. The lava, where it exists in lumps, is raised from its bed and thrown to one side; the soil underneath is dark in color and very fertile; spaces between these lumps are frequently planted with cane. In many respects the lava environment has advantages, such as rapid absorption of moisture and throwing it out as the ambient temperature increases, just at the period when the young plant is in the most need of the same. The tedious

planting of cane under the foregoing conditions may be appreciated when it is known that the cost of labor alone aggregates several times the primitive purchase value of the land. When hands may be had for $3 or $4 a month, the labor problem is very different than it is with us.

As regards improvement in existing methods of working the soil, great credit is due to M. Nash, manager of the Oriental Bank estates. He is thoroughly awake to the importance of plowing, etc.; and during the past season strong efforts have been made in that direction. At the Britannia sugar estates the lands were being plowed during our visit. The operation was easy, owing to the almost perfect level condition of the locality. The objection offered by many planters is, that plowing would loosen the soil, and canes, when attaining a certain height would not hold well in the earth. Such, however, has not proved to be the case. As to the direction selected for the rows experience will show which is most desirable. Questions of winds, sun and slant of soil are all to be considered.

The Mauritius planters are awake to the importance of a liberal use of fertilizers; and an interesting fact is that the cost of guano, the most popular of all fertilizers used, is the greatest expense to be contended with in cane cultivation on the island. Planters, in most cases, use this fertilizer because it has given satisfactory results in the past.

The difference of composition, etc., of soils in one place, as compared with another, are questions which have been too long neglected, but are being considered at present. Satisfactory results have been obtained with 4 ounces of guano per hole —700 pounds per acre; for virgin canes there are added 6 pounds barn-yard manure, or 8 tons per acre, costing $4 a ton, or $32. The fertilizer obtained as a residuum, after using Ehrmann's method for working cane juices, has rendered excellent results, owing to the sulphur and phosphate of lime it contains. Phosphoric acid and lime are both required for proper development of plants, more especially in cases like Mauritius, where these elements are frequently not found in the soil in sufficient quantities.

Some planters are only recently appreciating that guano alone cannot possibly meet all the requirements necessary to re-establish lost fertility; year after year certain plant foods

are extracted; their nature would show exactly in what should consist the typical fertilizer for that special case. We were informed that systematic experiments are now being made under the guidance of an agronomist from a well known experimental station of England. Several types of fertilizers will be used, on exactly same conditions of soil, location, etc. Every known variety of cane will be used in these experiments; and those who have confidence in the ultimate results do not hesitate to say that the best sugar days of Mauritius were not in the past, but are to be expected in the future.

In the foregoing we mentioned excessive rain on the upper altitudes; it should be said, on the other hand, that certain portions of the island would give excellent results in cane raising, if some sort of irrigation could be adopted. For a basis of such irrigations could be taken the extensive tanks or reservoirs of California; many existing huge crevices in rocks would, if properly cemented, form natural tanks overcoming one difficulty attending water supply. If something like this were done, the annual crop would be much greater than it is at present. For miles on both sides of the railroad, in several directions, lands are remaining fallow, owing to their exhaustion, and from neglect in not returning the elements by use of proper fertilizers. A little effort could bring these up to their past standard of fertility.

CANES.

The most popular cane now used in Mauritius may be said to be the Port Mackay from Australia. Other types, such as the Bourbon, Losier, etc., have also given satisfactory results. The yield of these canes per acre varies with the soil and locality. It may, however, be estimated at 20 tons.

The question of obtaining a variety of seed suited to a special environment continues to be constantly discussed. Since the recent discovery at Barbadoes, planters are willing to admit that cane selections may be made very much on the same basis as with beets. Some contend that the difficulty in securing cane seed is due to the incomplete maturity of the plant. Nothing prevents a scientific, methodical analysis of canes, with a view to selection. Canes obtained from cuttings rich in sugar will have the same characteristics. We fail to understand why it has not long since been done.

Most factories grow sufficient cane to meet their own requirements, and when necessity demands its purchase from farmers —who are mainly Hindoos remaining in Mauritius after their contract period of labor has expired. This method has given great satisfaction, and the advisability of starting a central factory with entire dependence upon these tillers is being seriously discussed. Canes are frequently purchased at a rate of 4 to 5 rupees per 1000 lbs. If we admit 8 per cent extraction, then 80 lbs. sugar in the cane cost $1.30. If we add cost of manipulation, the cost of 1,000 lbs. sugar will be $26 or 2.6 cents per pound. This cost must not be taken as a certain basis, as there is an immense variation between factories, depending upon facilities and perfection of plant.

Analysis made by Ehrmann upon a considerable quantity of Mauritius cane during 1888-89, gives an excellent idea of the sugar percentage at different periods, viz:

Months.	*Sugar variation.*	*Purity co-efficient.*
October	13.54 to 16.45	83.40 to 93.8
November	13.14 to 17.33	81.34 to 92.9
December	11.82 to 18.37	81.40 to 95
January	10.6 to 14.78	76.81 to 92.76
February	8.82 to 14.16	.....

The Bamboo has given the best results in various districts in which experiments were made. Recent analysis 1889-90 by same expert shows:

Months.	*Sugar variation.*	*Purity coefficient.*
July	7.64 to 17.3	78 42 to 95.68
August	6.53 to 18.81	82.30 to 93.22

It is not worth while for the present to give figures relating to density of juice; sufficient to remark, that the maximum is reached in July and August; it is then 1083, and the minimum during other months is 1033.

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WHO SHALL BEAR EXPENSE OF FERTILIZERS?

Editor of Planters' Monthly:

DEAR SIR.—In the interest of fertilizers, and the benefits derived from their use, I desire to call the attention of interested parties, to the practice, that is carried on, between *planters* and manufacturers, in the sugar industry of these islands.

Many of the contracts now existing between the *planters* and *mill owners*, were made some ten to fifteen years ago, and at that time were under more favorable conditions to the *planter*, both as in regard to the conditions of the soil and as to the prices of sugar; but since then, these conditions have somewhat changed. At that time fertilizers were not much used, or the expense for same did not appear as one of the larger expenses in the plantation accounts, and during the last few years so long as prices were good and crops fair, no change of agreement has seemed necessary until now.

But now as the *planter* is looking forward to the near future, and planning how to manage his planting interests with more economy, and figuring on the use of more fertilizers, that his labor and lands may yield him a larger and better crop; I wish to ask for him a change in his agreements with the *mill owner*, whereby both may reap a benefit by joining in the expense in using fertilizers.

If I understand the situation correctly, the planter who has his cane ground on shares is obliged to furnish all fertilizers, when used, and the mill gets half the sugar (or thereabouts) that is gained by the use of said fertilizers. Let me illustrate.

If the application of 1000 lbs. of fertilizer to the acre, costs thirty dollars ($30) including freight, labor, interest for two years, etc., increases the yield say one ton of sugar; and if the price of sugar is about seventy dollars ($70) a ton, the planter's half will bring him in thirty-five dollars ($35), a net gain of five dollars ($5) an acre. This does not and cannot pay him for the trouble or for the extra stripping, cartage, etc., on the cane that it takes to make this extra ton of sugar. Whereas on the other hand the *mill owners*, at a cost of about ten dollars ($10) a ton for manufacturing the sugar gets thirty-five dollars ($35), a net gain of twenty-five dollars ($25) on the planter's outlay, and this he is not bound to furnish.

Now for the point in question, I submit that under the existing circumstances, and taking everything into account, that the *planter* and *mill owner* should share in the expense of fertilizing their cane fields. The question may be asked, then the *planter* must share in the mill's expenses, for new machinery, alterations, etc. To this I would answer. 1st: If on account of the increased quantity of cane, the mill has not the capacity

for manufacturing all the sugar; I should answer no! 2nd: If the new machinery or alterations is to *improve the works*, so that more sugar can be got out of the cane than with the present machinery, and so be of mutual benefit, I should answer, yes! Let the planter in this case stand his share of the expenses. The expenses of either, for the direct benefit of both, should be borne by both. I think this subject is a matter of great importance to the sugar interests of these islands, and when this is amicably settled it will very materially help to bridge over some of the difficulties now before us, more especially concerning the problems connected with the tariff questions.

In the interest of a large proportion of our *planters* this would seem a fitting subject for discussion before a meeting of the P. L. & S. Co., or the *agents and planters*, and I hope it will be taken up at once.

Yours truly,

Honolulu, Nov. 8, 1890. A PLANTER.

SCIENTIFIC EDUCATION.

(SECOND PAPER.)

It has been said that an ounce of practice is worth a pound of theory. Although this may have been true when theory was but another word for imagination, we may well at the latter part of the nineteenth century doubt the truth of the statement. And it will interest us in Barbados, when we are thinking about scientific education for our future planters, to inquire into the use of a scientific training in Agriculture.

In Agriculture we have to deal with three elements. Firstly, there is the plant, a member of the vegetable kingdom. It is living and therefore has a life-history. Secondly, there is the soil in which the plant grows and from which the plant derives all the mineral constituents of its food, and thirdly, there is the climate best fitted for the cultivation of the plant, and this is determined by the amount of sunlight, the temperature of the air and its humidity, the nature of the winds, whether they be hot or cold, dry or moist, and so forth. In times when a large part of the surface of the earth was covered with virgin soil, that is soil that had been untilled, and from which the

growths of centuries had remained and decayed where it grew, it was sufficient to cultivate some plant already found on that soil, and one which suggested itself as being easy to rear with advantage, and it was possible to do this for a length of time without the return of anything to the land, because the land was rich in its original mineral constituents. But the long continued cultivation of one plant leads to the removal of the mineral constituents required for the life of that plant, and the result is that at last the soil becomes deficient in those substances, without which, the plant cannot live, much less thrive. This leads us to study what the constituents of the soil are which the plant removes, and so we come to analyze the plant on the one hand, and to analyze what we may call the rich and poor soils on the other hand; that is soils which are favorable to the growth of the plant, and those which are unfavorable to it. And we find that it is just those constituents that the plant contains which the poor soil is deficient in as compared with the rich one.

In Agriculture we mostly take seed and from them we rear plants; we study their production and their growth, we analyze the plant at different stages, we note in what chemical substances the plant gains as it increases in size, and we inquire how the plant lives and what conditions of soil and climate are necessary to its existence and prosperity. In making these enquiries we come across the fact that the sun's light is a most important factor, that a free supply of air and abundance of water are required. And we find that light is a form of energy, and that energy is just as much needed for the building up of a plant as the building of a house; that the air contains carbon in the form of a gas called carbonic anhydride, and that carbon is an essential constituent of every living thing both vegetable and animal: and that a plant by means of the energy which the sun supplies is able to take carbonic anhydride from the air and water from the soil, and from these two constituents to manufacture substances called carbohydrates, of which starch and sugar are well known instances; and so we are led to regard a plant as a manufactory of various substances amongst which are starch and sugar. Now these results are arrived at from a careful study of the structure of the Physiology and Chemistry of a plant. Botany teaches us

that a plant is composed of a large number of cells or small separate particles, each with its outside case or wall consisting of dead material, and its living interior of semi-fluid protoplasm. It is this living interior that is the active part and in both this and the cell case we find not only carbon and hydrogen and oxygen derived as we have seen from the carbonic anhydride and water, but also a number of mineral substances, the most important of which are nitrogen, phosphoric acid, potash, iron and lime: and every plant contains in small quantity these mineral substances. Where does the plant obtain these substances from? They cannot or do not exist in any appreciable quantity in the air, and therefore they must come from its soil. Consequently the soil must contain these substances; a conclusion which is verified by chemical analysis. And just as we should expect, if a soil is deficient in any one of these substances, a plant cannot live on that soil. Now all the substances including the water, which a plant obtains from the soil, it gets through its roots, and since all the little cell manufactories of a plant have closed walls, all these materials can only get inside the cell by being dissolved up in water and soaking through. In other words, the nitrogen, the phosphoric acid, the potash, the lime, the iron, must all be dissolved up in the water for them to be of any use to the plant; and since these substances can exist in many forms, some of which will not dissolve in water, it follows that the soil must contain them in the form which will dissolve. One of the great uses of moisture is that while passing through the plant it takes a supply of mineral matters with it. It does not go through empty-handed. But if the mineral matters carried by this water are to be beneficial to the plant they must be very small in quantity. The water must not contain too much dissolved in it; it must be a very weak solution. The mineral food of its plant must be supplied in homœopathic doses. In order, therefore, that a plant may get sufficient mineral food, a prodigious amount of water must pass through the plant; a large quantity of water must be present in the soil and a large quantity must be continually in some way or other passing away from the plant. And we find that this takes place as follows: Loss of water is continually taking place by evaporation from the large surface which the leaves present to the air,

and this loss by evaporation is continually being made good by absorption of water from the soil by the roots. The water then must be supplied to the roots, and the leaves are the means by which the water is got rid of to make room for more water to come up, bringing with it its offering of mineral food. The leaves also have other most important functions, they are the seats of manufacture of the carbohydrates. But this subject we leave, as it is not our object to give an exhaustive account of plant life; but to show how much valuable information can be gained by careful scientific study.

The question that the agriculturist has to deal with is, what is the most profitable plant for him to cultivate under certain given conditions of soil and climate? Whether by a study of the nature and varieties he can improve in any way its qualities; and whether he can in any way improve the soil and the climate. As regards improving the plant, a study of its Life-history, that is a study of its botanical physiology, is the only way to solve the question, and we have already pointed out how much valuable information has been acquired on this subject. Experience long ago showed the advantage of grafting: but it is only of late years by a study of the theory of plant life that we have arrived at the present ideas of cross-fertilization and careful selection of seeds. In all matters connected with the life of a plant we are at the mercy of nature and we can only hope to arrive at a solution by studying what the course of nature is and leading her in one of her own paths. When we come to climate we are almost entirely at the mercy of circumstances; it is true that in some places we irrigate if rain be wanting; yet we are practically dependent upon nature in this respect; we get our light and our warmth from the sun, and the winds bring the moisture from which is derived our rain. So the most we can do in this field of enquiry is to find out the exact climate of a place and all its variations, so that we may bring to that place the plant which is best able to thrive in it. It need hardly be pointed out what careful observation is needed before we can consider we have such a thorough knowledge of a climate. It means years of observations; we have to note all the variations of rainfall, of light, of moisture, the direction and the velocity of the wind, and the fluctuations of temperature and pressure. But when

we have done this, we have the exact knowledge which enables us to make changes in our methods of agriculture; and the great importance of this must be evident to every practical man. As regards soils, the matter is quite different. If phosphoric acid, nitrogen, potash, iron, and lime be present in the right proportions, a plant thrives. If a soil is deficient in any of them, they are chemical substances, easily obtained in suitable forms and we simply have to supply them; that is we have to manure the soil. Here again theory has answered simply and precisely how to meet and overcome a most important difficulty.

A scientific training in agriculture means a study of physics, or the different forces of Nature which are continually playing their parts in all the processes around us; a careful study of chemistry, that we may understand the composition of soils and plants and the uses of all these various constituents; a study of the life-history of plants and their vital processes; a study of geology which will teach us the origin of soils; a study of climate. its causes, variations and effects; and finally the study of the principles and practice of agriculture itself, which combines our previously acquired knowledge of the life and habits of plants, and the nature of our soils and climates. In this branch we learn how and when, best to cultivate our plants; how to prepare its soil by tillage, drainage, and manuring; how to reap the fruits of our labor and how to extract the valuable constituents, and what to do with the less valuable ones. It teaches us how, on a given area to raise the greatest quantity of material of the highest quality.

It ought not to be necessary to contrast such a system of agriculture with the old system of "follow my leader." Indeed a grim contrast is made when we see that he who can bring scientific knowledge to bear upon his work is rapidly ousting his less informed neighbor out of every field of competition, and it is the result of competition that now decides the fortune not only of individuals but of nations. Everywhere and every day it is more and more recognized that for work to be done well it must be done intelligently. The worker must know the why and wherefore of what he is doing, so that he may vary his course with varying circumstances. A man is not a mere machine: he is or should be, an intelli-

gent being. We can invent mechanical instruments to do almost anything in a set way; the use of intelligence is to adapt our actions to all kinds of external conditions. A man differs from a mere machine in having brains and he fails to assert his superiority over a machine unless he uses them. For this purpose his intellect must be trained: and this is the use of a scientific education. Theory is not another word for dreaming. *Theory is the guide to practice*, and in this age of competition to be successful in any undertaking whatever, theory must move hand in hand with practice. Neither will lead to any good result without aid from the other.—*Barbados Agricultural Gazette.*

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DIFFUSION vs. MILL-WORK.

(FROM THE SUGAR CANE.)

A paper by Dr. Dannenmann, which lately appeared in the *Louisiana Planter*, although evidently written with a strong bias in favor of diffusion, concludes by admitting that the phenomenal success attained in the Hawaiian Islands had not hitherto been reached in Louisiana. The closing remarks of the paper seem worthy of reproduction as affording a contribution to the discussion of the as yet unsolved problem, whether diffusion or mill-work is the best. We therefore reprint it in full, as follows:—

It is claimed on the part of mill adherents that the large dilution necessary for thorough extraction with diffusion, increases the expense of fuel in evaporation of this extra dilution. This extra amount of steam necessary is almost wholly offset by the small amount of steam required to run the light machinery of a diffusion plant in contrast to the ponderous and prodigious mill outfit, and, moreover, the recent improvements in evaporative apparatus, for instance, the multiple effect, or triple effect evaporate as high as 60,000 gallons of juice in twenty-four hours, and thus the evaporative power of a sugar house is equal to the extraction, whilst steam in great excess is not necessary.

It has been proven that by diffusion we can obtain from 12½ per cent. to 15 per cent. juice extraction in excess of what can

be obtained by the best extraction of the best mills, even where maceration is practiced by the mill, which is, by the way, a modified form of diffusion. So that a planter who obtained 3,000,000 pounds of sugar by the mill would obtain 350,000 pounds of sugar by diffusion, a gain of 450,000 pounds of sugar at 5½ cents per pound, equals $24,750; a fact, which when realized need not be further extolled with grandiloquence of words and differentiation of advantages and renumerations to influence speedy adoption of this method.

Another feature is, as I have said before, that it is even more profitable to the small planter than to the large, because it is impossible to obtain as thorough extraction with the light metal of a small concern, and at the same time the diffusion works equally effective whether small or large.

The burning of the chips has been a moot point for a long time, but this obstacle to successful operation of diffusion was this season surmounted, and the feasibility of this operation was demonstrated without peradventure.

There remains no barrier to the universal adoption of diffusion, other than the first cost of the battery and the loss sustained in disposing of the costly mill machinery, and no progressive and thoughtful sugar planter will allow himself to neglect this golden opportunity which the child of science and necessity offers. Never more in the history of sugar making was it of so eminent importance to obtain larger quantities of sugar than at the present time, as the Republican Congress threaten to cut the sugar tariff one cent a pound, arguing that we are producing a mere fragmentary portion of the total consumption of this country.

Now, while I do not propose to enter into the political side of this question, suffice it to say that the best argument in favor of the sugar industry is to produce *prima facie* evidence that it can and will produce every pound of sugar necessary for home consumption. Then can the claim for protection on an equality with other industries be sustained without recourse to apology and excuses for inadequate supply and for attributed benefaction to a few.

To summarize, I will briefly state the various advantages of diffusion over any other process of extraction known. 1. The most thorough extraction and that as I have illustrated, of the

crystallizable principles of the cane, 200 pounds of sugar is an average for a season's run, and that with the numerous defects of untried machinery, the stops and delays causing loss and expense, contingent with improperly constructed apparatus as compared with the fact that not 5 per cent. of the mills of this state exceed an average of 150 pounds per ton, a balance in favor of diffusion of 50 pounds of sugar at 5½ cents per pound, equals $2.75; deduct from this, say 25 per cent. for extra cost of fuel and labor 70 cents, leaving a net gain per ton of $2.05, which means to the planter working 10,000 tons of cane, a gain of $20,500, almost the full returns in one season for the erection of a diffusion battery.

2. The most simple and thorough clarification possible, the neutralization and precipitation by lime in the cells and the filtration performed mechanically by the chips, thereby obviating undue and derogatory subsequent treatment and exposure, etc., operations which subject the juice to potent inverting agents and the possibilities in the near future of improving cell clarification so as to immediately run the juice into the triple effect for evaporation without further treatment; and

3. The reduction in expenses of manufacture concomitant with the above improvements. While not all diffusionists are equally successful as regards fuel economy, yet there are some plantations that are using the chips as fuel; of course I refer to those which have natural water advantages. But the fact serves a double purpose *i.e.*, that diffusion chips can be serviceably used as a fuel, and that all improvements tend to a reduction of fuel consumption, and while there is a slight increase in labor necessary, the cost is but a small per cent. of the excess of yield.

4. Again, while the sugar produced is just as good as by the mill, yet greatly in excess, there is no danger of the terrible breakdown that makes the hours of grinding season periods of anxiety and fear to the planter, that any moment he may be called upon to witness the wreck and ruin of all his prospects and his energy, time, and money, spent in the vain hope of replenishing his already depleted resources. But while these mishaps are not always so disastrous, yet they are expensive, and cause the loss of many hundreds of dollars. The total

immunity from such losses by diffusion can only be appreciated by one who has passed through the mill, or, in other words, experienced the consequent results in trying to do first-class crushing on dry, hard rations, and who has broken his rollers by it.

5. Last, and not least, remains the fact that among the diffusion enthusiasts are the most progressive and educated of the sugar planters of this and other states, and that not one of those who have diffusion plants regrets the change, but is willing to make further outlay in completing his machinery, and who does not become more and more convinced of its merits and advantages as he becomes thoroughly acquainted with it.

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RAMIE WILL SUCCEED.

Some time ago a representative of the New Orleans *City Item* visited Waveland, Miss., for the purpose of obtaining all the information possible in relation to the manufacturing of ramie goods. Mr. A. A. Ulman conducted him through the factory and he witnessed the manipulation of ramie from the crude ribbons through the various machines to the looms. He reported that each machine seemed to perform its special part of work in the most satisfactory manner.

Mr. Ulman found no easy task in doing this, but with a determination to succeed he devoted to it mind, energy and ingenuity in the most persistent manner, and step by step he untangled the knotty problem.

Mr. Ulman stated that he has no trouble in handling ramie, but can card, spin and weave it as easily as wool. It is worth more than the best washed wool. It is finer, stronger, and the fibre is even and uniform, while in every fleece there are three or four grades of wool. Some wool loses over 60 per cent in washing, which brings the cost to over 50 cents per pound.

Great care is required to preserve wool from moths. Ramie will not be injured by them. Any goods can be made from ramie that can be made of silk, wool or flax. It takes colors beautifully and there is no fibre that can be bleached as white. All that is now required is the production by our farmers of this valuable ramie fibre. Mr. Ulman has ordered a quantity

of seeds and roots which he intends to plant. A number of farmers of Bay St. Louis will plant them also.

The mainspring of this entire enterprise is Mr. S. B. Allison, whose wonderful energy and persistent efforts have been the means of establishing this industry. After thoroughly investigating his magical degumming process and defiberizing machine, a number of business men became so fully convinced of their merits that they formed a company with abundant means to place Mr. Allison's inventions on a commercial basis.

Mr. Allison's great difficulty was to find mill men to undertake to work his fibre. They claimed that it could not be carded, spun or woven in this country. Fortunately, he met Mr. Ulman, who, after closely examining the fibre, concluded that he would undertake it. As experimental work is very expensive and new machines were required, Mr. Chas. H. Adams generously came to the aid and furnished the necessary means to carry on the work, and much credit is due to him for the progress that has been made..

Mr. Allison stated that there was no question about success, as all obstacles had been overcome. The three cardinal points are: 1. Decorticating green ramie stalks. This has been successfully accomplished by the Kauffman Fibre Co.'s machine. The Kauffman decorticators will do all the work required of it.

2. The degumming and defiberizing of the decorticated ramie. This has been accomplished to the satisfaction of all parties interested—rapidly, economically and without injury to the fibre. The Allison defiberizing machine separates and loosens the fibres ready for the cards.

3. The carding, spinning and weaving. This has been performed by Mr. Ulman, as the thread, yarns and goods he has manufactured prove beyond question.

Mr. Allison further stated that they had received some very inferior and damaged fibre that lost 80 per cent. in degumming, but they had purchased a quantity from Mr. E. P. Cottreaux, President of the Kauffman Fibre Co., for 8 cents per pound, which lost less then 50 per cent. in degumming. It is bright, straight, and almost free from wood. No trouble whatever is experienced in degumming it. Mr. Allison took one pound of these ribbons which he degummed in the presence of the *Item's* representative in six minutes' time, producing after drying 8½ ounces of beautiful, white silky fibre.—*Sugar Bowl.*

A DEMERARA MAN IN JAVA.

Labor hire is very cheap. You can get any quantity of it for 5 pence for 12 hours' work. There is a population of 20 million Javanese and Malays in the Island, and they are very willing and obedient workers, just as good as the very best coolies in Demerara. As regards a careful handling of the juice and economical manufacture, the estates here, are a good way ahead of the majority of the Demerara properties. If the juice were so much liquid gold running through the factory, more care could not be taken of it, than is. No rum is made anywhere, but everything is extracted in 1st, 2nd, 3rd, and 4th sugars, and the quantity of molasses left is very small, and is kept generally for the stock, or sold in the Island. Double crushing is done on nearly every estate, and on a great many the canes are crushed three times. The extraction here is accordingly very high. No coals are used at all. First, 2nd, and 3rd sugars are made with the megass only and the trash brought from the fields. Fourth sugars are made with wood. This is the only extra in fuel. All megass is sun-dried when the weather is favorable. It is not an uncommon thing to see a factory here working with four elephant boilers only, which are equal in power to five Demerara multitubular boilers, and making 200 tons of sugar in a week of seven days, for Sunday is just the same as another day in Java. In crop time the buildings go through day and night, Sunday and all, and never stop except for a day once a month for a general clean up. Each factory has two young working chemists, one for the day and one for the night. They have entire charge of all juice, syrups, masse-cuite, sugar, and molasses. There is no head pan-boiler. The juice is polarized and the glucose tests taken every half hour throughout the day and night. And every three hours all syrups, juice, canes, megass, and masse-cuite are analyzed; and each analysis is entered in a separate book kept for the purpose. The laboratories are very perfectly fitted, and every thing is kept very clean and neat. The buildings are perfect pictures of cleanliness and order. Machinery all highly polished and in perfect order, and floors and fittings spotlessly clean. When they are working you scarcely ever

see on a floor so much as a patch of dirt or water the size of your hand, and rarely, very rarely, such a thing as a leaky steam-joint or a blowing safety-valve. At night the factories are as brilliantly lighted as any ball-room. Where they have not the electric light there is a large kerosene lamp every five or six yards. All these things strike one particularly. For this is not an exceptional case, but what you see in nearly every factory you visit. Even the cleanest and best kept factory in Demerara that I have ever seen would be considered dirty, and far from what it ought to be, by a Dutch planter. He is most particular about details, and is never satisfied unless he is constantly improving.

The land that is cultivated does not belong to the factory, but to the natives of the Island, and from them it is rented for the crop. No European is allowed by the Dutch Government here to own more than 17 or 18 acres of land, which the factory usually stands on. The same land is never planted in cane two years running. They go in, the natives, for a rotation of crops, the same as in home farming, canes being planted every fourth or fifth year. The intermediate crops are usually rice, indigo, oil-seeds, etc., etc. The soil is exceptionally rich throughout the Island. No artificial manures are used, with the exception of occasional oil-cake bought in the Island. And a manager here who does not get 3 tons of sugar per acre *all round* is not considered worth his salt; of course this includes 2nd, 3rd and 4th sugars, but still, this return, I think, is very good. There are, however, several properties here that average 3½ to 4 tons per acres all round. The land is cultivated by the natives of the village nearest to it; and the headmen of the village are responsible for its proper cultivation. This is done so well by the Javanese, that on an estate of 1000 acres in cultivation, out of crop time, not more than three overseers are employed in the field, including the head. In crop time the head overseer looks after the field by himself. All wages are paid daily; an ordinary laborer in buildings or field getting 6d. per 12 hours, and headmen, blacksmiths, carpenters, etc., 8d. to 9d. for the same time. A mont-jus here, in a good factory, is an unheard-of thing, and quite right too. All filter-presses are working by compressed air, supplied by a small engine, and the saving in steam is just one half, by this method. So care-

ful are they to save every atom of saccharine matter, that even the dry cake from the filter presses is washed with water, and the sweet water: used for imbibition at the second mill. The common extraction for all sugars, in manufacture, is 12 per cent. by weight of cane. But there are some factories with good juice (extra) that get nearly 12 per cent. of sugar from the cane. Most of the machinery here is by Fletcher, Manlove, Alliott, Fives-Lille, Cail et Cie., and some German makers. But the best machinery I have seen here is by the French makers. This Island is a very beautitul one. The Dutch certainly possess a gem, but they don't know how to manage it. In the hands of the British, it would by this time have been a glorious colony. It is most amusing to hear the Dutchmen cursing their own Government, and their halting vacillating policy. They openly say, that they would rather be governed by us, than their own countrymen. The scenery in some parts is simply grand, and the vegetation most luxuriant. —*Corr. Demerara Argosy.*

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SUGAR INDUSTRY IN TEXAS.

The following paper relative to the sugar industry in Texas was read at a meeting of the Texas Sugar Planters' Association, held in September at Houston, Texas, by Major Goree :

Members of the Texas Sugar Planters' Association:—The principal object for which this association was organized is to develop, encourage and build up the sugar industry in the state of Texas. In the first place it must be determined whether or not we have in any, and which, portions of our broad state a soil and climate favorable to the successful and profitable culture of sugar-producing plants. In different portions of the world sugar is being successfully produced from tropical cane, from sorghum and from beets. The profitable production of sugar from sorghum and beets in any portion of Texas is an unsolved problem which will have to be determined by future experiments. This paper will be confined to the discussion of sugar productions from the tropical cane.

To those who have had any experience in cane culture in Texas it will be unnecessary to produce facts and figures to

prove that it is a successful and remunerative industry, but it is proposed to show to the uninitiated its wonderful possibilities. The many old abandoned sugar houses, in what is known as the sugar district of Texas, to-wit; the counties of Brazoria, Fort Bend, Matagorda and Wharton, show that at one time it was an extensive industry in this district. This was before the late war, which, resulting in the freedom of the slaves and the general demoralization of labor, virtually destroyed the industry.

Within the last twelve or fifteen years, however, a few of the large sugar plantations in Brazoria and Fort Bend have fallen into the hands of capitalists, resulting in the revival of this great industry, and demonstrating beyond a shadow of a doubt that we have a soil and climate well adapted to the development of the plant, and the profitable manufacture of sugar.

THE AREA OF SUGAR LAND.

It is almost impossible to approximate the area of land in Texas suitable to the profitable production of tropical cane. We know that in portions of the four counties above named the proper conditions exist, and we feel assured that almost anywhere in Texas, south of 31 degrees latitude, where the soil is sufficiently fertile, tropical cane will flourish.

The sugar district in Louisiana extends as far north as Alexandria, which is above 31 degrees, and about on the same line as Waco, Texas.

In nearly every county of east, middle and south Texas, small patches of tropical cane are successfully grown every year and worked up into syrup, making at the rate of from 200 to 500 gallons per acre.

Of course it would not do so far north that the stubble would be liable to be killed, necessitating a new planting every year. Taking it for granted, however, that the climatic conditions are favorable south of Waco, on the Brazos, and south of Austin, on the Colorado, and that the soil in the bottoms of these two rivers is suitable (which it undoubtedly is) a low estimate will place the sugar lands on these streams, and including Oyster Creek, San Bernard and Old Caney, at 400,000 acres. On other streams within an area of 100 miles from Houston, may be safely estimated another 100,000 acres. The counties of

eastern and middle Texas, in which cane is now grown, contain suitable lands to largely increase the above estimates. There are also some fine sugar lands in the lower Rio Grande valley.

THE YIELD AND PROFITS OF SUGAR CANE.

This will depend largely upon the character and fertility of the land, and the appliances for and process of manufacture. All cane is not rich alike in saccharine matter. A few years ago in Louisiana, planters were satisfied with from 75 to 100 pounds of sugar per ton of cane, but now, with improved methods of cultivation, by the judicious use of fertilizers, with improved machinery, and with the invaluable aid of science, the yield per ton has been constantly increased until large crops have averaged from 150 to 200 pounds of sugar per ton, and a few instances in excess of 200 pounds. On good land, well cultivated, the tonnage of cane may be safely estimated at 20 tons per acre, and at least 100 pounds of sugar per ton; 2,000 pounds of sugar at 5 cents per pound, $100; 100 gallons of molasses at 10 cents per gallon, $10; total value of cane product from one acre, $110. A fair estimate of the cost of cultivating and taking off a crop in Texas is about $50 per acre. Suppose, now, that the estimated 500,000 acres of sugar land were cultivated in sugar cane and the yield per acre and per ton as above estimated, the product would reach the enormous sum of $55,000,000 annually. To show that there is no over-estimate in the above, the following are presented as actual results on Harlem (the state farm), Fort Bend county, for the years 1888 and 1889: In 1888 about 430 acres of cane were ground, producing 1,014,950 pounds of sugar, or 2,350 pounds per acre, and in addition thereto about 64,000 gallons of molasses, which sugar and molasses sold for about $72,000, or over $167 per acre. In the season of 1889, about 500 acres of ground, produced 1,150,000 pounds of sugar, or 2,300 pounds per acre. This crop not all sold yet, but at present prices the sugar and molasses will sell for at least $65,000, equal to $130 per acre. The crop of 1889 was equally as good as that of 1888, but much of the cane very seriously deteriorated by remaining too long in windrow. The yields of sugar for both years would have been materially increased if we had been provided with a more powerful mill, obtaining a greater extraction, or if we had been provided with a diffusion plant.

COMPARISON WITH COTTON.

On Harlem, in 1888, 900 acres were planted in cotton, which, because principally of the ravages of the boll worm, only produced 219 bales, which sold for $9,828.26. In 1889, about 850 acres in cotton, for the same reason, produced only 254 bales, which sold for $12,590.30. In 1888, value of cane crop, $167 per acre. Value of cotton crop, $10.82 per acre. In 1889, value of cane crop, $130 per acre. Value of cotton, $14.81 per acre. But if no disaster had befallen the cotton, and the yield per acre had been one bale of 500 pounds, at 10 cents per pound, the value of the product would have been only $50 per acre.

THE COST OF MAKING SUGAR CROP.

It is estimated that the cost of the cultivation and manufacture of a sugar crop in Texas is about $50 per acre. It is probably less in Texas than in Louisiana, because our sugar lands here, having better natural drainage, do not require much expense for ditching, and the soil being lighter and more alluvial, does not require so much team for preparation and cultivation. We have in Texas no levee tax, and have not yet found it necessary to make a large annual outlay for fertilizers, as is done in our sister state. To plant an acre of cane requires from four to five tons of cane, worth say $4 per ton, or to include labor of planting, $5 per ton. As planting is only necessary every third or fourth year the expense of planting may be estimated annually at from $6 to $8 per acre. After planting the expense of cultivation is very little greater than the same acreage in cotton.

THE CERTAINTY OF THE CANE CROP.

There is no crop grown in Texas, or elsewhere, which is a more certain crop than the cane crop. A dry season may decrease the tonnage, but compensation comes in the increase in saccharine matter. A season too wet may render the cane deficient in sweetness, but the increased tonnage is apt to make up for this. The greatest danger to be apprehended is an early freeze, but this, too, can be to a great extent so provided against that it will not amount to a great deal. There has not been a failure in the cane crop in Texas since the revival of the industry, twelve or fifteen years ago.

THE DIFFICULTIES IN THE WAY.

Having shown that portions of Texas possessed the soil and climate suitable for the sugar industry, and that it is largely more profitable than any other agricultural industry in the state, the inquiry naturally arises; why, if these things be true, is it so far behind other industries? Why, if we have 500,000 acres of good sugar land, capable of yielding a product worth over $100 per acre, less than 10,000 acres, or one per cent., are cultivated in cane? Why the product of sugar in the state is less than 10,000,000 pounds per annum worth $500,000, when it might be one hundred times as much? The two great difficulties which have been and are in the way of the rapid development of the Texas sugar industry are the lack of capital and the want of good and efficient labor, both of which are absolutely necessary. To erect a plant with the best modern machinery requires a large outlay of money, and there are very few farmers in Texas who, owning suitable sugar lands, have the money necessary for such an enterprise. Heretofore it has been deemed necessary that one man should own the farm, the sugar house, and make and work up the crop. Under this plan only the very wealthy can engage in this industry, and they probably prefer investing in something which will not require so much worry and labor. It is now believed that the difficulties mentioned will disappear with the adoption of the

CENTRAL FACTORY SYSTEM.

This system, which has prevailed some time in Cuba, and is making rapid headway in Louisiana, and growing in popularity, separates the growing of the cane from the factory. By agreement previously entered into, a factory is erected by capitalists on condition that the farmers contiguous plant and cultivate a certain amount of cane, which is sold to the factory at a stipulated price. The farmers can own stock in the factory and share in the profits of manufacture. This system will very much assist in the solution of the labor problem. The farmer can cultivate his own land or hire hands, or rent to tenants, just as if cultivating a crop of cotton. The profits of a cane crop being larger and the crop more certain and a cash market at hand, it will be great inducements for the best labor to engage in it. The farmer who has his broad acres and the teams

and means to cultivate and sell 500 acres of cane will have no advantage over the poor man, who may only have the cane to sell off of from one to ten acres. Will the production of cane to sell for cash to the central factory pay better than the raising of cotton? Let us see. A man has ten acres in cotton, which yields 1,000 pounds of seed cotton per acre, or 10,000 pounds, worth at the neighboring gin three cents per pound in the seed, which is $30 per acre, or $300 for the ten acres. His neighbor has ten acres in sugar cane, which produces twenty tons per acre, or 200 tons. He carries it to the point of delivery to the central factory and receives $3 per ton for it, or a total of $600. It has been but a few years since there was a

GIN HOUSE ON NEARLY EVERY FARM.

Now public gins, where cotton is bought in the seed, or ginned for money or toll, have almost superseded the private gins. The central factory is destined to take the place of the private sugar houses.

As pertinent to this subject the following is an extract from a paper read in July last before the Louisiana Sugar Planters' Association by Mr. Henry McCall, a practical and prominent sugar planter of Louisiana. He says: "I have an abiding faith in the future of the Louisiana sugar industry, no matter what iniquitous or unjust legislation we may have to accept. Our industry has gone through so many ordeals of seasons, war, reconstruction, floods, tariff legislation, cheap sugar, and other ills, that it has become inured to hardships and nothing can kill it. It is my confident belief that the industry is more prosperous to-day, with four and five cent sugar, than it was when 10 and 15 cents were current prices. The progress made in our fields by better drainage, improved agricultural implements, fertilization, handling and delivery of cane to the mill on railways, have both cheapened the cost and

INCREASED OUR TONNAGE.

Five, and even eight-roller mills, diffusion, filter presses, multiple effects, vacuum pans, centrifugals, etc., in the factory have doubled our yields, improved the quality, and lessened the cost per pound, especially when manufactured on a large scale. Several large sugar houses are making over 3,000,000 pounds of sugar from 20,000 tons of cane. Granulating houses have

reached 5,000,000 and 6,000,000 pounds of sugar. The Caffery central factory, now being erected, promises to take care of this season at least 30,000 tons of cane, and should make 6,000,000 pounds of sugar. Last season in Ascension and Assumption six sugar houses took care of nearly 100,000 tons of cane and made over 15,000,000 pounds of sugar. These houses were under one chemical control. The most distant houses are six miles apart, and these same establishments did not make 6,000,000 pounds of sugar in the prime ante-bellum days. This season the same six houses should not make less than 20,000,000 pounds of sugar; two establishments are booked for 4,000,000 pounds each. We have progressed thus far satisfactorily, and must continue to march in the van of improvements. Small sugar houses equipped with poor mills and pots must be abandoned. Those who are unable to erect modern plants, or whose places would not justify such an expense, must combine with their neighbors to erect a factory, or

SELL THEIR CANE TO CAPITALISTS,

who will start such establishments if they are met half way. If possible, the agriculturists of the sugar districts should own stock in the factories and share in the profits of manufacture. Cane can be raised and laid down at factories by tenants or small planters at a cost of $2 to $2.50 per ton. Factories, even with sugar at 3½ to 4 cents per pound, can afford to pay $3 to $3.50 per ton, leaving a profit of $1 per ton to the farmer; the factory can make, with good machinery, 160 to 200 pounds of sugar from a ton of cane, worth with its molasses, at the most reduced prices, from $6.40 to $8 a ton of cane, a profit to the manufacturer, even if it costs $2 per ton to manufacture, of from $1 to $1.60 a ton, in which profit the farmer would participate. Factories costing from $250,000 to $500,000, and consuming from 25,000 to 50,000 tons of cane in sixty days, can be paid for in three years, and still pay a dividend of 10 per cent. to its stockholders. Let us then be encouraged as to the future. Those of us who are not too heavily indebted will certainly continue to raise sugar until we are broke, and believing in the intelligence and energy of the average sugar planter, I have no fear of such a result. The sugar cane crop of lower Louisiana is as certain a crop as any other in the United States, nothing

will pay better to raise even at $2.50 a ton, with from twenty to twenty-five tons per acre. It is, therefore, but a question of manufacture, and the next tariff will solve the problem. "Sink or swim, live or die, survive or perish"

IS OUR MOTTO.

What Mr. McCall so clearly and forcibly presents in regard to the situation in Louisiana, will apply with equal force in Texas. It will be seen from his figures and estimates that mine are exceedingly modest. When this matter is properly understood and brought directly to the attention of capitalists, I feel sure that the factories will be built, if the cane is provided. We see thousands of dollars being invested in Kansas in central factories to make sugar from sorghum, when not one-half the results can be obtained from sorghum as from tropical cane. The development of this industry not only inures to the benefit of the agriculturist and manufacturer who directly engage in it, but it will add to the material prosperity of the whole state. Especially will the mercantile interests of Houston and Galveston reap the greatest benefit. Because of their proximity to the sugar district, these cities will be the natural market for the vast product. It will cause the erection in their midst of large foundries, machine shops, barrel factories, and sugar refineries, besides they will be beneficiaries in many other ways. Does it not then especially behoove the progressive business men of these two cities to bestir themselves and help open up and develop this mine of wealth at their very doors? It will take time and money and talk, but the grand results to be obtained will pay back a thousandfold all that may be expended to obtain them. It seems to me that this being a matter of such great importance, and its development so beneficial to the material interests of the state, that state aid might well be invoked to develop, build up, and extend it. Appropriations are made by the legislature to develop the mineral resources of the state; then why not with equal propriety to develop the agricultural resources? Not only sugar, but cotton, corn, and other products? This paper could be indefinitely extended, but is already longer than intended. It is unfortunate that just at this time there is an

as regards sugar. If the tariff could remain as it is for a few years, until the industry is more largely gone into, and more fully developed, it could probably be dispensed with. However, with the advantages we have in Texas, the sugar industry can be made to pay, with good management, tariff or no tariff, bounty or no bounty.—*Houston Post.*

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AN INSECT COLONY.

Probably Southern California counties contain at present no happier man than A. Scott Chapman—that is, judging happiness from a horticultural standpoint. Mr. Chapman has many friends in this end of the State who will be pleased to know that no longer are his feelings as blue as are the famed skies about his sunny San Gabriel home. A few years ago Mr. Chapman, who is an alumnus of Berkeley and for a time was a member of the State Board of Horticulture, was widely known as a very successful orange-grower. He went into the business energetically and systematically and the San Gabriel Valley contained no prettier groves than he could show on his thirty acres. Then along came the *Icerya Purchasi*, which being interpreted means that the cottony cushion-scale entered the pretty groves and ravaged those thirty acres like the freebooters the pest has always been. Mr. Chapman worked his grove, but the scale worked harder, as it had done in many other of the choice sections of the orange-producing region, and the result was the scale triumphed. No wonder the owner became blue and despondent. Down dropped the product of the grove to 600 boxes, instead of twice 6,000 which it had been producing. But this season, in February and March next, Mr. Chapman figures, in a letter just received by a friend here, these same trees will yield fully 10,000 boxes. That is why he is now feeling bright and happy. The *Vedalia Cardinalis*, the Australian parasite that feeds on the scale, has worked this beneficence. The ravaging scale has practically disappeared from the entire grove. This example is only one of many similar cases among the Southern California groves.—*S. F. Bulletin.*