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An interesting account of seedling canes in Demerara is being published in late numbers of "The Sugar Cane," and those interested in the subject are referred to that periodical.

England and America are the principal consumers of cane sugars, and present indications are that they will continue to remain so, preferring the cane sugar even at a shade higher figure than the beet sugar.

Investigations regarding the new borer which has appeared in Barbados show that its ravages are confined to cane fields which are poorly cultivated or located in light and inferior soils. They seldom appear in healthy cane.

The *San Francisco Chronicle* states that a new species of coffee has been discovered growing in Marquesas, the berries being about the size of millet, which possesses all the flavor of coffee, and matures in four months after being planted. It will be well to test this new product by importing and planting the seeds, which can be procured in Tahiti.

Small importations of Hongkong granulated sugar continue to arrive at San Francisco by each steamer, and being of extra quality, are readily sold to the retail trade at 5 cents per pound.

Williams, Dimond & Co.'s circular of June 6th, says: "According to late press reports, there is now being agitated in Germany and Austria the advisability of forming a combination of those handling Raw Sugars and others interested to oppose the "Trust" in America, and regulate the price of Raws. Other sugar producing countries will also be asked to join."

Two very instructive articles in this number should not be overlooked on account of their length. One relates to ramie, which may, in the near future, become an industry of very large proportions. The other is Mr. Olesen's paper on co-operative cane planting, which has been carefully revised by the author. These are among the most instructive and valuable articles on the subjects to which they relate, that have appeared in print, and should be preserved for reference. In connection with the article of Mr. Oleson referred to, the reader interested in co-operative cane planting is referred to a letter on page 280 very minutely detailing the experience of Mr. Wm. Kinney, at Honomu in the Hilo district, on Hawaii. It deals with a new class of laborers—Japanese, and on an entirely new basis, which certainly appears as though it may prove successful. But so much depends on the manager himself, on his skill and forbearance with the cane growers, that it is only after a fair and impartial trial, that its value can be judged.

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A MODEL PLANTATION.

The Makaweli Sugar Mill on Kauai, which is exceeded in its capacity only by the Hawaiian Commercial Company's Mill on Maui, has now all its heavy machinery on the ground and in course of erection, as rapidly as is consistent with strength and permanency. This company has an exceptionally fine location on the lee side of the island, with an abundance of water from the two rivers which flow one on each side of the extensive plain now being culivated with cane. Over two thousand tons of machinery have been received from Messrs. Merlees, Watson and Yaryan of Glasgow, which is being rapidly placed in position under the supervision of Messrs. Simpson and Scott, engineers, the whole work to be done by the end of this year, so as to be ready to commence the manufacture of sugar by January 1, 1893.

Everything has been carefully planned on a scale to manufacture from ten to fifteen thousand tons of sugar annually, which this plantation is capable of producing, if everything works up to expectation. The latest improvements in every part of the diffusion work, have been secured, and these combined with the large experience of the principal owners in it, both in cultivating, and handling cane and sugar, as well as in the machinery department, give promise that this enterprise will prove a success from the start.

The landing being on the lee side of the island at Kekupua, is considered one of the safest on Kauai. A substantial wharf has been constructed, which is connected with the mill two miles distant by a railroad, on which a fine Baldwin engine is used. This plantation enjoys superior facilities for shipping freight to or from it, an item of great consideration in so large an enterprise.

Already 2200 acres of cane are growing, which will constitute the first crop of 1893. Those who have seen it report that it is as fine as any growing on Kauai, which is famous for its rich cane fields. A gentleman who recently rode through the plantation, assures us that some of the cane will strip twelve feet, with six months yet to grow. It ought to yield over 10,000 tons of sugar, if everything works well in the field and the mill, but the experience on most new plantations has been that the first crop does not turn out as well as succeeding ones, owing to various causes, which human foresight cannot prevent.

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FOREIGN SUGAR MARKETS.

Messrs. Williams, Dimond & Co's Circular of June 6, says: "Mail advices from New York state that the market for raws shows a much firmer tone, but there is a difference of opinion on the part of sellers, for while many holders continue to meet the market, there are others who are storing their sugars with the expectation of higher prices. The condition of the Refined Market is strong and the demand is increasing, so that it is likely to necessitate an increase in meltings.

"The European markets are watching closely the course of our markets, as Europe is still convinced that the United States will need 100,000 to 150,000 tons of their supplies this year, but there are no indications of any such movement yet.

"The total stock at Four Ports, U. S., May 21st, was 110,800 tons against 121,000 same time last year. Total stock Four Ports, U. S., May 26th, was 138,645 tons against 131,410 tons same time last year.

"Total stock in all the principal countries at latest uneven dates to May 26th, was 1,482,967 tons against 1,497,052 tons same time last year.

"It is difficult to state whether the last advance in New York, will be permanent, but the situation warrants it, and more. It is well known, however, under existing circumstances that there is little, if any, competition in the United States. Competition virtually ceased when the combination between the "Trust" and the Philadelphia Refineries was accomplished.

"Telegraphic advices from New York to-day, quote London Beets 88 deg. test 13-3. European and Foreign markets steady. Cuba Centrifugals 96 deg. test 3⅛ cents. Market very firm. Present prices likely to be maintained and higher prices predicted by many—Demand for refined improving daily.

"No change in estimate of the last beet crop. Present Cuba crop unchanged, but other West Indian 20,000 tons short.

"We quote Trust Certificates June 2nd, (C) 99¾, (P) 99½; June 3rd (C) 99½, (P) 99 and June 4th (C) 98¼, (P) 98¾.

"*Rice:*—Nearly all the late receipts of Island have been of inferior quality. We quote sales at $4.40 net to $4.50 net, according to grade. Market quiet, buyers holding off for new crop. We quote Japan at $4.50 (nominal).

"*Flour:*—G. G. Ex. Fam. $4.75 per bbl. f.o.b.

" El Dorado	$3.75	"	"	"
Crown	$4.70	"	"	"

"*Bran:*—$17.50 per ton, f.o.b.
"*Middlings:*—$19.50 to $20.00 per ton, f.o.b.
"*Barley:*—No. 1 Feed $1.00 @ $1.02½ per ctl., f.o.b.
Grd. or Rolled $22.50 per ton, f.o.b.
"*Oats:*—Fair $1.42½; Choice $1.52½ per ctl., f.o.b.
"*Wheat:*—$1.50 @ 1.55 per ctl., f.o.b.
"*Hay:*—Comp. Wheat or Oat $12.50 @ $13.00 per ton, f.o.b.
Large Bales $13.00 @ $14.00 per ton f.o.b.
"*Lime:*—$1.15 per bbl., f.o.b."

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SUGAR ANALYSIS.

The Division of Chemistry of the Department of Agriculture of the United States, has recently made at Washington a very thorough examination of the sugar, molasses, confectionery, syrups and honey sold in the United States. Over 500 samples of sugar obtained in various parts of the country were analysed, under the direction of Chief Chemist H. W. Wiley, assisted by a corps of well-known assistants. The report (Bulletin No. 13) says it is gratifying to know that the powdered sugars of commerce are not found adulterated with starch or terra-alba. From a chemical standpoint, water is regarded as an adulterant, and this is noted as being the chief adulterant of low-grade sugar. It seems that by modern methods of sugar boiling a great deal of low grade sugar and water can be incorporated in low-priced sugar, which still shows an almost white color. The question of the use of these sugars is one of economy only, for they are certainly not injurious to health. The report states that in general a given sum will procure a greater quantity of saccharine matter by the purchase of high grade sugar. We are glad, also, to chronicle the conclusion of the Department that maple sugar is free from adulteration. The report states that at the present time the resources of chemistry are powerless to detect such an adulteration. Chief Chemist H. W. Wiley secured as collaborators in the work many well known chemists in various parts of the country. Sugars were declared free from any added material that could be classed as an adulterant. Grocers frequently inquire why certain sugars show traces of bluing. This coloring of refined sugars was studied by the chemists, and the result published as follows:

"White and yellow sugars usually receive a special treatment, either in a vacuum pan or the centrifugal, in order to prevent a gray or "dead" appearance. In the case of white sugars blue ultramarine is the substance usually employed for this purpose. The coloring matter is suspended in water and is applied as final wash in the centrifugal immediately before stopping the machine. This process is termed "bluing." A very small amount adheres to the crystals, giving the sugar a whiter and brighter appearance. Some sugar-makers suspend a small amount of ultramarine in water and draw it into the vacuum pan a few minutes before the strike is finished. In addition to this treatment in the pan the sugar is also blued in the centrifugal. It is not unusual to find sugars which have been excessively blued, and which, on solution, yield a blue syrup. Fortunately ultramarine is not poisonous and no injury to health can result from its use.

"The yellow clarified sugars of the plantations are always treated with a wash containing chloride of tin, commercially known as tin crystal. The yellow sugars not treated with tin, soon after leaving the centrifugal, lose their bright color and become a dead or grayish yellow. Such sugars are only manufactured for the refiner, and do not enter directly into consumption. The tin crystal is dissolved in water and, as in the case of ultramarine, is employed as a final wash shortly before stopping the centrifugal: The depth of the yellow color of the sugar depends largely upon the strength of the tin solution and is modified by the manufacturers to suit the demands of the market.

"The principal constituent of the various sugar colors known as "rock compounds," "Smith's sugar color," etc., is chloride of tin. The tin chloride is not in itself a coloring matter. Tin can rarely be detected in sugars known to have been colored by means of tin chloride. The yellow color produced by this substance is probably a result of its action on the sugar itself.

"Tin crystal is also employed in the vacuum pan, but not generally in this country. In the manufacture of the beautiful sugar known as "Demerara crystals," chloride of tin is employed in the vacuum pan. Sulphuric acid was formerly used for this purpose, but it has been superceded by the tin compound.

The chloride of tin passes in the molasses and becomes an objectionable constituent of this product. Messrs. Lock & Newlands Brothers mention a harmless yellow color of organic origin, which is used in the manufacture of imitation Demerara crystals. So far as the writer is aware this color is not used on the sugar plantations of this country."

We may safely dismiss from mind the too common report that sugar is adulterated with sand or terra alba, and that other sugars than cane sugar are added to the sugars of commerce, particularly as regards maple sugar.

CALIFORNIA COFFEE.

A coffee planter from Guatemala has recently been investigating the climate and soil of the Allessandro Valley, San Bernardino county, with a view to the introduction of coffee growing in that section. The conditions there, it is stated, he regards as favorable, and he has offered to invest capital in a company to be organized to carry on the business. It is proposed to put two acres in nursery which would yield 80,000 sprouts per year, worth 25 cents each, and to set thirty-eight acres to coffee trees. This would require 30,400 trees, and the estimated yield on the third year is 91,200 pounds, valued at 20 cents per pound, or a total of $18,240. The fourth year after planting the yield, it is estimated, would be $34,340, figuring four pounds to the tree. This is a good exhibit, but like others in regard to the profits to be derived from the introduction of tropical or semi-tropical products in this State, it should be carefully considered before capital is invested. In regard to the the cultivation of coffee, even if the climate and soil are found favorable here, the fact should not be lost sight of that in countries where this staple is largely grown, labor an important element in its cost, is to be had at a very low rate. On this coast, conditions are quite the contrary, a fact that precludes the introduction of many new industries which otherwise might prove remunerative and successful.—*S. F. Grocer.*

Remarks.—The estimate given above for the yield of coffee is a long way off. An average of one pound per tree is a fair yield at three years old. And one and a half to two pounds per tree, when five years old; and if this average is maintained in future years, the plantation will do well. In Ceylon, a crop in full healthy bearing formerly averaged about 700 pounds of cleaned coffee per acre, though exceptional yields may have reached 2,000 or even 3,000 pounds per acre.—Editor Planter.

THE CEYLON COFFEE BLIGHT.

In the course of some remarks on the disease which has caused so much loss to the coffee planters of Ceylon—the Hememelia Vastratrix—the *Madras Times* says that "the planting industry is prepared to pay a fortune to the man who can provide a certain cure for it." * * "The disease has extended throughout every coffee district, and wherever it has been checked or stayed, it has been due to the precautions taken by the planters themselves. It is an undisputed fact that it has spread through the jungles, and unless there too it is destroyed, nothing can insure immunity for the fields of coffee, or prevent propagation of the uredinous spores. It is unsatisfactory to have to form such a conclusion, but it is idle to hope for the millennium yet awhile, and, if the lion cannot lie down with the lamb, there is no need just yet to anticipate a scarcity of mutton. So, too, in a large measure as regards the coffee industry, greater care and attention must be bestowed on the choice of locality and the cultivation. Under unfavorable circumstances the disease will doubtless assume the form of an epidemic, but so long as preventive measures are carried out and the weather does not become abnormally unfavorable to the plant, dire results need not be anticipated. It would, we believe, be wise if the Planting Associations of the different districts were to obtain from some of their oldest and most practical planters observations of the disease and the measures taken to check it, showing which they found most effectual. In some districts one remedy will be found the best, in others a different one. If such observations were carefully collated and edited by a gentleman with scientific knowledge, we believe that it would prove a hand-book of inestimable service to planters in contending against this disease and in mitigating the evil effects of an attack."

CORRESPONDENCE AND SELECTIONS.

RAMIE AND ITS CULTURE.

The following communication, recently published in the *Pacific Rural Press*, will be read with interest, as it contains much valuable information :

To the Editor: In writing this article on the very important subject of ramie for this country, and the great State of California in particular, at your request, please pardon me if I confine myself, in a homely way, very closely to the important information on the subject closest to the people's interest. I shall endeavor to give the most important facts in the fewest and plainest words possible to make it understood, interesting and most useful.

Ramie is a species of nettle, but thornless. There are three different varieties all suitable for this climate; but they vary in excellence in the market from two to four cents a pound, the best, which I recommend, being worth six cents a pound here in the rough as it comes from the decoricators, dried and baled.

Decortication of itself is of a very simple nature, being to strip or peel the bark from the wood, to knock out the inner wood, which must be done as fast as leafed and cut, or on the same day of cutting. It can be done to pay by flail, treading with horses, or flax break, and shaken out; or more properly in these days, with a machine run by horse or steam power, and with four to six men working two acres a day easily. One machine will run through 120 acres in two months, and keep a gang of men busy all the summer through. Ramie will grow in about that time if well supplied with water, irrigation or natural moisture.

Ramie should be cut green when about four or five feet high, and when it first begins to brown at the bottom of the stalks. Ramie will not rot like flax or hemp, and thus must be broken green before the gum or glue sets to the stalks. It should be run from the decorticator on an endless wire carrier through a drier and baled at the exit for shipping to the factory, where it is, by a process, ungummed and prepared for carding and spinning. It is excellent to knit or weave into goods of superior quality, pure or mixed with wool for cassimeres, woolen and worsted fabrics.

Ramie fiber is of a very firm texture and of uneven length, from two to six inches. It is a flat, hollow ribbon, and thus takes dyes in all shades of the brightest colors, as well as for black silk. It is not of such a glossy nature as common silk, but partakes more of what is called dead silk in black, which all ladies know is most desired in expensive goods. Silk is wound off the cocoons from 800 to 1,000 yards long and doubled in the winding seven strands, while ramie, being short, must be carded and spun like raw silk or broken silk, and therefore is not mixed with line silk in the way sometimes spoken of, but after made into thread is used to mix in the body, the strongest parts needed, for the warp or filling, and sometimes for the body of the goods when silk may be used for the raised glossy figures of flowers, giving a beautiful contrast and exquisite shading. In wool mixtures it can be cut or graded to the even lengths and carded and spun as a completed mixture, benefiting the wool by its superior strength, gloss and finish, the wool making the nap and warmth, the ramie alone being porous and cool for summer wear.

Ramie fiber being smooth, tough and strong like silk, makes a splendid worsted line of goods pure, such as fancy braids, binding, linings and dress goods, or mixed with long wool in the more expensive and intricate varieties of cassimeres and worsteds, upholstery, plush and other goods. In tapestry and curtain goods and rugs, it cannot be excelled by Oriental importations, as it is most durable and fast in colors. For fish lines, nets, hammocks, yacht sails and any uses exposed to moisture, where strength and durability are desirable, it is not to be equaled.

Ramie is not adapted to be worked on linen, hemp, cotton or jute machinery. It is estimated that some $30,000,000 to $70,000,000 worth of worsted alone, and of wool and woollen goods worth many more million dollars, are imported into the United States annually. Ramie fiber that can be grown in this country can take the place of this and excel in durability and fine finish, besides for all other purposes in ramie goods, pure, mixed silk and other ways, I have no doubt, to amount to much more. There is no end or limit to the possibilities, apparently, to the uses to which it can be put. Why should we not hasten to reap the direct benefit, as well as the incidental impetus it would give to all other enterprises, employments and home markets?

Ramie is now grown in China, Japan, India, Mexico, Cuba, Hawaii, Samoa, West Indies, Guatemala, Columbia and Brazil, and in the United States in Alabama, Louisiana, Texas, California, Washington and Oregon in small quantities. It is also grown in South France, Italy and Hungary, and is worth in China $100 to $200 per ton cleaned by hand. This is done there by scraping the pellicle off the outside of the stalk, cut green, then peeling the bark, and with a bamboo stick rubbing out the mucilaginous gummy matter over a log, and repeated washing and drying on scaffolds or roofs of their houses. For export it is only partially ungummed. For their hand-weaving they strip this partially ungummed fiber into threads as long as possible, containing, of course, thousands of fibers, which they fasten, stick or tie together end to end, making long threads in imitation of silk, which they weave into goods, then boil and bleach out and color in the piece. This primitive way of working, which can only be done with the cheapest of labor, has deceived most of our experimenters into the belief that the fiber was long as the stalk, like flax and hemp, and of course prevented success in our working it to manufacture by machinery. But now that we have scientifically investigated the fibers before we undertook to build machinery, and found out just what was wanted, it was easy enough to solve the difficulty, which of course, "was in a decorticator" (if a decorticator was to do, or could do, the whole business), which never has or never will be done economically by one. But when only decortication was wanted by a decorticator (see Webster), and we had a simple way to treat or finish it afterward, success was attained. The farmer is not bothered with the ungumming, which is the difficult part of the work.

AS TO PLANTING.

It can be done in various ways, but I have had early and extended experience in nursery and farming, as well as machinery and manufacturing, so looking to the end that the greatest success and efficiency might be attained, I will suggest this plan. After properly moistening, plow and pulverize your ground well and deep, roll smooth, mark out as for corn, but make the rows six feet apart, plant in the furrows from one to three feet apart, drop like potatoes, and cover like corn—or you can stick the roots, butt down, slanting sideways, two or three inches deep and cover the top about one inch, or let it come almost or quite to the surface, if the ground is not mellow and sandy and is moist to the surface, or is liable to bake. Cultivate well between the rows until the sprouts are up two or three feet high, when layer out to cover the ground in a bed four feet wide, leaving a space two feet wide between the beds to cultivate, from which you can procure roots that spread out into these spaces to replant or sell without disturbing the beds. You will find it will pay you for some years to come to raise roots to sell as a little demand will absorb all now on hand, and I have no doubt the price will double or treble before the rush is supplied.

The first crop after layering can be cut with a sickle by hand and all the poor or branchy shoots can be layered to fill up any vacancies or cut into cuttings and planted like grapevine cuttings.

Now these two-feet paths can be kept open and used for cultivation, or, after the four-foot beds have become solid, can be allowed to spread full.

I advise this plan as a four-foot bed can be grown solid thick sooner than six feet, and after that can be easily extended. When roots become plantiful and cheap you can plant thickly all over the ground at first planting, if you choose, but with roots $3 a piece, as at first in New Orleans, it could not be afforded. Although one planting lasts for a life-time it is supposed that five cents would be high, but two or three cents is reasonable, and $21 63 per thousand is very reasonable, delivered in good order, the purchaser running no risk in shipping at all. Two thousand five hundred, six feet by three apart, or 7,500, six feet by one apart, makes the first cost enough on a large scale, and with layering and cuttings will soon cover the beds.

If planted this spring a scattering crop can be cut in the fall from the layers, and the next season three or four fair crops can be expected, and the next year your most sanguine hopes ought to be realized. Anyone purchasing larger amounts or where possible, can have my personal attention as to soil, preparation and care, I will contract to buy all you will raise from roots purchased of me, for five or ten years, at six cents a pound, in bales delivered in San Francisco, Los Angeles, San Bernardino, Sacramento, Tulare or Bakersfield, Cal.; El Paso, Dallas or Galveston, Tex.; New Orleans, La.; or Mobile, Ala.; Atlanta, Ga., or Jacksonville, Fla.; Salem, Or.; or Seattle, Wash. I will also agree to furnish decorticators at a reasonable cost; now $700 to $800 for two acres a day, and give freely all necessary information and assistance possible personally; deposit a forfeit of $50,000 for every two thousand acres planted from roots purchased from me and paid for, or leave that amount approved, due on the same at 8 per cent interest and accept notes payable in fiber; build manufactory and buy your crop for five or ten years at 6 cents a pound, paying cash 90 days for the same, each crop delivered as above.

Ramie is not a noxious weed, does not spread over the couutry by seed, is not hard to eradicate, dies with drought, flood, or plowing out to sell the roots or replant. As to its injury or drain on the soil I must say that has been over-estimated, as the comparisons have been made with grain and fruit that grow and ripen, grain, wood, fruit, seed or pits, which make the greater drain and from the surface. The ripening of seed or pits, hardening of stem or wood, is much more exhaustive of the soil than the first or green part of the growth. Ramie should be compared with alfalfa more properly, but has some very important advantages over that also. While alfalfa roots deep and draws its substance not mainly from the surface, but deep down in the subsoil and far into subterranean depths for moisture, it does not materially exhaust the surface, though in cutting green it is all removed, stalk, leaves and all sold or used, hardly if ever, returned even in manure if fed on the place; yet, if ripened for seed, it exhausts the soil much more, while with ramie the roots also go down deep, not only one tap root, but many, each stalk supplying its own, every joint or piece supplying them if detached from the mother roots. Ramie is always properly cut green, all the leaves, about two-fifths of the whole weight, being stripped and left on the field; the wood and juice is separated and burned in dryers, and the ashes can be returned with little trouble, so that nothing but the pure fiber need be taken permanently away.

Now if an old overgrown stalk should be cut, weighed and burned to estimate the loss, the result multiplied by the number supposed to be on an acre, it might be that "fifty tons per acre" might be estimated, which would give a very erroneous impression from the real facts, I think the leaves and wood being returned might add to the soil, together with irrigation and the air, all, or nearly all, removed in the fiber, and possibly more in some cases at least. Something is taken from the air and water, and more brought up from the subsoil, or below. At any rate, I have seen as fine stalks on ten, fifteen and twenty-year-old grown patches of ramie (that I have been told have not been fertilized and not much watered) as I could wish to raise, About five tons green stalks can be expected off an acre each cutting, making a thousand or more pounds of fiber, or three to four thousand pounds in a season of three or four cuts.

Ramie fiber must not be bleached before used in the factory, as it needs a different treatment for different uses, and you must not be deceived by long, fine bleached or unbleached samples, as there is no practicability in them. Ramie is not ungummed if long, and cannot be used in that condition except by hand, and then must be prepared, while green and fresh by hand. We want no hand work, and cannot compete with foreign labor in that way. So do not be deceived by gaudy showings.

Bales of it have been made and shipped from the south, twelve to twenty years ago, and found unsaleable for profit to this country, and spoiled for their uses in Europe, by hand or otherwise. We want plain, practical working material.

It must be thoroughly and economically ungummed, and then it is as free and pure as wool, camel's hair or alpaca, and cut to even lengths, or separated into two, four and six-inch lengths, will card and spin as readily by machinery, and if properly done is full of strength and gloss. The farmer, except for curiosity or satisfaction, does not need to be a manufacturing expert to pass on the machinery or fiber. He simply, necessarily wants to be satisfied that he can put into bales and sell the raw material, and roots maybe, enough for several years to pay him for planting, raising and marketing, as well or better than anything else he can raise, and that he will get a better market for his other products, and be able to buy a superior article of goods for less money than is possible without it. If he can make $180 or $240 per acre on a large number of acres for several or many years, and never less than $50 clear, or double or quadruple his market, and that at home instead of the chances abroad; get his goods for less than half or one-fourth of the price he now pays; get a genuine, durable article that will wear four times the length of time the adulterated article he now pays a big price for, builds up his country, makes his property valuable, I think it is worth a little effort and faith, even if there is a good deal of work, and may be some few mishaps to start with.

S. H. Slaught.

San Francisco, February 1892.

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SCALE INSECTS.

[A lecture by Prof. B. Comstock, at the Stanford University.]

PACIFIC RURAL PRESS.

One of the most anomalous groups of insects is that family known to entomologists as the Coccidas. This family includes the insects commonly known as mealy bugs, bark lice or scale bugs, and many other forms for which there are no common names. Although these insects are bound together by certain structural features which have led entomologists to class them as a single family, the different species differ greatly in appearance, and we find even that the two sexes of the same species differ as greatly in appearance as do insects of different orders.

There are many other forms of scale insects than those commonly known to the fruit growers of this State. The family includes three sub-families. I will describe representatives of each. The first sub-family is represented by the mealy bugs and their allies. The mealy bugs are well known pests in the conservatories the world over, and in the open air in warmer sections of the country. Thus oranges are often infested by mealy bugs. These insects receive the common name from the fact that the body is covered with a whitish mealy powder. It is the presence of this powder, which is waterproof, that makes these insects so difficult to combat. The ordinary washes used to destroy allied insects are of little value when used against the mealy bugs, the wash being shed by the mealy covering and the insect remaining uninjured. The mealy bugs differ less than other members of the family from other insects. They retain the power of movement throughout their lives, whereas most scale insects become fixed in the latter stages, or at least the females do. The female mealy bug, when full grown, excretes a mass of woolly or cottony matter, within which the eggs are deposited. These masses are commonly found in the axis of the leaves of infested plants. When the eggs hatch, the young lice scatter over the plants, being able to crawl quite rapidly. The young lice resemble in form the adult female. In the case of the females, there is little change in form, simply an increase in size, but the males differ from the females in a remarkable way. The sex is rarely observed by gardeners. The male insect, when it ceases feeding, is not more than one-third as large as adult female. It spins a delicate cocoon about its body, and within this transforms to a pupa, and later, from this cocoon, it emerges as a winged bat-like insect. These are very small, delicate creatures, and would escape the attention of any but skilled observers.

I think, without doubt, the mealy bug is the most difficult insect to destroy that occurs upon plants in conservatories. We have conducted a very extensive series of experiments, using all of the commonly recommended insecticides, and found nothing that was satisfactory. The best results were obtained by the use of an extract of pyrethrum. This, however, is too expensive for use except upon a small scale. When the mealy bugs infest trees in the open air, as they do orange trees to a serious extent in Florida, doubtless the best method of combating the pest is by the use of hydrocyannic acid gas, in the same way that the red scale is fought upon orange trees in the southern part of this State.

The cottony cushion scale, so well known upon this coast, is closely allied to the mealy bugs. In this species the adult female excretes an egg sack somewhat similar to that of the mealy bug described above, but much more regular in form. In fact, it is a beautiful object, being ribbed in an exquisite way. The transformations of this species are similar to those or the mealy bugs just described, the male being a winged bat-like insect, differing very greatly in appearance from the female, the form commonly observed. Since the introduction of the Australian lady bird *(Vedalia)* there is little need of discussing other methods of combating this pest.

Not all the insects of this order are obnoxious to men. Certain species are very beneficial. Among these is the Lac insect, which exists in Asia. This insect lives in large numbers upon the twigs of certain trees. They suck their nourishment from these trees and excrete from their bodies a resinous substance which finally completely envelops them. This substance is collected and becomes an article of commerce, under the name of Stick Lac. The resinous excretion of the insect is dissolved and made into thin plates, which are known as Shell Lac, and from this is made the substance commonly known as shellac, which is used so widely in finishing woodwork.

Cochineal is an insect closely allied to the mealy bugs. It lives upon cactus in the warmer countries. I have found it living upon cactus in Florida, although it does not occur to any extent in this country. The insects are collected, killed and dried, and their bodies form the dye commonly used under the name of cochineal.

The second of the three sub-families of scale insects includes the Lecaniums and their allies. Here belong several of the well-known pests of fruit trees in this State. The soft scale of the orange, the black scale infesting almost all our cultivated plants, and the brown apricot scale, are familiar examples. In these the adult form usually becomes fixed, remaining in one place upon the plant infested. The young Lecaniums are active, crawling quite rapidly over the limbs of infested trees. It is in this way that the insects spread.

In the case of both the black scale and the brown apricot scale, the eggs hatch in the latter part of the summer. The young lice grow but little during the fall and winter months. In the spring they move out upon the newly-grown wood. Finding a suitable place, they settle, insert their beaks, and do not move thereafter. Very soon after this the body increases rapidly in size, becoming very convex. This rapid growth is due in part to the development of eggs within the body. These eggs are deposited beneath the body of the insect, the body shrinking upward so as to make room for them. In this way the insect becomes reduced in thickness, so that it is finally a little cuplike scale covering the eggs. When the eggs hatch, the young crawl out from under the scale and spread over the tree.

A remarkable fact in the history of the majority of species of Lecanium is that the males are unknown. It seems probable that in the majority of species, this sex rarely if ever occurs. This is true of both the black scale and the brown apricot scale.

The third sub-family is represented in this State by the pernicious scale, the red scale of the orange, and many other species. This insect differs from the two proceding sub-families, in that the body of the insect is covered by a scale. Thus while in the Lecaniums the scale like object covering the egg is the dried up body of the female, in the case of the pernicious scale and its allies the scale which one sees is a covering beneath which the insect is to be found.

The young insects of this sub-family resemble in general appearance those of the preceding sub-families. Their active stage, however, is much shorter. After crawling about over the twigs of the trees for a few days, the young scale insect settles upon a suitable place and immediately begins to excrete a cottony substance which soon becomes compacted into a thin pellicle covering the body. As the insect grows and needs to shed its skin, this cast skin is joined to the excretion and forms a part of the scale. This is the bright colored nipple-like prominence seen in the centre of the pernicious scale and of the red scale of the orange. The position of this cast skin in the scale differs in different genera and forms a good character for classification.

The closely allied species present but little difference in the forms of the scale. To distinguish these it is necessary to study the insect itself, which is found beneath the scale. The distinctions between closely allied species are such that it requires very close observation and much skill in this particular line to make the determinations, a careful preparation of the specimen and an excellent microscope being necessary requisites.

The different species of scale insects vary as regards their food habits. We find that certain species infest particular plants and will feed upon no others. Thus the red scale of the orange does not trouble deciduous fruits. On the other hand, other species have a very wide range of food plants. This is the case of the greedy scale, which infests a great variety of both cultivated and wild plants.

As to the best methods of fighting scale insects, there are two which are used under different conditions. Thus in the case of citrus trees, where, owing to the constant presence of the foliage, it is difficult to reach every part with the spray, the gas treatment used in Southern California is doubtless the best; but in the case of scale insects infesting deciduous trees a cheaper method can be employed, namely, the use of winter washes. During the season of the year when the trees are free from foliage and the buds are dormant it is a comparatively easy matter to spray the trees in such a way that every twig can be thoroughly coated with a wash which will destroy the insects and not injure the trees. Formulæ for making these washes have been prepared by the State Board of Horticulture, and can be obtained from that board on application. From what I have been able to observe in comparing orchards treated by the different washes, I am led to believe that the most efficient wash now in use is that known as the "Resinous Wash for Winter Use on Deciduous Trees."

The wash which Prof. Comstock thus commends is, we presume, the following, as priced by Mr. Craw :

RESIN WASH FOR WINTER USE UPON DECIDUOUS TREES.

This remedy should be applied as soon as the leaves drop in the fall, and will destroy the "San Jose," "apricot" and "black" scales.

30 pounds resin at 1½ cents	$ 45
9 pounds caustic soda (70 per cent.) at 5 cents	45
4½ pounds fish oil at 4 cents	18
Total	$1 08

Water, 100 galls. This brings the diluted wash to a little over one cent per gal.

A FEW REMARKS ON THE HEAT VALUE OF MEGASS.

The great success which, in recent times, has attended the burning of green megass in suitably constructed furnaces, has opened up the possibility of the entire wants of a sugar factory, with accompanying distillery, in the way of fuel being thus supplied. In fact as matters now stand, with evenly balanced and well-equipped buildings, working with average juice and canes, the equivalent of from 2 to 3 cwts of coal may be looked upon as all that is necessary to supply deficiency of power from megass.

The problem thus resolves itself into a question of small differences, and the accurate estimation of the heat value of megass in relation to the work to be done, becomes a matter of extreme importance. The few points brought forward in the following remarks may, therefore, be worth consideration.

The ordinary method of calculating the heat value of megass is to look upon it as being merely a mixture of water, fibre and sugar. No allowance whatever is made for the "ash" of megass, amounting to at least 2 per cent of the whole, or 4 per cent of the solid matter therein, this being regarded as fibre and consequently as combustible.

Then again it is a common practice to take the fibre as containing 51 per cent carbon. Beyond the fact that wood—dried, with all its constituents in it—exhibits this proportion of carbon, there is no authority for such a custom. Woody fibre, proper, or cellulose, such as is the fibre of the cane, contains 44.4 per cent of carbon, and this should be the basis of calculation in this direction.

Another important point lies in the number of units of heat produced by the complete oxidation of carbon. Favre & Silbermann gave it as 14500 T.U., while Dulong states it to be 12906 T.U. The former is the one commonly taken, and has the merit of being based on experiments with wood, while on the other hand, Dulong's figure applied to oils, etc., gives figures agreeing closely with the practical results of combustion. It can thus readily be seen in that calculations relating to the fuel capabilities of megass, widely differing conclusions can easily be arrived at.

For the purpose of illustrating what these differences may actually amount to, we will take an average sample of megass and presume it to possess the following composition:—

Water	50
Fibre	40
*Sugar	8
Ash	2
	100

This represents megass from double crushed canes containing 12 per cent fibre with average juice.

The heat value of this megass available for the factory work, calculated on the different lines mentioned above, will be:—

A.—Ordinary method, all the solids being considered combustible, the fibre presumed to contain 51 per cent carbon, and the heat value of the latter taken as 14500 T.U.

1 lb. fully oxidized would give:

			T.U.	
·40	lbs.	Fibre	2958	
·10	"	Sugar (ash included)	609	—3567 T.U.
		Less 5 lbs. vaporised water from 100 deg. F. (temperature of megass)		549
		Net		3018 T.U.

B.—Method based on actual composition, with fibre considered as containing 44.4 per cent C, and with the heat value of the latter taken as 14500 T. U.

1 lb. fully oxidised would give :

·40	lbs.	Fibre }	
·80	"	Sugar }	=3162 T.U.
		Less 5 lbs. vaporised water from 100 deg. F	549
			2613 T.U.

C.—As B., but with heat value of carbon taken as 12906 T.U. 1 lb, fully oxidised would give:—

·40	lbs.	Fibre	2302	
·08	"	Sugar	437	
				2739 T.U.
		Less 5 lbs. vaporised water from 100 deg. F		549
				2190 T.U.

To obtain the actual proportion of these available for steam purposes the loss of heat in flue gases and by radiation must be taken into account. 10 per cent. will probably be a fair allowance for the latter, and the former may be calculated on

* The small proportion of albumenoid and other bodies is included in this, but may be disregarded as such and calculated as sugar.

the basis of twice the weight of air required theoretically being used, and with internal and external temperatures of exit flue, 450° F. and 85° F. respectively. The above figures will thus become:—

A.—Net heat value of 1 lb. megass		3018 T. U.
Loss by radiation	302 T. U.	
In flue gases:		
·902 lbs. Carbonic acid	71	
5·300 " air	460	
·500 " vapor, mechanical	182	
·204 " " from combustion	93	1108
Recoverable as steam		1910 T. U.
B.—Net heat value of 1 lb. megass		2613 T. U.
Lost by radiation	261 T. U.	
" in flue gasses:		
·774 lbs. Carbonic acid	51	
4·289 " air	372	
·500 " vapor, mechanical	182	
·267 " from combustion	95	961
Recoverable as steam		1652 T. U.
C.—Net heat value of 1 lb. megass		2190 T. U,
Loss by radiation	219	
In flue gases as in *B*	700	919
Recoverable as steam		1291

The differences between the several values are thus enormous. Method A may be neglected as being crude and inaccurate, and by converting the figures given in B & C into their equivalents of water evaporated at 60lb. on □″ pressure and with feed water at 150° F., we obtain:—

B	1.56lb. water.
C	1.20lb. water.

As a matter of fact, with appropriate furnaces (cold draught) and well hung boilers, megass of the composition taken in this particular instance, does give about the evaporation given in B. As the difference in the calculations of B & C only lies in the different heat equivalents of Carbon taken, the conclusion suggested is, that either Dulong's figure of 12906 T. U. is wrong, or else that the hydrogen and oxygen in fibre and sugar, although already existing in the proportion to form water give out a certain amount of heat when, by combustion, they actually are converted into aqueous vapor. This of course is in antagonism with known laws, but is rather borne out by Favre & Silberman's figures which were derived from the combustion of wood, and in which these observers naturally, and in accordance with existing views, regarded the hydrogen and oxygen as passive for heat purposes.

By raising the temperature of the draught (so long as the increase is not obtained by robbing the furnace of its heat) to, say, 185° F. the number of heat units in B would be increased by 115, and if with the same furnace combustion the temperature of the flue gases were reduced to 350° F., a further gain of 164 T. U. would be obtained. The value of the 1lb. of megass in steam in B, would thus be equivalent to an evaporation of 1·82lb. water, an amount which should be amply sufficient for all the requirements of a modern factory, with double crushing and distillery—*Demerara Argosy.*

Georgetown, February 12, 1892.

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A CRYSTALLINE MAGMA OF INVERT-SUGAR.

[By F. G. Wiechmann, Ph. D.]

Invert-sugar is considered to be a combination of dextrose and levulose, in equal proportions.

$$\underset{\text{Dextrose.}}{C_6H_{12}O_6} + \underset{\text{Levulose.}}{C_6H_{12}O_6} = \underset{\text{Invert-sugar.}}{C_{12}H_{24}O_{12}}$$

It is well kuown, that aqueous solutions of invert-sugar suffer decomposition when exposed to light. From the liquid, originally of homogeneous composition there is deposited a white crystalline precipitate, commonly held to be dextrose, and above this there is generally found the remaining liquid.

The writer, while engaged in a study of the influence of light on solutions of invert-sugar, noticed, that the crystallization in one of the samples under observation, continued, until the solution of invert-sugar, which had originally been placed in the flask as a thick, colorless, transparent syrup, had become completely transformed into an almost solid, perfectly homogeneous, white, crystalline magma.

This specimen was carefully analyzed, and as the results may be of interest, they are here given in detail. Acknowledgment is due Mr. E. G. Brainerd for valuable assistance rendered in the securing of the analytical data.

History of the Specimen.—This solution was made by dissolving granulated sugar of the best quality, polarization 99.9–100.0, in distilled water, and inverting with strictly chemically pure HCl (specific gravity 1.20). The amount of acid used was 0.0265 per cent. of the weight of the sugar taken.

The solution was perfectly colorless and transparent; its density was about 80 deg. Brix (43.11 deg. Baume), and on analysis it was found to contain 84.8 per cent. of invert-sugar on the dry substance. No attempt was made to neutralize the HCl, and the sample showed a slightly acid reaction.

This syrup was placed in a glass flask, which was well corked, and was exposed to diffuse and to direct sun-light. The average temperature of the room in which the sample was kept was about 24 deg. C.

Decomposition of the invert-sugar commenced in the usual way, a crystalline deposit appearing at the bottom and on the sides of the flask. After three months' time, the liquid had *entirely* disappeared, and in its place was found the snow-white crystalline magma.

Gravimetric Analysis.—The reducing-power of this magma on Fehling's solution (Soxhlet's formula) was determined by the method of E. Meissl.*

A solution of the magma was made up with distilled water. The specific gravity of this solution=1.1427 at 15 deg. C. This specific gravity=32.7 deg. Brix.;

$$100.00 \div 32.7 = 3.058.$$

Hence 3.058 grammes of this solution=1.000 gramme on the dry substance.

Of this solution there were taken 30.827 grammes (=13.024 grammes on the dry substance), and made up to 100 c.c. solution.

Of this solution 50 c.c. (=6.512 grammes dry substance) were made up to 1000 c.c.

Of this solution, 1 c.c.=0.006512. Used of this 35 c.c.=0.2279 grammes of dry substance.

50 c.c. Fehling's solution (Soxhlet's formula) were taken and to this, when boiling, there were added the above 35 c.c.

* *Zeitschrift des Vereins fur Rübenzucker-Industrie*, 1879, vol. 29, p. 1034.

invert-sugar solution and 15 c.c. distilled water. Boiled for two minutes and then proceeded as usual in such determinations. This determination was made in all three times; the results follow :

	Invert-sugar Magma.		Copper.
Determination 1	0.2279	reduced	0.396
" 2	0.2279	"	0.392
" 3	0.2279	"	0.395
Average			0.394

According to the table calculated from the reducing factors determined by E. Meissl† 0.2278 gramme of pure invert-sugar reduce 0.4040 Cu. The amount of Cu reduced by 0.2279 gramme of the magma=0.394 Cu, which amount of Cu corresponds to 0.2212 invert-sugar.‡

The sample of magma therefore contains

$$0.2279 : 0.2212 :: 100 : x$$

$x = 97.06$

Hence it contains 97.06 per cent. invert-sugar and

$$\begin{array}{rr} & 100.00 \\ & 97.06 \\ \hline & 2.94 \\ \text{less } \frac{1}{20} & 0.14 \\ \hline & 2.80 \text{ per cent. sucrose.} \end{array}$$

OPTICAL EXAMINATION.

A. Determination of $[a]_D^{20}$ *of Sample.*—Made a concentrated solution of the magma in distilled water. Specific gravity of this solution=1.1427.

This is equal to 32.7 Brix.* 100.00÷32.7=3.058. This means that 3.058 grammes of this solution contain 1.0 gramme of dry substance.

Weighed off 30.58 grammes of this solution, equal to 10.000 grammes on the dry substance, and made this up to 100 c.c. at 17.5 deg. C. with distilled water.

Placed this solution in a 200 m.m. tube and polarized in each instance at 20 deg. C.

† Wein E. *Tabellen zur Quantitativen Bestimmung der Zuckerarten*, p. 16.
‡ *Loc cit.*
* Wiechmann: *Sugar Analysis* Table I.

Polarization No. 1. Reading made 6 hours after preparation of solution= . . . . —10.7

Polarization No. 2. Reading made $27\frac{1}{2}$ hours after preparation of solution= . . . . —10.6

Polarization No. 3. Reading made after heating the solution 15 minutes at 70 deg. C. Reading taken $29\frac{1}{4}$ hours after original preparation of sample= . . —10.5

Polarization No. 4. Reading made $53\frac{1}{4}$ hours after original preparation of sample= . . . . . . —10.5

CALCULATION :

$$-10.5 \times 0.346 = -3.6330^{\circ}$$

$$[a]_D^{20} = \frac{-3.6330 \times 100}{10.0 \times 2} = -18.1650$$

According to the formula given by Gubbe, the value of pure invert-sugar in a 10 per cent. solution is

$$[a]_D^{20} = -20.0181.$$

If it may be assumed, that the sucrose present exerts the same effect on the plane of polarized light in the presence of this amount of invert-sugar, which it exercises when alone, then allowing for the dextro-rotation produced by the 2.8 per cent. of sucrose, =1.8620, there would be obtained :

$$[a]_D^{20} = -20.027.$$

B. 26.048 grammes of the magma were dissolved up to 100 c.c. with distilled water. All polarizations were made at 20 deg. C.

Polarization No. 1. Reading taken immediately after making the solution= . . . . — 7.9

Polarization No. 2. Taken 5 minutes after Polarization No. 1.= . . . . — 9.0

Polarization No. 3. Taken 55 minutes after Polarization No. 1.= . . . . —18.0

Polarization No. 4. Taken 60 minutes after Polarization No. 1.= . . . . —18.2

Polarization No. 5. Taken 65 minutes after Polarization No. 1.= . . . . —18.3

Polarization No. 6. Taken 120 minutes after Polarization No. 1.= . . . . —21.4

Polarization No. 7. Taken 21 hours and 5 minutes after Polarization No. 1.= . . . . —23.3

Polarization No. 8. Taken 23 hours and 50 minutes after Polarization No. 1.= . . . . —23.3

C. 50 c.c. of above solution were taken immediately after making the same, 5 c.c. of HCl. (specific gravity 1.20) were added, and the solution heated for 5 minutes on a water-bath at 67 deg. C. The solution was cooled, made up to 100 c.c. with distilled water and polarized.

All polarizations of this inverted solution were made at 20 deg. C. All readings are recorded for full normal weight (26.048 grammes) and were made in a 200 m.m. tube.

Polarization No. 1. Reading taken immediately after preparation of sample= . . . . —26.2

Polarization No. 2. Taken 60 minutes after Polarization No. 1.= . . . . —26.6

Polarization No. 3. Taken 18 hours and 40 minutes after Polarization No. 1.= . . . . —26.4

Polarization No. 4. Taken 20 hours and 30 minutes after Polarization No. 1.= . . . . —26.4

Determination of the Specific Gravity of a 10 per cent. (on the dry substance), Solution.—A solution of the magma was made with distilled water. The specific gravity of this solution=1.1427=32.7 deg. Brix.

$$100.00 \div 32.7 = 3.058,$$

therefore, 3.058 grammes of this solution=1.000 gramme of dry substance. Of this solution there were weighed off 30.580 grammes=10.000 grammes of dry substance. This was made up with distilled water to 100 c.c. at 17.5 deg. C.

A careful determination showed the specific gravity of this solution to be=1.03853. Herzfeld* states the specific gravity of a pure invert-sugar solution at 17.5 deg. C. to be=1.03901.

Determination of the Melting Point of the Magma.—5.000 grammes of the magma were taken, placed in a test-tube and slowly heated on a water-bath, which was started cold. A thermometer was inserted in the magma. At 50 deg. C. the magma began to liquify, the liquifaction commencing at the bottom; at 60.5 deg. C. the liquifaction was completed. The time taken to warm from 50 deg. to 60.5 deg. C. was 29 minutes. The liquid sample was cooled and set aside in diffused daylight to see whether it would recrystallize.

* *Zeitschrift des Vereins fur Rubenzucker Industrie*, 1887, vol. 37, p. 915.

For 12 days this sample showed no signs of crystallization, then two small crystals formed near the surface of the solution and the crystallization progressed slowly.

Determination of Water in the Magma.—Weighed off 2.000 grammes of magma. Placed in a vacuum over sulphuric acid and kept at a temperature of about 18 deg. C.

In 645 hours the sample had lost 9.70 per cent. of water.

Reaction of Magma.—Tests made with methyl orange and Congo red show the magma to be slightly acid.

The composition of the magma, on the dry substance at the present time, is:

Sucrose	2.08 per cent.
Invert-sugar	97.06 per cent.

It seems most probable, that under existing conditions, the transformation of the remaining sucrose into invert-sugar, is only a question of time, and the specimen, exposed to full daylight, remains under observation.

Should this anticipated inversion of the sucrose be effected, an ettempt will be made to separate all adhering fluid from the crystals, and these will be submitted to careful analysis in order to determine the proportions in which the dextrose and the levulose are present, and to learn whether possibly the specimen consists of pure invert-sugar in the crystalline condition.—*School of Mines Quarterly, January, 1892.*

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CANE PRODUCTION BY THE LEASEHOLD SYSTEM.

BY REV. W. B. OLESON.

[READ BEFORE THE HONOLULU SOCIAL SCIENCE ASSOCIATION, MARCH 12, 1892.]

The advance made in sugar manufacture in recent years has been notable; in the Hawaiian Islands, it has been phenomenal. The contrast need only be mentioned between the primitive sugar mills worked by cattle and the splendidly equipped diffusion plants of the present day, to demonstrate the advance in this our principal industry. A still more valuable evidence is the high percentage of saccharine matter extracted from cane by the present mills as compared with that extracted by the mills of thirty years ago; or for that matter, of ten years ago. Sugar manufacture has passed through its infantile stage on these islands, and though it may not yet have reached its maturity, it has certainly attained a very lusty manhood.

While we may expect further improvements in milling machinery with a still higher percentage of sugar extracted from the cane, it is not to such improvements mainly that the sugar interests must look for favorably returns. While our mills have been brought to a high state of efficiency, the other branch of the sugar industry, viz., the production of cane, has not made corresponding advances.

There is vastly better farming on the plantation to-day than in the era when whaling captains undertook to raise cane on the land as they had successfully done on the seas. Intelligent farmers have come to the rescue of the plantations, and the day has passed when any man who can control large numbers of men will meet the demands of profitable cane growing. Wise methods of cultivation, and the use of fertilizers, and the scientific study of soils, have come with the advent of genuine tillers of the soil. Hard-headed business men with figures and expedients and enterprise have come to the rescue of the plantation with their solution of perplexing problems of transportation and of irrigation.

And yet all eyes are looking to the plantations, in spite of all this advance, for still further decrease in the cost of production, as well as still further increase in the yield of cane per acre. And this is a justifiable expectation, for with all the improvements that have been made, there certainly has been comparatively less progress made in the economical production of cane than in the economical manufacture of sugar.

This has been, in some measure, due to the current conviction that the way to economize in the cost of cane-growing is to reduce the wages of laborers. Such conviction has stood in the way of other solutions of the problem. So long as it is easy to cut down wages to increase profits, profits will not be increased by adopting any other method less easy and convenient. "Expenses are too high; cut down your wages!" is the command of the agent to the planter. "Can't get men at present wages; get us cheaper labor!" is the cry of the planter to the agent; both planter and agent all the while forgetting that to lessen wages lessens productions too. Cut down a man's pay and he, in turn, cuts down the quality of his labor.

In dealing with labor, one never gets more than he pays for. A fifteen-cents-per-day man in his natural fifteen-cents-per-day environment will furnish fifteen-cents-per-day labor. Put the same man in a fifty-cents-per-day environment and you must pay him fifty-cents-per-day wages, or face the double alternative of either parting with your laborer or of receiving from him very inadequate service. It will as a rule take four fifteen-cents-per-day laborers to do the work of one fifty-cents-per-day laborer.

The reduction of plantation wages is certainly not the only solution of the problem of cheapening the production of cane. It may not be altogether the most desirable solution. There are certainly graver objections to the policy of conducting plantations with low-class labor. Some of the objections need not be mentioned. Others more to the purpose of the present paper are (1) that when wages are low more laborers will be required to do the necessary work in producing a ton of cane, and, in the long run, the cost of production is quite as likely to be enhanced as it is to be reduced; (2) that men who labor at low wages will not produce as many tons per acre.

There is, in the plantation system, no identification of the laborer with the planter's interests, and no inducement thereto. There is accordingly a loss in the quality of labor, and consequently in results obtained.

The way out is to present a stimulus in the form of compensation contingent on the quality and amount of labor. The conditions of the labor market are such that in order to secure sufficient labor for the seasons of the greatest activity on plantations, men have to be retained through the less active periods, thus greatly enhancing the cost of production. While the plantation system exists, there does not seem any escape from the necessity of keeping throughout the year the number of men needed during the busiest season. This is a serious obstacle to any adjustment of labor that shall at the same time promote economical production and benefit the laborer, For it is clear that to sensibly diminish the cost of production, there must be fewer men to do the work and to share the compensation, without in any wise imparing the quality of the labor or lessening the yield per acre.

How can the yield be maintained or increased, and fewer men be employed? It may not be impossible that by some wise adjustment of the plantation system, the same work that is now being done by 500 men, can be as well done by 400. But if this is possible, it cannot be done with low class labor, and it cannot be done with the best of present labor, without an advance in wages. And in either case there would be no real decrease in the cost of production. What is needed is that 300 men shall do the work of 500, and be given the compensation belonging to the 400. This would divide the compensation for the labor of 200 men, so that one-half would go towards lessening the cost of production, and one-half towards an advance in the compensation of laborers actually employed, thus serving as a substantial stimulus to a more interested participation in profitable cane-growing.

This is co-operation between labor and capital. Capital steps forward and says: "I must have some return on my investment. Either I must cut down your wages. or, in return for a slight advance in wages, your labor must be more productive." And labor sensibly replies, "Make my compensation contingent on the quality and amount of my labor and we shall share the advantage."

This is the present status of cane growing in these Islands. There must be some more decided association of interest in the achievements of his labor, or the laborer himself with thwart all schemes for the cheapening of production. It is greatly to the credit of plantation managers that so much has already been undertaken in the direction of co-operative cane-growing.

Closely identified with the so-called plantation system of cane-growing, is the profit sharing scheme, originated by Mr. Jas. B. Castle, and already in operation at Honouliuli. By special contract, the laborer, at his option, is assigned land for cultivation with the view of sharing in the proceeds of his labor. The employer, on his part, furnishes lodging for the laborer and his family, medicine and medical attendance, first equipment of tools, water for irrigating, seed-cane, and the transportation of same, and the privilege of procuring fuel by the laborer for himself. The employer, likewise, clears, plows, harrows and furrows the land preparatory to planting.

The laborer, on his part, plants, cultivates, cuts and delivers the cane on the cars. All the work is under the supervision of the manager, in the sense, that, irrespective of the hours of labor, the work done must be satisfactory to the interests of the plantation. The employer has the privilege of placing other laborers in the field, advancing wages to such laborers, and deducting the same with interest from the proceeds of the original laborer's share.

One-fourth of the gross receipts from the land thus assigned goes to the laborer after deducting advances made to him. These advances do not exceed $10 per month.

Should the laborer abandon his contract without notice, he receives nothing aside from the advances already granted him. Should he give two month's notice, he is entitled to $15 per month for all back time, less the amount already advanced him. The employer may summarily discharge the laborer at any time, by payment at the rate of $20 per month for all back time, less advances made. Should the manager at any time deem it unnecessary for the laborer to confine himself wholly to the cultivation of the assigned land, he can require said laborer to work elsewhere on the plantation at a daily wage of 75 cents.

From the annual report of Manager Lowrie, the following quotation is made: "During the year 1891 there have been two attempts made to introduce the profit sharing system. The Portuguese are afraid to go into it on account of the low price of sugar. The Japanese don't seem to understand the meaning of it, but I believe they will be anxious for it very soon, and I also believe the system will prove a boon to the sugar industry of these Islands."

There are some admirable features about this scheme to which allusion does not need to be made, inasmuch as the ground has already been covered in the introductory matter of this paper. There are some objections, which seem inevitable with all schemes which seek to hold on to the plantation system as a basis. They are, briefly, (1) that the supervision of the manager is too arbitrary; (2) that the liability to friction and abandonment of contract is not sufficiently reduced; (3) that the disposal of his labor is not sufficiently optional with the laborer; (4) that there seems lacking any suitable inducement to a permanent alliance of the laborer with the interests of the plantation.

Another scheme, also identified with present plantation management, is in quite successful operation at Waiakea, near Hilo. Land is assigned as desired, whether to one or several individuals associated together. The laborer is not required to labor elsewhere on the plantation except at his own option. Those who are so-called contract laborers, after their daily task, out of plantation hours, are permitted to cultivate land in their own interest. No rent is charged for the use of the land. The laborer can hire plantation mules and plows by the day, when not otherwise employed. Should a planter be neglectful in cultivating his cane, his crop is paid for at a lower rate per ton, based largely on polarizing tests as well as general appearance of cane in the field. The laborer delivers the cane on board the cars or scows, and is paid, at present price of sugar, $3.50 per ton of cane. This is equivalent to $29.75 per ton of sugar, nearly double what is paid to the laborer at Honouliuli who contracts to cultivate assigned land for one-fourth the gross receipts, which at present price of sugar is about $17.50 per ton. This difference of $12.25 per ton, compensation to the laborer, is in a measure due to the fact that at Waiakea the laborer pays for his plowing and harrowing, while at Honouliuli that expense is assumed by the plantation. Undoubtedly this difference has acted as a deterrent, discouraging the Portuguese at least from undertaking contracts under such terms.

Mr. Kennedy, manager at Waiakea, thinks that the co-operative scheme as worked there would be undesirable unless worked in connection with the plantation system. But the chief excellence of the Waiakea system is that it so successfully breaks away from the plantation system. There is no arbitrary control or interference. There is no friction as to hours of labor. Each man gets a fair return for his own labor, wholly irrespective of the quality and amount of other men's labor.

The main objections to the Waiakea system are (1) that, without modification, it is unsuited to displace the plantation system; and (2) that it does not offer adequate inducement to a permanent settlement of laborers of the right class on the assigned lands.

The pernament prosperity of the sugar interest in these Islands demands (1) that the planters of cane shall be small land-holders who are established in homes of their own on land owned by themselves in reasonable proximity to mills; and (2) that the compensation paid these small land-holders shall be equitable, and assured for a term of years, and definitely adjusted to the current market price of sugar. These two elements are essential, inasmuch as without equitable compensation and the possession of homesteads no permanently desirable class of laborers will become identified with the cane industry.

The plan which we merely wish to outline, with the hope that it may at least prove suggestive to those most nearly concerned, may be conveniently called the leasehold system. It aims at a complete reorganization of the present plantation system. It provides for the dismemberment of the large sugar estates into leaseholds of from five to twenty or thirty acres each according to locality. These leaseholds are to be taken up by responsible laborers who wish to make a home for themselves, and are ready to make the getting of such a home dependent on their industry, frugality and enterprise. Such leaseholds could be leased for a term of five years, with proper conditions that would secure the interests of the company owning the mill, and not operate against the interests of the industrious planter. These leases should be renewable for a second term of five years, conditional of course upon mutual satisfaction of interested parties. At the expiration of this renewed lease, the planter becoming attached to the land, and the mill-owner recognizing the reliability of the tenant, the land, if owned by the company, could be deeded over to the tenant, or if on a long lease, could be released for the full term. Whether rental, if any, should be charged remains for further consideration. It would undoubtly be wise to fix a small rental, to be paid out of the proceeds of the crop, which sum could be placed to the credit of the tenant to be forfeited by him in case he relinquished his lease, and to be returned to him in case he remains and becomes a permanent settler on the estate. This would hardly prove too expensive an inducement for the mill-owners to offer to planters, considering the value of permanent settlers on the land, engaged in cane-growing.

Such a system would greatly stimulate production and lessen the farming expenses on each ton of sugar. More cane would be produced per acre, and the cane would doubtless yield a larger per centage of sucrose. The planter's labor would be more profitably and intelligently directed because his interests would be bound up in a two-fold degree in the results of his industry. He would have constantly before him the advantage of a larger annual income, and of an ownership in the soil. Where plantations own leases of Crown lands, it is altogether probable that legislation could be had that would give tenants under this system a quit-claim deed to the land occupied by them up to a certain number of acres. This might be an outright grant, as in early days, in view of long residence on the land, or it might be at a price equal to the amount of the rental for the ten years of occupancy. The former, in view of the desirability of encouraging small farmers, might prove the wiser plan.

In favor of the system, thus briefly outlined, it may be claimed that it is simpler and more permanently advantageous to the sugar interests, and more desirable for the country at large. It is simpler. Everything is dependent on the industry of the planter. His own interests are so bound up in the results of his labor as to prove a constant spur. The acquisition of a home for himself and family, and the certain provision for old age, will be a permanent incentive. The plantation company will be so interested financially in the fruits of his labor as to leave the laborer undisturbed, so long as he advantageously serves his own interests.

This scheme is more permanently advantageous to the sugar interests, inasmuch as it does away with the unsatisfactory elements in the plantation system. The management of labor is reduced to a minimum. The friction now existing will largely disappear. The financial loss on account of frequent changes of laborers, and on account of unintelligent labor, or of labor not directly interested in its product, will no longer occur. The manager or cane inspector, whose function would be mainly advisory, being relieved from the harassing details that now consume so much vitality and lead to so many complications, could give more attention to scientific farming and create a prestige for himself among the planters that would advance experiments looking to the financial betterment of all concerned.

This leasehold system of cane-growing is more desirable for the country at large, inasmuch as it would offer attractions to the elements in our population which it is most desirable to retain among us. The family is the unit of genuine industrial welfare, for it provides the elements of permanence and of recuperation and of vital self-interest. The low-class labor that contentedly exists in plantation barracks and never makes homes, would be stranded, and that, too, greatly to the financial advantage of our plantation interests, if proper inducements should be offered, and proper protection be guaranteed, to the laborers who want to make homes for themselves on land that they have a reasonable chance to acquire and hold in their own right.

That the leasehold system will prove attractive to the most intelligent labor in our population there can be but little doubt. Men with European blood in their veins have always and everywhere been willing to toil hard and long to win homes and provision for old age. The labor that is done by farmers in America and Europe is more exacting, and calls for greater privations, and yields slighter returns, and is performed under more disadvantageous climatic conditions than is the case with cane-growers in this country. Then too the semi-tropical conditions existing here take out of the problem the necessity of providing for a winter season, with its additional expense and discomfort and lack of income. Then again the actual returns in hard money would prove an inducement for the settlement on the sugar lands of a desirable class of tenants.

At from $3 to $3.50 per ton of cane, it is possible for a man to earn $500 per annum on five acres of cane land. Using figures kindly furnished from several plantations, I find that on an average one man, by the present method, cultivates about one acre and a half of a cane land per annum. With the additional incentive which the leasehold system holds out, it is not too much to expect that one man, with such aid as his family might render, would be able to properly cultivate five acres per annum. It is not too much to expect, again, that the land will yield six tons of sugar per acre for the crop requiring eighteen months' growth, or four tons of sugar per annum. It is estimated by planters that it requires about eight and half tons of cane to make one ton of sugar. Four tons of sugar per acre then means thirty-four tons of cane, which at $3 per ton, which is fifty cents less a ton than is paid at Waiakea, and about the same as is paid in the West Indies and in New South Wales, would amount to $102, which is quite a reasonable compensation for the cultivation of one acre of land which the laborer is all the time establishing a claim to by his industry and productiveness. At that rate five acres would yield $510. Tens of thousands of farmers in America never get such a cash income from five acres of land. Besides cane growing would not interfere with the raising of vegetables and the keeping of pigs and poultry and a cow, which would very materially reduce the money outlay for food supplies. As compared with the inducements of such an opening, even a high daily wage would prove ineffectual to attract men away from what would evidently be for their interest to undertake. It is very probable that when fairly initiated, there will be little difficulty in securing the right kind of tenants.

It is proper to note the difficulties and objections to such a system as is proposed. It is in point, however, to say, before noting such objections and difficulties, that if the scheme is practicable and economical, lesser details will surely accommodate themselves to the demands of the situation, and all problems inherent in so radical a readjustment will find solution much more readily than conservative minds will at first be willing to admit.

Is the scheme practicable ? Since the preparation of this paper was begun, ample and definite testimony of the successful operation of a somewhat similar scheme has come to hand. Dr. Kauffman, a recent visitor to the sugar plantations in this country, is the chemist of the Colonial Sugar Refinery Co. of Sydney, New South Wales. He stated in a conversation with the writer of this paper that the company with which he is connected owns and operates three sugar mills whose total maximum capacity is 145,000 long tons of cane. The cane is bought by the ton, for which the company pays 12½ shillings or $3 per ton. This cane is raised along the river-bottoms on homesteads owned by white men, or on land leased by them, having an acreage in cane of from three to eighty acres. The contract is for five years, and the price paid for cane is based on the market price of sugar at the time the contract is made.

The rotation of crops is from cane to corn. The farmers cultivate their cane in their own way, which appears to be a very lazy one, inasmuch as they strip their cane but once, and then do it only because the company make note of such neglect, and it thus affects the price of the cane. A cane inspector is employed by the company, who offers suggestions to the farmers, advisory to be sure, and who also notes the condition of the cane in the field, and otherwise guards the interest of the company. The cost of cutting is borne by the company, while the work of transporting the cane to scows along the rivers is performed by the planters. Some men, favorably located, cart the cane to the mill for which they receive a bonus. Some land is cultivated by the company, but wholly by the labor of white men. This scheme of cane-growing has been in successful operation along the Clarence River for twenty years.

In Queensland, a new enterprise is being started. Blocks of land of from twenty to fifty acres are given to the right class of settlers, character and reliability being sought for in making the grants. The company advance money at a low rate of interest to establish the settler and to get his first crop in.

Surely the leasehold system as advocated in this paper cannot be impracticable if a scheme so similar is operated elsewhere with satisfactory results.

There are difficulties to be met with in adjusting the proposed system, but they are not insuperable. The difficulty that comes first to men's minds is the satisfactory operation, under the new conditions, of the irrigation system. It is hardly within the province of the writer to offer suggestions as to the solution of the difficulties attendant on the introduction of the new system, but it certainly is not amiss to submit that at least a way to the solution of the irrigation problem may lie in the retention by the mill owners of the irrigation system with the distinct and avowed purpose of operating it, under the direction of the cane inspector or manager, to the advantage of the growing crops, according to his discretion. The planter and the mill-owner are interested alike in the largest production on each individual section of land, and the planter can have no real case against the manager, because of insufficient irrigation, that does not affect just as vitally the interests of the mill-owners whom the manager represents. This essential unity of interest is the strong bond in the proposed scheme, and furnishes the hopeful element for the solution of all the problems likely to arise.

It may be objected that such a radical change in operating the plantation would entail great expense and unlimited annoyance in initiating the scheme. But this would not be true if it were got at gradually. The gradual adoption of such a scheme would enable its promoters to cope more satisfactorily with the details necessary to its success. It would enable the manager to make a wiser selection of tenants.

The great diversity in the tenure of land now used by plantations, it may be objected, would render such a scheme as has been proposed, too complex and unmanageable. Where the land is owned by the plantation, nothing could be more simple than the plan proposed. Where the land is Crown Land, as has already been suggested, legislative action could undoubtedly be relied on whereby the government would be as generous toward worthy tenants as the plantations could afford to be. Where the land is leased from individuals, an agreement to release the land to tenants under a similar agreement, whenever such lease should require renewal by the original lessee, would amply secure the interests of the small farmer. The planter and mill-owner would alike have a vital interest in perpetuating the hold on the land, and what the mill-owner would be impelled to do for his own interest, with reference to land whose lease had expired, would be just as truly for the interest of every tenant on the land.

But can the plantation owners afford to relinquish their ownership in land of such apparent value? They certainly can if the proposed scheme is likely to prove permanently advantageous to themselves. If by this scheme more cane can be raised per acre, at cost less than the present farming expenses per ton, with a very large shrinkage in the present outlay for superintendence, and with a thrifty and permanent community of small farmers supplying the mills steadily and satisfactorily with cane—the relinquishment of ownership in the land would be equivalent to its sale for a fair figure to the class to whom the mill owners must mainly look for profitable production in the years ahead.

Limitations of space prevent a consideration of co-operative schemes undertaken in other sugar-growing countries. There are several phases of this Leasehold System, viewed from a sociological point of view, that have been rigidly excluded from this paper in the interests of the main feature. Conscious of the insufficiency of this presentation, and aware of the defects incident to the fact that the writer, not being a sugar planter, is therefore not personally conversant with all the facts in the case, the scheme outlined here is believed to be worthy the thoughtful consideration of every planter. With the sincere hope that a way out may be found for renumerative production of cane in these islands, I leave the subject in your hands for discussion.

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CO-OPERATIVE CANE PLANTING.

MR EDITOR: In answer to your enquiries as to our Honomu experiments in co-operation, I will say that I would hardly choose the present time to give a decided opinion as to the outcome. A year or two further along will be a better time. We began in a small way four years ago and have gradually extended this system until nearly half of our cane area is given out in parcels of thirty to fifty acres to companies each comprising from six to ten men, a portion of them having families. We began by basing their earnings upon the market price of sugar, and since the drop in price came, our experiment has gone through a very severe test. On the top of a drop to half the old price, we have had exceptionally bad weather and consequent short crops, involving more labor to the acre in cultivation than would a full stand. The planters were on the edge of the Hilo forest and got more rain than we, further down. Both sides to the bargain have been losers; the plantation not getting a dollar back of the many thousands paid for c earing the forest, and the cultivators not making a dollar over their advances for subsistence.

I had expected this to be the death blow of our experiment on the clean up of these men's crops, but it is otherwise. They are as eager as ever to take land, and we have accordingly divided part of our lower lands among them upon a basis differing a little from the one at first started. I speak of this not as a matter of immediate interest, but as showing the tenacity of the Japanese under this system, against adverse circumstances, which counts a point in favor of both the system and the men. At present our contracts take this form:

1st. We furnish the land free of rent paying taxes on land and crop.

2nd. We break the land, furrow out and fully prepare the field for the seed.

3rd. No charge for seed.

4th. We furnish fertilizer, but at our own discretion, delivering the same on the field.

5th. We build and maintain flumes, shifting the same as needed.

6th. We flume the cane to mill.

7th. We pay per 500 gallons clarifier of juice seven dollars and fifty cents. Prices vary a little according to quality and locality of the land, but this is the average.

8th. We allow each company from two to four acres of land for garden and pasture besides wooded pali for fuel, building, etc.

9th. We advance on account ten dollars per twenty-six days work.

For the laborers part they agree,

1st. To collect seed and plant their field.

2nd. To cultivate in a proper manner to maturity.

3rd. To cut and deliver crop alongside of flume.

4th. To build and maintain their own quarters.

5th. To furnish their own animals and implements.

Rattoons same terms except that there is no breaking for us to do.

Then without either written or verbal agreement, certain co-operative customs have grown up between us mainly as follows:

1st. If a company at starting be too poor to buy an animal and outfit, we furnish a medium sized mule with harness, light plow, cultivator and harrow at six dollars per month; company to feed, shelter and care for the animal and return in good condition, payment to be made in cash or labor at laborers' option, but if in labor it must be at our call.

2nd. In case of a pinch, as happens most frequently in planting, we put our men in to help them, they to return an equal number of days work, in our need; and when the condition of their fields will justify their absence. In practice this does not work badly. We very often have men from several companies returning their days which we are lending to another; no confusion results, supposing time-keeper and book-keeper to be up to the mark in their duties.

3rd. Any company owing us no days, and having their fields in good order, is preferred in our general work to outside men. Wages the current rate.

A condition of our written contract is that when a company by neglect or laziness allow their fields to foul, we can take possession or put in our gang. We have never had occasion to break up but one company.

Our time-keeper visits each company every day, twice when necessary, the same as in our own gangs. Settlements are made monthly. Pass-books are strictly kept. They have no lunas, but select a head-man who works the same as the others, and carries pass book and agreement as authority to draw the monthly allowance. These head-men are sometimes changed or even expelled as are other members of the company. With this we have nothing to do. They have their own rules, our only concern being that the requisite number of men are on hand, and the work properly kept up. They seem to have a way of settling among themselves without trouble. Our head overseer makes frequent and close inspection as to condition of the fields, and so also does the manager, as much so as if the fields were under the hands of day labor.

Carrying this system to its full, a plantation would only keep back say a couple of hundred acres in order to keep together men for stable, for shipping sugar, shifting flumes, fencing and other odd jobs, and not necessarily a full compliment either for all these jobs as the companies can be relied upon to furnish a considerable force. Boiling house in grinding season would be largely manned by company men. Outside of boiling house, a medium sized plantation would only need for officers a manager, book-keeper who might also be inspector, time-keeper and head teamster.

At the prices which we now pay, it is not difficult to estimate pretty closely the cost of cane delivered at the mill. Giving our plant fields three and a half tons sugar to the acre

the number of clarifiers is seven equal	$52.50
Fertilizer per acre	15.00
Breaking and preparing land	10.00
Fluming cane, shifting flume and wear and tear of material per acre	8.00
	$85.00

Being $12-25 per clarifier, or $25 per ton of sugar.

Now we have to add to each ton of sugar its proportion of taxes, rents, Government and management and some incidentals. As these vary so much in different localities I will attempt no figures.

Two knotly questions stare us in the face at this stage of the experiment. 1st. How to dispose of surplus labor between seasons. Something besides growing cucumbers and egg plants must be devised. We have several things in view but none sufficiently tried to speak of with confidence. Coffee we are in hopes may help to bridge the gap, and rice, tobacco and some other things are under trial in a moderate way.

The second question relates to cane delivery. It is a lot of trouble to grind each companies' cane separately and not interfere with steady work at mill. This applies particularly to fluming. Where other means of delivery are in vogue, the matter would look plain.

These two difficulties (if no others now unseen accomplish it) may break up our system, but it looks just now as if we may find some way out.

Two men imbued with this sense of proprietorship will do the work of three for wages. Even with lighter returns the laborer seems to enjoy himself far better under this system, than in wage gangs either shipped or otherwise.

Of several attempts at co-operation with which I have come in contact in the course of thirty years plantation experience, all were failures; but it always seemed to me that they might have resulted otherwise.

If co-operation ever should prove a success in any shape, it will be by the education of ourselves as well as our helpers and the laborers to meet new conditions. There must be some give and take, all round, in contrast to the wage gang system, with reluctant snail-like motion on one side, and constant wearisome pressure on the other.

WM. KINNEY.

Honomu, Hawaii, June 12, 1892.

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INSECTS AND INSECTICIDES.

[CEYLON MAGAZINE OF THE SCHOOL OF AGRICULTURE.]

The Agricultural Conferences lately held in Queensland have been the means of bringing together many Agriculturists and men of Science, whose utterances, spoken with authority, have been embodied in a report issued by the Brisbane Department of Agriculture. At one of these Conferences Prof. Shelton delivered himself on the subject of insect pests, and a good deal of the learned Professor's advice on this head is worthy of consideration. All insects might be said roughly to get their food by only two methods—either they are provided with beaks or sucking apparatus which they thrust into the bark of a tree and draw the juices to themselves, or they have powerful jaws and teeth, and gnaw into the substance of the tree, or the leaf as the case may be. It is important to remember that this difference most materially effects man's method of treatment and handling. The scale insect, which adheres to the leaf and sucks the juices plainly cannot be got at with poison in the same way as the other which gets into the substance of the leaf and consumes it. In a general way the insects which gnaw could easily be reached by some poison thrown on the leaf itself, so that when it consumes the leaf it also takes the poison and is killed. In the case of the sucking insects, something must be forcibly thrown on them, which in itself is fatal by contact, and the great agent used for this purpose in some form or other, is kerosine—in fact kerosine is the best agent for this class of insects, and London purple or Paris green for the gnawing insects. There are of course many other ways of accomplishing the work of destroying insects, but none so satisfactorily as those mentioned. Paris green is an arsenical poison, a waste product occurring in the manufacture of aniline dyes, and poisonous in the same sense as arsenic. Arsenic might be used in place of it, but for various reasons it is not safe. Paris green, owing to its color, is not likely to cause accidents as arsenic through being left about. London purple, another arsenical insecticide, is made in a like manner to Paris green, but it differs slightly in composition, and is cheaper and stronger and goes a little further in fact. Prof. Shelton considers it generally better than Paris green. These insecticides, which could be ordered through any chemist, might be used in two different ways. The common way is to take one pound of Paris green and dilute it with 150 to 200 gallons of water. The green will not dissolve, or very slightly, and the mixture could be distributed with a can, only care should be taken to stir it frequently so that the powder may not settle at the bottom of the can. Again, the mixture might be scattered all over a tree by means of a force pump. Another way of using the insecticides is to take Paris green or London purple and mix it with twelve parts of fine dust, flour, ashes, plaster of Paris, or lime, put it in a piece of suitable cloth (so as to allow the powder to pass through readily), tie it up, attach it to the end of a stick, and walk along between the rows, shaking the dust on the plants. This is sure, says Prof. Shelton, to kill every insect that exists there. This should be done, if possible, in the early morning, when the dew is on the plants. Some prefer to use a syringe and a can to be fastened to the back, and distribute the poison diluted with water. In the case of potatoes, Prof. Shelton did not think that either Paris green or London purple was injurious to the plants themselves, and states that they could be applied with the absolute assurance that the potato would not take enough of it to influence the plant itself. He mentioned, however, that he would be careful in using it on cabbage plants, which were eaten whole, and which grew rapidly, because if the fine powder settled around the leaves there would be real danger; with young plants, however, there would not be the same risk, and the slugs that feed on them would be killed instantaneously. The cotton worm can be totally destroyed in the manner described. In the case of cotton, by the use of a pole with bags of the powder on either end, a man, walking between the rows and giving the pole a shake now and then, would deal with 8 or 10 acres in a day. All this refers to the biting insects.

With the other class, to which the various scales belong, Paris green is perfectly helpless, for the simple reason that we cannot get at them with it. The universal remedy for this class of insects is kerosine in one form or another. The moment kerosine strikes it kills, but unfortunately it often kills the tree also—the leaves get scorched and soon drop off, and great damage results. Hence kerosine must be diluted in some way, and put into a shape in which it can be applied to the tree without injury and yet kill the pests. To overcome this difficulty a good many remedies have been proposed, but the best form in which to apply the insecticide is kerosine emulsion, which has been tried in all parts of the world with success. The following is the recipe for its manufacture: Take first a quart of common soft soap, or half pound of hard soap (the former is preferable), add two quarts of boiling water so as to thoroughly dissolve the soap, and then put one pint of kerosine. If possible a pump should be used to churn the mixture, till the water, kerosine and soap are thoroughly intermixed. When left standing for a time, if the soap be good, no scum of kerosine should rise to the surface. Now add cold water to make, altogether, about 15 pints of the material—that is to say, 1 pint of kerosine to about 14 or 15 pints of the other ingredients. This could be applied to a tree, says Prof. Shelton, with the absolute certainty that it would do no damage, and it is strong enough to kill almost all kinds of scale insects. But the application of the emulsion is of the utmost importance, and those who have found it a failure, did not apply it as they should. All contact poisons must be applied forcibly; the insect must be struck vigorously. This is true with nearly all scale pests and one application does not always do. If one be found insufficient, another must be given in one or two days, or one or two weeks' time, as the case may be. By thoroughly syringing, a tree could be rid of all or nearly all insects, but patience and labor are necessary. There are a multitude of machines for applying this emulsion, but a pump with a cyclone nozzle which would produce a mist-like spray of soap and kerosine is one of the best means. By fixing the nozzle pump on the end of a pole, and by one man walking beside the trees with the hose over his shoulder, while the other walked behind with a bucket, a big orange tree could be syringed in about three minutes.

In view of the enormous extent of damage done by insects to all kinds of crops in Ceylon, it would be of immense benefit to our cultivators if facilities were given for the carrying out of a series of experiments on the lines of the systems which Prof. Shelton describes as being so successful.

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THE PINEAPPLE INDUSTRY.

The estimated profit of $5000, or, roughly speaking £1000 per acre made out of a Florida pineapple farm will prove somewhat astonishing to those of our farmers who carefully read the article on the subject which we republish in this number of the Journal. Such a profit raises visions of a successful yeomanry settled so closely on the land that the theory that all have an ownership in our real estate would be actually put into practice. While we are not prepared to assert that under present circumstances the Queensland cultivator could approach such welcome results we do think that to many, unable for various reasons to touch cane, there is a profitable outlet for their industry in the propagation and marketing of the pineapple. There are many reasons why the growth of this fruit should receive attention. Though unlike our Florida friend we cannot hope to meet 1s. to 2s. for pines and up to 9s. for the plants still there is a practically unlimited market in the Southern colonies, while were the canning of the fruit taken in hand a local demand would be created that would still further strengthen prices. One of the main advantages of pine apple culture is that a return can be obtained within eighteen months of planting, and from that out the plants increase and spread so as to return heavy crops of fruit with an eyer diminishing necessity to cultivate. For the first year a return of £20 to the acre is not very extravagant, while as high as £75 per acre may be expected in succeeding years. Messrs. Mills & Co., thus speak of the Melbourne market for the fruit:—"The prices vary considerably according to the quantity coming forward and the quality of the fruit. We find it has the best sale when carefully packed in the cases containing from three to four dozen. At present prices obtainable are no criterion, being very low —namely, from 5s. to 7s. per case, but the general average for good fruit is 9s. to 10s. We have obtained at various times up to 25s., but these instances are very rare." As an acre is usually planted with from 2000 to 3000 suckers, and as each sucker should give a fruit, the lowest calculation would give, at average Melbourne prices, £74 to the acre, against which must be counted cost of production, cost of marketing, and a liberal allowance for badly grown fruit. We do not, however, think that £20 an acre for the first year is over-estimated. In subsequent years the new suckers thrown out increase the crop of fruit. The pineapple industry is one that should occupy a more prominent position in Queensland than it has hitherto done. It is well suited to the farmer of small means, to the holders of small areas. For some time to come there is little fear of over-production and even in such case additional methods of placing the fruit on the market will remove any fear of collapse of the trade. In the present case we do not deal with the trade in pineapple fiber which has elsewhere assumed such large proportions and proved so remunerative to cultivators of this easily grown tropical product.—*Mackay Sugar Journal.*

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The analysis, by chemists at the State Agricultural College, of sugar-beets raised in Iowa shows 14.41 per cent of sugar, which is not often excelled in the best beet-growing countries of Europe.