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The latest sugar quotation from New York was $3.41 for Cuban centrifugals, 96 deg. test, with a strong market.

A correspondent asks "which is the best book on coffee cultivation, and where can it be had?" It will be well for our book dealers to provide a few of the latest and best issues.

The sugar mills throughout the group have mostly finished grinding for the season, except those few which have cane suitable to grind all the year, which include the Waimea district on Kauai, and the Kau district on Hawaii.

The Queensland sugar estates have increased their output about one-third more than in 1889, and yet they are not satisfied with the returns of about 60,000 tons, the crop costing much more than in other sugar countries, on account of the high price of labor.

The last legislature voted an appropriation of $10,000 to encourage the coffee industry, "to be expended and apportioned, by the Minister of the Interior, among homestead and kuleana holders who shall have, under cultivation, no less than five acres of coffee trees."

The steamship Yamashiro Maru arrived here on the 18th inst., bringing 1,100 immigrants from Japan; 815 men and 285 women. These will all be distributed among the plantations. Like the previous arrivals this year, they comprise stout, healthy men and women from the agricultural districts of Japan—the best laborers obtainable from any country.

The rose-bamboo cane, which was imported from Queensland some years since, has been found well suited to the highlands of Hamakua, where the cold does not affect it and check the growth, as it does the Lahaina and some other varieties; indeed, it seems to grow as well in high altitudes as it does below. Such a cane has been needed on Hawaii and Maui, and, if the reports received here are confirmed, the rose-bamboo will be a boon to these islands.

The Makaweli ditch, which is to supply the new plantation with water sufficient to irrigate 3,000 acres of cane, is the largest irrigation enterprize in this kingdom. It is 13½ miles in length, about one-sixth of the distance being through solid rock. There are six inverted syphons, the longest nearly 2,000 feet long, and 400 feet deep, with a diameter of forty inches. The ditch will furnish 216,000 gallons per hour and the supply is unlimited and permanent. The cost of this great engineering work has been $150,000, and so thoroughly has it been done that it is thought it will last for fifty years.

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COFFEE CULTURE.

We are glad to learn of the increased attention paid to coffee planting on Hawaii. Mr. Barnard, of Laupahoehoe, writes that he has 12,000 young trees growing, and we hear that Mr. J. M. Horner, of Kukaiau, has thirty acres planted, while Mr. Wm. Horner, of Kukuihaele, has ten acres. All these intend increasing the extent of their plantings as rapidly as they can.

Mr. Rufus A. Lyman has purchased a large tract in Puna, located near East cape, and including the lands of Puna, Kula and Pohoiki, with some leased tracts adjoining, which embrace some of the richest coffee lands in that district. There is room for a large plantation there, and we trust the enterprise may prove successful. The want of roads in that district is a drawback, and we trust some measures will be taken to secure them. The high price of coffee throughout the world ought to stimulate our planters to push this and any other coffee enterprises, so as to obtain as early returns as possible.

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A VALUABLE INVENTION—LOSE'S CHEMICAL COMPOUND.

For some months past Mr. H. Lose, of this city, has been interested in a new process of manufacturing or clarifying sugar. A patent has been issued by the Hawaiian government, securing whatever benefits may be derived from the use of what is termed in the patent, Lose's "Chemical Compound for Clarification of Cane Juice." It is applied in the following manner:

For each clarifier of 500 gallons capacity, from two to five pounds of the Compound should be well stirred in bucket of water, the quantity actually required to produce the needed effect depending wholly on the quality of the juice. After the juice has been subjected to the ordinary boiling and liming process, and finally skimmed, the Compound is to be added by spreading the contents of the bucket over the juice, as is done in liming. The juice should be allowed to stand at least fifteen minutes, either in the clarifiers or settlers, (precipitators) before entering the double or triple effect. Sufficient lime is to be used, where the compound is used, to render the juice but slightly alkaline. The juice is to stand at least twelve hours after leaving the double or triple effect. Here the principal feature of the action of the Compound will eventually show its beneficial results, as by giving the juice at least the above mentioned time, the graining process will receive its full benefits.

Lose's Compound has been tried on several plantations, and in each instance with great success, resulting in higher polarization, a decrease of molasses, and a natural increase in the quantity of sugar made as compared with sugar made without it.

Chas. Koeling, manager of Hanalei Plantation, says: "It improves the polarization of first and second sugars about one degree, and also improves the color slightly. Please secure for me 5,000 pounds of the Compound."

Otto Isenberg, of the Kekaha Plantation, says that "besides the trash, at least one and one-half tons of coal were required every day. Since applying Lose's Compound, more of the trash is accumulating than we care for. We have also abandoned the sweeping pans, with a saving of steam, etc. There is a remarkable improvement in the graining of the sugar; it is very dry and polarizes higher. There is also a falling off in the molasses, and, on the whole, the output of first, second and third grade sugars is about five per cent. more than heretofore obtained."

Mr. A. Haneberg, at Olowalu, says he could not get along without the compound, and the sugar polarizes higher with it than without.

Besides the above, Mr. Lose has received flattering letters from the managers of Waianae, Pepeekeo, Paauhau, Waiakea, Hawi, Waimea and other plantations, ordering supplies of the compound to be sent to them.

Those who have used the compound speak well of it as producing the following results: A saving of steam, fuel and labor, an increase of all grades of sugar, a higher polarization, a decrease of molasses, the bone ashes contained in it are useful as a fertilizer, and it has been found equally useful in the battery of the diffusion process.

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CAREFUL CULTIVATION.

From an exhaustive account of experiments made at the Calumet Sugar Plantation in Louisiana, by F. E. Coombs, chemist, we extract the conclusions arrived at by him, which are applicable to cane cultivation as well as to sorghum or anything else:

"From the two years' cultural experiments, made during seasons of diametrically opposite character, it seems reasonable to conclude that: (1.) Several varieties exist which, from both the agricultural and manufacturing points of view, already promise to answer the requirements of a profitable supplemental sugar crop in the tropical cane plantations of Louisiana, and that, therefore, it is wise that the experiment should be continued. (2.) The adverse climatic conditions of 1890 considered, progress has been made in the improvement of several of the better varieties by seed selection and otherwise, which, it is fair to anticipate, will become more pronounced with further effort under more favorable conditions. (3.) The principal difficulties attending the improvement of varieties in Louisiana by seed selections are (*a*) the difficulty of protecting seed from insects, sprouting, etc.; (*b*) the considerable cost of the analytical work which such selection involves. (4.) Diffusion or some analogous process is absolutely necessary, instead of the cane-mill, for the extraction of its juices when the latter are to be worked for sugar. (5) The extraction should be carried on at a temperature below 50 degrees Centigrade. The mark is too high to permit of reasonably good extractive results, even from the repeated crushings of the Calumet 8-roller mill, and juices so secured will fail to produce sugar in paying quantities, owing to the presence of starch, gums, etc., consequent upon the grinding process. (6.) Improvement in the purity of the juices is of more economic importance for the present than any mere increase of the sugar content without such increased purity. (7.) Seed-selection work should be confined as strictly as may be to the best varieties already possessed, and propagation from single heads followed without deviation."

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WITH OUR READERS.

This number of the PLANTERS' MONTHLY will be found full of valuable mental food, not alone for the planter, but for everyone engaged in agricultural or horticultural pursuits. At the risk of being a little tedious, we insert, see p. 252, the whole of a valuable "bulletin" on fertilizers, which has probably not appeared in any other publication than that issued by the New York State Agricultural Experiment Station. This station is located at Geneva, in that State, and is presided over by Dr. Peter Collier, who is assisted by a corps of ten able chemists, among whom is our old friend, Prof. Van Slyke, formerly of Oahu College, to whom we are indebted for the "bulletins" issued by the Directory, which is rendering valuable assistance in disseminating knowledge which every farmer or fruit grower ought to know and profit by.

The time is rapidly approaching when Hawaiian cane and rice growers, and even taro, grain and fruit cultivators will need a thorough knowledge of the fertilizing elements required to feed and stimulate the plants which they cultivate, so as to enable them to secure the most profitable result in each of the branches of agriculture in which they are engaged. The extraordinary increase of sucrose obtained by the intelligent cultivation of sugar beets, as shown in Europe, where from a percentage of five at the commencement, the yield has been increased to fifteen, and even twenty per cent. extraction, is an instance showing the advantage of scientific aids. So, too, in our own Hawaiian experience, we have seen the yield of one ton of sugar to the acre, which was the ordinary result obtained fifty years ago, increased by the selection of the rich Lahaina cane and by improved cultivation and machinery, to five, six, and even seven tons to the acre in exceptional cases, with a determination on the part of expert planters not to rest satisfied till ten tons per acre are obtained.

All this demonstrates the necessity of each cultivator studying the best methods, the best varieties and the best fertilizers; in other words, of knowing "how to do it" in the best and most remunerative way possible. And he who does not follow this progressive course will most surely be left behind in the struggle of life, where the survival of the fittest is becoming more clearly established as the stern and inexorable law of success, secured only by merit.

If the reports which reach us regarding the increase of the borer in our cane fields be true, more attention will have to be paid to this little pest, which works night and day and is capable of doing much harm if allowed to increase. The fullest and best account of the cane-borer that we have seen is one inserted on page 274, which gives its habits and characteristics so minutely that anyone disposed to make further investigations regarding it, or is desirous of trying remedies, can easily start on the right track. One point should not be overlooked—that canes infested with the borer depreciate the quality of the sugar, and, probably, of all the sugar that comes in contact with it. On this account, constant efforts should be made to destroy the cane-borer, and we know of none so cheap or effectual as burning off the field immediately after harvesting the cane.

Cocoa is an article which ought to be grown here and exported. The cocoa of commerce is high-priced and always in demand. There are a few cocoa trees growing on these islands, but no attempt has ever been made to prepare the article used in commerce. On page 249 a correspondent gives a detailed description of the best mode of cultivation and of curing the berries. It seems to us that a small farm of ten to twenty acres, located on the line of the Oahu railroad, where artesian water for irrigation can be supplied, would be just the locality. Bananas help to pay current expenses till the cocoa orchard comes into bearing and perhaps even after it. The subject treated of by our correspondent is well worth the attention of those having the means and the opportunity to engage in this pursuit, in a desirable locality, which, if well located, must always be a safe real estate investment.

Some plain talk from a practical man will be found in the "Hints to small and large Farmers," on page 282, emphasizing the advantage of a mixed husbandry, or diversified farming, every paragraph of which contains something worth remembering. It recalls the experiences of our younger days, which were spent on a farm in Ogden, New York State, belonging to a good old Dutch farmer. He had what was then considered a good sized farm, of perhaps two hundred acres. It was well cultivated, but a great variety of produce was sent from his farm every year. There were sixty acres in wheat, ten in oats, as much more in clover and corn, with an orchard of fifteen acres of apples and peaches, besides fine horses, cattle, hogs, etc., all yielding an income which, in a few years, rendered farmer Vroom quite independent. It illustrates the advantage of diversified farming and the profit attending it.

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SUGAR CANE.

The following are the analyses of twenty-five varieties of sugar cane grown on the Louisiana station in 1890:

ANALYSES OF VARIETIES OF CANE GROWN ON THE STATE EXPERIMENT STATION, BATON ROUGE, LA., 1890.

VARIETY.	Total Solids.	Sucrose.	Glucose.	Solids not Sugars.
Purple	15.0	12.1	2.65	0.25
Striped Mexican	16.0	12.4	2.00	1.60
Rose Bamboo	12.8	9.9	2.77	0.13
Honuaula	12.4	7.4	2.94	2.06
Ohia	13.1	8.1	4.07	0.93
Papaa	12.6	7.3	4.24	1.06
Otaheite	14.4	8.7	4.24	1.46
Kokea	13.5	9.5	3.41	0.59
Lahaina	13.3	8.7	3.65	0 95
Akiolo	13.8	7.8	·5.04	0.96
Ainakea	12.4	7.4	4.66	0.34
Crystallina	16.5	12.9	3.21	0.39
Yellow	14.1	9.3	3.12	1.68
Kanio	9.9	3.0	5.70	1.20
Cavengerie	11.0	6.0	4.07	0 93
Loucier (No. 1)	14.0	8.7	4.68	0.62
Green	14.0	9.0	3.03	1.97
Bourbon	14.5	11 3	2.04	1.16
Black Java	15.5	12.9	1.73	0.87
Portier	13.4	9.1	2.69	1.61
Blanca d' Otaheite	13.5	8.5	4.08	0.92
Loucier (No. 2)	12.5	7.6	3.92	0.98
Japanese	15.1	9.0	3.29	2.81

These analyses are quite low, but this is easily accounted for by the fact that these are all foreign varieties and are now undergoing a process of acclimation. After this process is completed some of these may prove very valuable as sugar producers.—*Bulletin of the Louisiana State Experiment Station.*

[REMARKS: In the above list are eight varieties of cane grown on these islands, but none of them gave so good sucrose returns as the following named foreign varieties: Purple, Striped Mexican, Crystallina, Bourbon and Black Java.—EDITOR.]

CORRESPONDENCE AND SELECTIONS.

THE CULTIVATION OF COCOA.

THE EDITOR, "PLANTERS' MONTHLY."

The absence of minor industries which might be prosecuted on these islands is no doubt, in a great measure, attributable to the absorbing interest heretofore evinced in sugar-cane culture and cattle ranches, from which sources immense returns were received ; but since the depression in the sugar market, which capital, together with cheaper labor and improved machinery, alone can compete with, then small capitalists may find it advantageous to turn their hands to some other industry requiring less outlay and not so liable to fluctuations in prices as sugar. The success which has already attended the cultivation of coffee and rice (although the latter is virtually monopolized by Chinese) should serve to prove how remunerative such industries are, and awaken the "sons of the soil" to the sense that, by a little energy and perseverance, a comfortable income may come in, if only they will turn their attention to the culture of some other minor industry, as cocoa, indigo, castor oil, etc, etc.

For the cultivation of cocoa good clay soil and an ample supply of water are indispensable. In Surinan (Dutch Guiana, South America), where cocoa is largely planted, there are two varieties, viz: Those with yellow pods, called "creole," and another with red pods, called "caracao" cocoa. Planters there assert that the caracao is preferable, as it grows quicker and stronger and grows more abundantly than the creole. The beans, however, are lighter, so that on an average the kernels of ten to twelve creole pods will yield one-half kilogramme (1.1 lb.) of cocoa, which for the same quantity would require fourteen to sixteen of the caracao variety. The flavor of the creole cocoa is considered to be much superior.

Planting may be done either by seedlings or seeds. In the first case, the fruit being opened on the day the seeds are to be planted, the beans are taken out and put into a tub filled with fresh water. Those which float are removed, the remainder washed. To protect them from the attack of insects and further destroy the sweet pulp surrounding them, they should be covered with wood ash or lime. Sometimes seed-beds are formed, and when the plants are sufficiently large they are dug up, put in small baskets and transplanted to the desired place ; an operation which requires great care, for if the roots are injured the plant dies. In planting with seeds the soil is made loose to a depth of four to five inches, three holes are made, triangularly, one foot and a half apart ; in each hole one seed is put and, according to the season, left uncovered or slightly covered with earth. The best time for transplanting is the rainy season. It is important to replace the plants so that the morning sun falls upon them from the same direction as it did when they were in their former positions. This may easily be done by chipping two or three of the leaves on the side on which the morning sun strikes before the plants are disturbed and arranging them in the same way, in relation to the sun, when placing them in their new sites. Training is done as soon as the growth permits. Only three or four of the strongest branches are left, all weak ones are removed. The ground should be covered as much as possible without allowing the trees to interfere with each other or exclude light and air.

The cocoa is apt to produce a great number of branches and branchlets at the cost of its bearing powers ; care must be taken to remove those that are superfluous in time. The best trees are on one single stem ; they live longer, bear better and are not split by heavy winds. When the trees are growing so high as to make it difficult to gather the crop, then it is necessary to prune.

Pruning should always be done from underneath, cutting as near the stem as possible, so that the wound can heal easier. Trees often wither at the top, especially when attacked by ants or blight, while lower down healthy suckers are sprouting. In this case it is better to cut down to a short distance from the ground and it will sprout again. The precaution should always be taken of planting a young tree near, to guard against any accident to the older plant. When forming a cocoa plantation, good drainage and a sufficient supply of fresh water are points not to be overlooked. The land, after having been drained and cleared, should be divided into beds, say thirty feet wide, and banana suckers planted at distances of eight to ten feet. This serves to shelter and shade the young cocoa, keep the soil cool and helps to cover the current expenses. Cocoa requires shade always, and, as the banana dies after a time and the cocoa becomes taller, it is necessary to provide some other tree as a shade, which no doubt might be easily determined on. In South America the *Erythrima Umbrosa* is generally used.

The trying period for the young cocoa is between the second and fourth years, when, if there is not sufficient shade, many may die out; it is then that the importance of having a reserve quantity of young plants close at hand to supply the field is seen.

When the plantation is established the planter has only to keep his fields in order to be sure of success.

No profit is to be expected during the first five years, though there are examples of planters having made a handsome profit out of the bananas in the second year. The cultivation fully grown, the expenses are trifling and seventy per cent. of the gross produce is profit. The cocoa tree generally begins to bear in the fourth year and is considered to attain maturity at the twelfth. The average yield is then 1½ kilogrammes (3.3lbs.) per tree. Even when the trees are fully grown it is always necessary to keep a vigilant eye on pruning and, when necessary, to trace out and remove the causes why one field produces less than another. The cultivation of cocoa thus demands no great outlay of capital and the profit is pretty certain. The preparation of the nibs or beans for the market involves no great labor. The first operation is fermentation, which gives a certain color, developes the flavor and taste and favors the drying process. The duration for fermentation varies from two to four days. In Dutch Guiana the fermenting shed is a small closed building divided into compartments, generally three or four, each with a door and provided with a plank floor with holes throughout its length, in order to allow the cocoa juice to drain from the beans. This juice is often collected and used to manufacture a sort of inferior quality of vinegar. The wet or fresh cocoa is passed into the first compartment, where it is left for twelve hours, then it is transported to the second, being turned at the same time, where it remains for twenty-four hours; it is then spread out on a large tiled pavement to dry. Generally the fermenting shed stands on one side of the pavement and the drying store on the other.

The first and second day the cocoa is allowed to remain in the sun until noon, when it is brought in and packed in heaps. It ferments again slightly, with the result of making the beans more uniformly round. It is necessary to turn the heap over frequently to avoid too strong a fermentation.

On the third and fourth days the cocoa should be exposed to the sun; it is then spread out in the drying store for five or six days. This drying room is merely a shed provided with a glass roof.

The cocoa must be frequently turned at this period, for unless it is quite dry and cool when packed it becomes mouldy. The cocoa is now cured and ready to be put into bags for shipment. E. C. Crick.

Honolulu, June 3rd, 1891.

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OUTLINE OF THE HISTORY OF COMMERCIAL FERTILIZERS.

1. The history of fertilizers practically dates back to the time when bones were first applied to the soil and their value as a fertilizer was first recognised. Fertilizing with bones was first practiced in England. Probably the first instance of their extensive application was in the case of the farmers living near Sheffield, England, who applied to the land the bone and ivory clippings, which were waste products of the knife and button factories of Sheffield. These clippings amounted to about eight hundred tons a year and were regarded, until about a century ago, as a nuisance, the disposal of which was a serious problem to the manufacturers.

In 1774 the agricultural use of bones was first publicly recommended by Hunter, and successful experiments were made with bone dust.

About 1814, Alexander von Humboldt called public attention to the use of guano as a fertilizer, which he had seen used by the natives of Peru.

About 1817, the first super-phosphate is believed to have been made by Sir James Murray.

It was not until after 1820 that the use of phosphates assumed any great commercial or agricultural importance, and not even then was it appreciated what gave bones their value as fertilizers.

About 1830, Peruvian guano began to be imported into Europe as a fertilizer, and a few years after, into the United States, especially at the South.

About 1840, Liebig published the results of his researches and suggested that plants must obtain materials for their growth from the soil as well as from the air and water, which alone were previously supposed to furnish plant food; and, hence, that the proper life of a plant can be benefited by furnishing those elements that are necessary. It was shown that the phosphate of lime in bones gave them their value, and that, by dissolving bones with sulphuric acid, they were made much more effective. The demand for bones then outran the supply. Other sources were looked for and in 1843 a new source of phosphate of lime was found in Spain, consisting of a rock which contained considerable amounts of phosphoric acid. On trial, this rock was found to be a substitute for bone.

In the United States, farmers first used bones about 1790. The first bone mill was built about 1830, and super-phosphates were first used in 1851. The discovery of the so-called South Carolina rock was a great boon to those using commercial fertilizers, as this was found to take the place of bones.

The investigations based upon Liebig's theory showed that other elements in addition to phosphorus must be used to secure the best results, and, gradually, commercial fertilizers containing other elements came to be manufactured and offered for sale.

PRINCIPLES UNDERLYING THE USE OF FERTILIZERS.

2. Until fifty years ago, agriculture was without a scientific working basis. To the investigations of the illustrious German chemist, Justus von Liebig, we largely owe the advances that have been made in agricultural methods during the last half century. The following four laws, which form

the foundation of modern agricultural practice, were fully established by Liebig :

(1). "A soil can be termed fertile only when it contains all the materials requisite for the nutrition of plants in the required quantity and in the proper form."

(2). "With every crop a portion of these ingredients is removed. A part of this portion is again added from the inexhaustible store of the atmosphere ; another part, however, is lost for ever if not replaced by man."

(3). "The fertility of the soil remains unchanged if all the ingredients of a crop are given back to the land. Such a restitution is effected by manure."

(4). "The manure produced in the course of husbandry is not sufficient to maintain permanently the fertility of a farm ; it lacks the constituents which are annually exported in the shape of grain, hay, milk and live stock."

These four laws of Liebig contain a clear statement of the principles underlying the use of fertilizers ; but, to understand their meaning with satisfactory clearness, we must know something more in detail about the following subjects :

(a.) The constituents and food materials of plants.

(b.) The constituents of soils.

(c.) The relations of soils and plants.

These subjects will now be considered in the above order:

THE CONSTITUENTS AND FOOD MATERIALS OF PLANTS.

3. To chemical analysis we owe all that we know about what plants contain or are made of. Less than eighty years ago not a single vegetable substance had been accurately analyzed ; and although in the thirty years following much was learned about the different elements contained in plants, it was not until after the investigations of Liebig that our knowledge of the chemistry of plants progressed with any satisfactory degree of rapidity.

CHEMICAL ELEMENTS.

4. All matter is composed of about seventy different chemical elements. A chemical element is any substance which cannot, by any known means, be separated into two or three different kinds of matter. For example, gold is an element,

because, in whatever manner it may be treated, we cannot get anything out of it but gold; pure gold contains nothing but gold. So, nitrogen is an element, because, as far as we are able to find out, it contains only one thing, that is, nitrogen. Similarly, carbon, sulphur, potassium, oxygen and iron are elements.

Just as the twenty-six letters of our alphabet are combined in various ways to form the words of a whole language, so these seventy elements or simple substances, constituting nature's alphabet of matter, are capable of being united to produce all the different chemical compounds that go to make up the countless forms of matter. The number of different combinations possible between these seventy elements is practically infinite.

ELEMENTARY COMPOSITION OF PLANTS.

5. When we state what elements any substance contains, we give its elementary composition. For example, sugar contains the elements, carbon, hydrogen and oxygen; this is a statement of the elementary composition of sugar. So, when we state what elements a plant contains, we give its elementary composition or analysis. The term ultimate composition means the same as elementary composition. We will now consider the elementary composition of plants.

6. The exact number of different kinds of plants growing on the earth has never been definitely ascertained: but the number probably exceeds 200,000. Of this large number, only a few have been subjected to careful chemical analysis, and yet, so uniform in all its great variety are nature's methods of working and building, that we can quite safely say that, so far as the elementary composition of plants is concerned, little remains to be learned. Chemical analysis shows that, of the seventy elements known to exist, only fourteen are essential to produce all the different forms of vegetable life.

While all plants contain certain chemical compounds, such as cellulose, albuminoids, etc., it may be that each plant contains, in some one or all of its parts, one or more chemical compounds peculiar to itself, so that there may be as many distinct chemical compounds in the vegetable kingdom as there are different species of plants. This, of course, cannot be known absolutely until all plants in existence have been carefully analysed; but, whether the number of different chemical compounds in the vegetable kingdom be a few thousand or a few hundred thousand, we know that they are almost entirely made up of fourteen elements, and these, therefore, form the chemical alphabet of the vegetable kingdom, all the different vegetable compounds, like words from letters, being formed by the union of two or more of these elements.

The fourteen elements which are regarded as being necessary to the perfect growth and development of every plant are the following: Carbon, hydrogen, nitrogen, oxygen, phosphorus, sulphur, chlorine, silicon, calcium, iron, magnesium, manganese, potassium and sodium. The element fluorine is of frequent occurrence in very small quantities, and the following elements are of rare or doubtful occurrence: Aluminium, barium, bromine, cobalt, copper, iodine, lead, lithium, nickel, rubidium, tin, titanium and zinc, but their occurrence is a matter of curiosity rather than of practical importance, for, unlike the fourteen named above, they seem in no way to be necessary to plant life.

AIR-DERIVED AND SOIL-DERIVED ELEMENTS.

7. The elements that are necessary to the growth of plants may be divided into two quite distinct classes, which have important and marked differences. These two classes are: (1). Air-derived or organic elements. (2). Soil derived or inorganic elements.

AIR-DERIVED ELEMENTS.	SOIL-DERIVED ELEMENTS.
Carbon.	Phosphorus.
Hydrogen.	Sulphur.
Oxygen.	Chlorine.
Nitrogen.	Silicon.
	Calsium.
	Iron.
	Potassium.
	Sodium.
	Magnesium.
	Manganese.

8. It is usual among writers on agricultural chemistry to call these classes organic and inorganic elements, but this

use of these words is extremely inaccurate ; for any element may be either organic or inorganic, according as it is or is not a part or product of an organized body. Oxygen, as it exists in the air, is inorganic matter ; but when, through vital processes, it becomes part of an animal or plant, it is organic.

9. These two classes of elements differ in three important particulars, as follows :

First. The elements of the first class are derived exclusively from the air, either directly or indirectly ; while those of the second class come exclusively from the soil.

Second. Air-derived elements disappear, for the most part, in the form of gases, when a plant is burned ; while the soil-derived elements, usually the smaller part, are left in the form of a residue or ash, which further heating will not have any effect upon. Some carbon and oxygen and nitrogen are always found in the ash, while slight quantities of chlorine, sulphur and phosphorus are apt to be driven off by heating. The two classes of elements are, therefore, not so sharply defined in this regard as they are in respect to the sources from which they come.

Third. These two classes differ very noticeably in regard to the quantities in which they are present in plants. Thus, the air-derived elements constitute, at least, ninety-five per cent. of the whole vegetable kingdom, while the soil-derived elements occur in small quantities, varying from a fraction of one per cent. up to ten per cent., or even more in some cases. Because the soil-derived elements occur in so much smaller quantity, it does not follow that their presence is of less importance ; in their absence, vegetation would disappear.

We will now consider each of these elements in order, and mention briefly some of the more important characteristics of each ; but, before doing this, it is desired to explain the meaning of two or three chemical terms which we shall have occasion to use.

ACID-FORMING ELEMENTS AND METALS.

10. Of the fourteen elements which are found in plants, some are spoken of as non-metallic elements or acid-forming elements, because, in certain combinations, these elements

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form well-known acids. The other elements are known as metallic elements or metals.

ACID-FORMING ELEMENTS.	METALS.
Carbon.	Calcium.
Hydrogen.	Potassium.
Oxygen.	Sodium.
Nitrogen.	Iron.
Phosphorus.	Magnesium.
Sulphur.	Manganese.
Chlorine.	
Silicon.	

ACIDS AND SALTS.

11. An acid is a compound containing an acid-forming element combined with hydrogen and oxygen, or, in some cases, with hydrogen alone. The following examples will serve to illustrate :

Nitrogen, hydrogen and oxygen form nitric acid ; phosphorus, hydrogen and oxygen form phosphoric acid ; sulphur, hydrogen and oxygen form sulphuric acid ; chlorine and hydrogen form hydrochloric acid. The common name of sulphuric acid is oil of vitriol ; the common name of hydrochloric acid is muriatic acid.

12. A salt is a compound formed by putting a metal in the place of the hydrogen of an acid ; that is, an acid differs from a salt simply in having a metal where the acid has hydrogen. Every acid has a salt corresponding to it. For example, as stated above, nitric acid consists of nitrogen, hydrogen and oxygen. Now, if we put the metal potassium in the place of hydrogen, we have a compound containing nitrogen, potassium (in place of hydrogen) and oxygen. This compound is the potassium salt of nitric acid and is called potassium nitrate, or, sometimes, nitrate of potash. Again, phosphoric acid consists af phosphorus, hydrogen and oxygen ; in place of hydrogen, put one of the metals, as calcium, and we have a compound containing phosphorus, calcium (in place of hydrogen) and oxygen, which is the calcium salt of phosphoric acid and is called calcium phosphate, or, sometimes, phosphate of lime. Similarly, if a metal, as magnesium, is put in the place

of the hydrogen of sulphuric acid, we have the magnesium salt of sulphuric acid, or magnesium sulphate, familiar to us as Epsom salt. If in hydrochloric (muriatic) acid, we put some metal, as sodium, in place of the hydrogen, we have a compound consisting of sodium and chlorine, which is the sodium salt of hydrochloric acid and is called sodium chloride, sometimes muriate of soda, familiar to us as common salt.

The word "salt," as used in chemistry, applies to a great number of compounds, and many of the substances we have to deal with in speaking of fertilizers are chemical salts, that is, substances formed by putting some metal in place of the hydrogen of some acid.

CARBON.

13. IMPORTANCE OF CARBON.—The element, carbon, may be called the central element of all animal and vegetable substances; for there is not a living thing, from the smallest cell to the giant tree, which does not contain carbon as a necessary constituent. That all vegetable and animal substances contain carbon can easily be shown by simply heating them sufficiently, and thus causing them to blacken or char. When, for example, wood is heated, the different elements of which it is composed, are driven off in one form or another, but the carbon is the last to go, and remains behind as a black substance or charcoal, unless heated higher, when it disappears or burns up.

14. OCCURENCE OF CARBON IN NATURE.—Carbon usually occurs in nature united into compounds with other elements. Thus, most products of plant life contain carbon combined with the elements hydrogen and oxygen; such are starch, sugar and cellulose or woody fibre. Carbon, combined with oxygen, occurs in the air in the form of carbon dioxide, commonly called carbonic acid gas. Carbon, when combined with oxygen and some element such as calcium, occurs in the form of carbonates; for example, marble, limestone and chalk are chemically known as calcium carbonate or carbonate of lime.

Carbon by itself or in the free condition, that is, not united with any other elements, is familiar to us in several different forms; the most common of these forms are (1) diamonds; (2) graphite, which is used in the manufacture of lead pencils; (3) ordinary wood charcoal; (4) lamp-black; (5) animal charcoal; (6) mineral coal. Excepting diamonds these forms of carbon are more or less impure, containing some other things mixed with the carbon.

15. It is pertinent to make here the inquiry, "What is the relation of carbon to fertilizers?" Before we can answer this question satisfactorily, we must know what is meant by a fertilizer and what must be regarded as necessary constituents of a fertilizer. We will, therefore, turn aside from our consideration of the element carbon and take the opportunity, at this stage, to give some definitions of general and special terms which we shall have occasion to use more or less frequently.

DEFINITIONS.

16. FERTILIZER.—As ordinarily spoken of, a fertilizer may be defined as any substance which, by its addition to the soil, is intended to produce a better growth of plants.

The materials which come under the head of fertilizers are numerous in kind, and different both in form and in the manner in which they act.

17. The following tabulated classification, while not strictly accurate in every respect, will serve to give a good general idea of the number and relations of the terms used in speaking of fertilizers:

FERTILIZERS
- I. DIRECT
  - 1. Natural
    - Stable manure.
    - Refuse vegetable matter.
    - Green crops for plowing under.
    - Cotton seed.
    - Muck, marls, etc.
  - 2. Artificial
    - Commercial (Chemical, Prepared).
      - a. Complete or general.
      - b. Incomplete or special.
- II. INDIRECT
  - Lime.
  - Gypsum.
  - Salt, etc.

These terms are, in general, loosely and indiscriminately used, as their meaning is often misunderstood; and so an attempt will be made here to define them in accordance with the best usage of the terms.

18. A direct fertilizer is one that contains elements of plant food which are available at once, that is, which can be taken up and used immediately by plants.

19. The term available is applied to plant food which is soluable, that is, in such a condition that the roots of the plant can take it up readily in solution.

20. Plant food is unavailable when it is in an insoluble form, so that the roots of the plant fail to take up any part of it. A large proportion of plant food present in the soil is unavailable, but, by the action of air, water, carbonic acid, etc., it is gradually changed to soluable or available forms, which the plant can take up and use. As will be noticed later, phosphoric acid in the form of insoluble calcium phosphate, or phosphate of lime, is unavailable as plant food, but when converted into a super-phosphate, or soluble calcium phosphate, it becomes available. Unavailable plant food is potential food or food in reserve.

21. An indirect fertilizer is one which does not furnish to the soil any needed plant food and which may not be a plant food at all, but which is characterized by the way in which it acts on the matter already in the soil, changing more or less of it from unavailable plant food to an available form. For example, lime, gypsum, salt, etc., are indirect fertilizers, so far as they have any fertilizing action. Later, some attention will be given to the action of some of the most familiar indirect fertilizers.

22. Natural fertilizers include the solid and liquid excrement of animals, all kinds of vegetable refuse, green crops for plowing under, cotton seed, mucks, marls, etc.

23. Artificial fertilizers are also known by such names as commercial fertilizers, chemical fertilizers, prepared fertilizers, etc., and are artificial preparations or mixtures of fertilizing materials sold under trade names. The fertilizing materials used in making these mixtures include the substances found in natural deposits and by-products of numerous industries, which are obtainable by farmers only through the channels of trade. Some substances which might be classed as natural fertilizers, such as cotton-seed meal and tobacco stems, are also included among the materials of artificial fertilizers.

24. Complete fertilizers, known also as general fertilizers, are those which contain nitrogen, phosphoric acid and potash.

25. Incomplete fertilizers, also called special fertilizers, are those which contain only one or two of the three constituents, nitrogen, phosphoric acid and potash.

26. There is a common practice among farmers and dealers, of calling all commercial fertilizers "phosphates," regardless of whether they contain any phosphates at all or not. The practice is clearly objectionable, because a phosphate is not the only fertilizing constituent present in commercial fertilizers—in some cases it may be entirely absent. The term "super-phosphates" applies truthfully to many commercial fertilizers, but even these can not be correctly spoken of as simply "phosphates."

Having considered such definitions as we may have occasion to use more or less frequently, we can now return to

THE RELATIONS OF CARBON TO FERTILIZERS.

27. We know that carbon must be an important element in plant food, since it forms nearly one-half of the solid portions of plants. Notwithstanding the fact that carbon forms so large a portion of plants, it has no importance as an active food constituent of direct fertilizers. This statement may appear strange and the question may be asked, "Why is not carbon to be regarded as an essential constituent of direct fertilizers?" The answer is that the carbon of plants comes from the carbon dioxide (carbonic acid gas) of the air, and the air furnishes an inexhaustible and available supply of this substance. We do not, therefore, need to add carbon to the soil. However, as we shall notice later, some forms of carbon possess value as indirect fertilizers.

HYDROGEN.

28. OCCURRENCE IN NATURE.—The element, hydrogen, is nearly always found uncombined with other elements. It combines with oxygen to form water. Hydrogen also occurs in most animal and vegetable substances, such as various kinds of wood, fruits, etc., when it is combined with the elements, carbon and oxygen. Hydrogen is always present in all kinds of acids.

29. DESCRIPTION OF HYDROGEN.—Hydrogen, in the uncombined form, is a gas that resembles air in that it has neither color, smell, nor taste.

OXYGEN.

30. OCCURRENCE OF OXYGEN IN NATURE.—Oxygen is the most abundant of all the elements. The compounds which contain no oxygen are few in number. Oxygen forms nearly one-half of the crust of the earth; eight-ninths of water; about one-fifth of air, and one-third of all animal and vegetable matter.

Oxygen occurs in the air uncombined with other elements. Oxygen, combined with the elements carbon and hydrogen, or with carbon, hydrogen and nitrogen, is found in substances which go to make up animals and vegetables.

31. DESCRIPTION OF OXYGEN.—As might be inferred from knowing that oxygen in the uncombined state forms part of of the air, oxygen has no color, taste or smell.

Oxygen is a very active substance from a chemical point of view. It tends to unite with nearly all of the other elements. In all forms of burning, the oxygen of the air is simply uniting with other elements. Thus, in a coal fire the oxygen unites with the carbon of the coal. The heat is produced by the union of the two.

THE RELATIONS OF HYDROGEN AND OXYGEN TO FERTILIZERS.

32. As already stated, water is formed by the union of two gases, hydrogen and oxygen. These elements are supplied to plants in the form of water. Growing plants contain a larger amount of water than of any other constituent. The oxygen and hydrogen of the water are separated in the plant, and in this way plants secure the hydrogen and oxygen which they need to build up their tissues. In this manner water acts as a direct fertilizer. The water is supplied by rains to the soil; from the soil it is taken into the plant through the roots. In regions adapted to agricultnre, plants receive all the hydrogen and oxygen needed, and usually much more, from the rains. Therefore, these elements are not considered important parts of fertilizers, except, perhaps, that it is desirable to have in a commercial fertilizer as little water as possible.

When water is supplied to plants by irrigation, it can very properly be called a fertilizer, and an extremely important one, too.

35. In addition to its action as a direct fertilizer, water has an important part to play as an indirect fertilizer. Thus, it dissolves the soluble food materials of the soil, the mineral matter and most of the nitrogen, and carries them into the plant. In addition to its action as an indirect fertilizer, water acts as a carrier within the plant in transferring from one part of the plant to another, as needed, the various products contained in the plant, just as the blood in the animal body carries to every part the nutriment adapted to each organ and part.

NITROGEN.

34. OCCURRENCE OF NITROGEN.—Nitrogen occurs in nature in the following forms:

(1). As a constituent of air.
(2). In the form of ammonia.
(3). In the form of nitric acid and nitrates.
(4). In various other forms in plants and animals.

35. NITROGEN IN AIR.—Nitrogen, uncombined with other elements, forms about four-fifths of the air. Since the nitrogen in the air is not combined, we can conceive its properties for ourselves, and our observations show us that it is a gas, which has neither color, taste, nor smell.

36. NITROGEN IN AMMONIA.—Nitrogen combined with the element hydrogen forms ammonia. Ammonia is present in the air in very small quantities. Ammonia is formed when vegetable and animal substances containing nitrogen decompose.

Ammonia is a colorless gas, and it is this gas dissolved in water which is familiar to us as ammonia water, or "spirits of hartshorn," and which causes the peculiar odor of "hartshorn."

Ammonia unites with different acids and forms salts, much as acids do; these salts we call ammonium salts, compounds which do not generally have any odor like ammonia. Thus, ammonia combined with sulphuric acid forms ammonium sulphate, called by some, sulphate of ammonia. Ammonia combined with hydrochloric acid forms ammonium chloride, sometimes called muriate of ammonia, also known as sal ammoniac.

37. NITROGEN IN NITRATES.—Nitrogen, combined with hydrogen and oxygen, forms nitric acid or *aqua fortis*. If in nitric acid a metal, as sodium, for example, takes the place of hydrogen, we have a sodium salt of nitric acid, or a nitrate, formed, called sodium nitrate.

When animal or vegetable substances decompose in rather warm, moist places, the nitrogen is changed into nitrates. This change of the nitrogen of organic matter into nitrates is caused by bacteria, which are very small living vegetable organisms, and which exist everywhere in enormous numbers. The process is known as "nitrification."

38. NITROGEN IN ANIMALS AND PLANTS, OR, ORGANIC NITROGEN.—Nitrogen, combined with the elements, hydrogen, carbon and oxygen, occurs in plants and in animals. Such substances, for example, are the casein or curd of milk, the gluten or gummy portion of wheat, the fibrin of blood, the white of egg, etc. When such compounds decompose, the nitrogen is first changed into ammonia, and then, under proper conditions, into nitric acid or nitrates. The nitrogen existing in animals and plants is generally spoken of as organic nitrogen.

IN WHAT FORMS IS NITROGEN USEFUL TO PLANTS ?

39. Plants can use nitrogen in three different forms, viz:

(1). As nitrogen gas or uncombined nitrogen.
(2). In the form of ammonia.
(3). In the form of nitrates.

All plants cannot use nitrogen in any of these three forms equally well, but each form is found specially suited to certain kinds of plants, as will be noticed.

40. NITROGEN GAS USED BY PLANTS.—Although we have nitrogen gas, or uncombined nitrogen, existing in the air in enormous quantities, still, the number and kinds of plants which can use the nitrogen of the air is not large. In general, those plants which are called leguminous, such as the bean, pea, clover, alfalfa, etc., can take uncombined nitrogen from the air.

41. NITROGEN OF AMMONIA USED BY PLANTS.—The leaves of some plants have the power of absorbing ammonia directly

from the air and obtain nitrogen in this way. Some plants obtain nitrogen from ammonium salts through the soil.

42. NITROGEN OF NITRATES USED BY PLANTS.—The largest part of the nitrogen which most plants obtain is taken up by their roots from the soil in the form of nitrates; that is, nitric acid combined with some metal, as sodium or potassium. As already stated, most of the nitrates used by plants are formed by changing into nitrates ammonia compounds and organic substances in the soil by the process called nitrification. Hence, nitrogen, in the form of nitrates, is the most available form for most plants; that is, it can be most readily taken up and used by plants.

RELATIONS OF NITROGEN TO FERTILIZERS.

43. Experiments have shown that nitrogen is essential to the growth of plants; that the quantities of nitrogen available as plant food are very small; that nitrogen is one of the first elements in the soil to be used up; that, of all the fertilizing elements, nitrogen is and always has been the most expensive.

THE SPECIFIC ACTION OF NITROGEN UPON PLANTS.

44. The influence of nitrogen in its various forms upon plant growth is shown by at least three striking effects.

First. The growth of stems and leaves is greatly promoted, while that of buds and flowers is retarded. Ordinarily, most plants, at a certain period of growth, cease to produce new branches and foliage, or to increase those already formed, and commence to produce flowers and fruits, whereby the species may be perpetuated. If a plant is provided with as much available nitrogen as it can use just at the time it begins to flower, the formation of flowers may be checked, while the activity of growth is transferred back to and renewed in stems and leaves, which take on a new vigor and multiply with remarkable luxuriance. Should flowers be produced under these circumstances, they are sterile and produce no seed.

Second. The effect of nitrogen upon plants is to deepen the color of the foliage, which is a sign of increased vegetative activity and health.

Third. The effect of nitrogen is to increase, in a very marked degree, the relative proportion of nitrogen in the plant.

LOSS OF NITROGEN COMPOUNDS.

45. Since ammonia compounds and nitrates dissolve easily in water, is there not danger of their being carried away in drainage water from the upper soil out of reach of the plant?

Experiments have been made to settle the question, and results indicate that ammonia compounds are largely retained in the soil. Nitrates are apt to be washed out and lost in the case of bare fallow land; but when the soil is covered with vegetation there is little or no loss, for the reason that the roots of growing plants absorb nitrogen very readily. Some nitrogen is also lost by organic matter in the process of decay, escaping into the air as free nitrogen.

These losses of nitrogen are, to some extent, replaced naturally by means of the nitric acid and ammonia dissolved by the rain and dew, also by organic matter decaying at the surface of the soil, and also by conversion of the free nitrogen of the air into some form which the plant can take up and use. These natural additions of nitrogen do not usually make good on the farm the losses, and in time the nitrogen becomes insufficient to produce paying crops without the addition of nitrogenous manures.

We shall notice later the various forms of nitrogen ordinarily used in commercial fertilizers.—*Bulletin of the New York Agricultural Experiment Station.*

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SUGAR MAKING IN DEMERARA.

We all, more or less depend upon sugar, and yet perhaps we never consider where it is grown nor how it is manufactured, therefore a word or two on a visit to a Demerara sugar estate may be of interest. I spent part of my Easter holidays last year in Georgetown, Demerara, and having a great desire to see a "model" sugar estate I started, along with two friends, in a cab for Providence, a large sugar estate belonging to Messrs. Sandbach, Parker, and Co., of Demerara, and situated about four miles southwest from the Tower Hotel, Georgetown, the capital of the colony. When we arrived and stated our object, the manager of the estate, Mr. Monkhouse, kindly showed us through the premises and explained in simple language the process of sugar making.

The manager of a sugar estate is a gentleman who does not always wear white kids—the fashion of the colony—dress coat, choker, etc., etc. No! nor does he gain his present position of importance in a dress coat, but by many years of hard toil as an overseer. On our approach to the large machine buildings we were shown a disturbed furnace, a large boiler which had been hoisted from its seat, minus a plate, and an open space where a gangway was being erected; all entirely under the guidance and superintendence of Mr. Monkhouse.

We followed our guide into the main building and were at once taken by him to the mill itself, close to which ran the main navigation trench. Here several large iron punts full of cane were lying ready to be unloaded by the laborers. The cane is thrown from the punts into the cane carrier, which, when the mill is at work, slowly and surely feeds it into the ponderous rollers of the crushing mill. Through this, and on the carrier directly opposite, appears the smashed fibre or megass, which is carried up towards the roof along a tramway and then dumped on top of the large furnaces. Here the shovellers push it into the feed box, or slide, after which it descends into the fibre box. Thus the cane, deprived of its juice, becomes the heat producer of the factory, and saves a large annual expenditure on coal. From the mill the juice falls into a large iron tank, and is then pumped through a juice heater into what is generally called a battery of clarifiers, wherein it is allowed to remain until it subsides, after which it is drawn into large iron vessels containing a number of steam tubes. When these vessels are filled sufficiently with juice the steam is turned on until the juice is boiled and skimmed of its dirt. During this process the scum runs into subsiding pans, where it is again heated and allowed to settle; the pure liquid is then drawn, off, and the refuse passed into filter bags.

The juice is also passed from the iron vessels, through filter bags, into receiving tanks, where it is increased to a certain density, then pumped into another set of receiving vessels.

From these it is drawn into the vacuum pan, where the evaporisation is completed and the raw sugar formed. After being discharged from the pan it is run into wire baskets and the dry crystals separated from the molasses, or residue. The crystals are then bagged, weighed, trucked, and sent to the docks for shipment. The molasses from the first sugar is reboiled and the second quality of sugar contained; the refuse from this is again reboiled to obtain the third quality, and from this grade the celebrated Demerara rum is made, producing 25 gallons of rum to the ton of sugar. It will thus be observed that not a drop of juice is lost to the manufacturer during the entire process, while the otherwise useless cane refuse becomes a valuable fuel, and what I think is a good example to his brother managers, Mr. Monkhouse uses the scum for manure when planting the cane. The machinery used in this and other improved factories in Demerara cost over £20,000, and in many instances £60,000, to put on the premises and set in working order, so that the production of the sugar for which we pay from 2d to 4d per pound is not without very considerable outlay. A well-known planter informed me that the soil of Demerara was so rich that it yielded goods crops of sugar every fourteen months for 100 years without the assistance of any artificial manure, at the end of which time it began to cost the planter on an average eleven dollars an acre yearly.

To form a new estate it would cost about eight dollars per acre to clean the ground of its brushwood and grass bank it.

To plant an estate with sugar costs about twelve dollars per acre; drainage would cost about two dollars, forking eight dollars, weeding three dollars, trashing three dollars, reaping twelve dollars, and liming 48 cents, per acre.

The sugar estate owners who have machinery for refining sugar make fair profits, while those who have none can scarcely live let alone obtain refining machinery. But we must consider that in some respects these people have themselves to blame, for when they were receiving large prices for their sugar they wasted their profits instead of saving them. Those who saved their profits in good times were able to purchase machinery when hard times came, and now live comfortably, while their squandering brothers starve.

The average estate in Demerara has from ten to twelve hundred acres of cane under cultivation, while the largest estates exceed two thousand acres.

The area of cultivation on each estate is generally divided into small fields of ten, fifteen, or twenty acres. The work of planting these areas is only necessary every four years or thereabouts, while the crop is reaped every fourteen months. To plant a large estate with sugar, cultivate it, harvest it, and manufacture it into marketable sugar, require necessarily a comparatively large number of laborers. These are free Black natives, Portuguese, and Chinese, although the majority of laborers are from East India, better known as coolies, who are brought our from India as indentured immigrants under a five years contract at the joint expense of the colonial Government and the planter in the respective proportions of one-third and two-thirds. This class of labor is counted most profitable. The laborers are divided into gangs known as follows :—1st. The shovel gang ; 2d. The weeding gang ; 3rd. The Creole gang, employed to transport plants from field to field—manure, &c., &c. The duties of the weeding gang are performed by the men, and of the other two by women and children, the rate of wages being—Men, 1s ; Women, 8d per day.

The drainage system on this estate is most complete. The water supply for both navigation and irrigation is obtained from a fresh water canal which runs along the rear. A sluice gate is constructed on the dam of this canal, and when water is required it is opened and the water pours into the trench. The transportation of canes from all parts of the estate, coals from the rivers and railway depots, to the buildings, is done entirely by punts drawn by oxen or mules. The main navigation trench runs from the river up the centre of the estate and is intersected at short distances by cross trenches and branch waterways, affording waterways for transporting canes cut at a distance of several miles from the factory to their destination by water. This, and nearly all other estates in Demerara front on the sea or river, and are a source of constant trouble, anxiety, and expense to the planter, for their dams are frequently bursting, which had been known to do damage to the amount of £10,000.

A sugar estate in complete working order, and with 1,200 acres of cane under cultivation, is worth about £15,000.

The cost of producing a ton of sugar, interest on capital invested alone exempt, is from £12 to £14. First sugar sells at from £19 to £20 per ton. When the market realises this price the second sugars, rum, and molasses are regarded as profits.

The Government requires that on each estate a hospital must be provided, with accommodation in proportion to the number of laborers employed. The hospital is kept clean and well ventilated. A doctor visits the institution every 48 hours. Dispensers and nurses are also employed according to the wants of the inmates. I have not had the opportunity of going through more than one of these hospitals, but, from what I saw of that one, and from the description I have heard from the lips of those who have visited these places frequently, I can safely say that, while they are not the hospitals that we in this country are accustomed to see, yet they are all that is required, and he is a very fortunate mân who has such a place to go to when sickness overtakes him while following his employment on the estate.

The large population of this estate are housed according to the emigration laws, and when we consider that an average estate has a population of 1,500 souls, while some of the large ones have over 2,500, we can imagine the long rows of huts which must be constructed to suit the ideas and customs of this mixed and curious populace. The coolie's house is generally a low, square hut with only one room, which serves as kitchen, dining room, hall, parlor, bedroom, and sitting room. The walls are of mud, and the roof of plaited palm leaves.

The most important houses on a sugar estate are the residences of the manager and the overseers. The manager's "castle" is generally a large, airy dwelling built upon brick pillars from six to ten feet high. This elevation keeps the house cool, and the space beneath is generally utilized as a coach house or for some other stock which requires to be kept out of the sun and rain. The inside of the house is divided into apartments, only separated, in most cases, by a screen. Over these are the bedrooms and bathroom. Hammocks are swung from corner to corner in the coolest parts of the house.

Lounges here and lazy chairs there strike one with the home-like appearance of everything. From the balcony we get a fine view of the miles of waving cane, which is studded here and there with the majestic forms of the cabbage palm, and interspersed by large trenches and waterways, which provide a continual supply of fresh water that keeps the canes from being thirsty when under the burning tropical sun. The overseers' quarters are generally in a large house similar to that of the manager. Each man has his own room and servant to look after it. The number of overseers is according to the size of the estate. They are mostly strong, active young men from this country. Their duties are to assist the manager, take charge of the gang of laborers, make up the pay books of their gangs, etc. Each overseer has his mule, which carries him to and from his work, and, while his master is engaged in his duties, , the animal stands out in the rain or sun, besides making itself generally useful to its master when required.

The manager keeps his own horse, trap, butler, groom, cook and messengers, besides being allowed so much for each overseer who dines at his table. There are generally five overseers on an ordinary estate.

The manager, from experience gained when an overseer, is competent to handle the hundred and one knotty questions of cane growing, drainage, machinery, sea defences, besides looking after the hundreds of employes under him. In the good old days of sugar growing he had not the anxiety that the manager of to-day has. In those days sugar brought double its price; labor was not difficult to obtain, the complicated machinery of the present time was unknown, in fact, his responsibilities in years gone by were far lighter; it was more manuel labor than scientific knowledge that was required of him; now it is a combination of both that he must possess.

The "sugar king" does not sit in his office all day or watch the machinery in the factory, but, on the contrary, he must needs take an early ride daily through the plantation, either under a scorching sun or under a tropical rain shower, to see if his overseers are in charge of their gangs; to make notes of work requiring immediate attention, or to give directions as to planting, hoeing, trenching, dam-making, etc., besides settling a happening dispute which may have arisen between laborer and laborer, or overseer and a member of his gang. He then returns, when a sumptuous breakfast awaits all hands. The overseers drop in and have a bath, a change of clothing, and all seat themselves to do justice to the morning meal. A smoke is then indulged in for a few minutes, after which the overseers ride off on their respective mules to the gangs under their charge, while the manager and his assistant go to see how things are running in the mill.

Next under the head of manager comes the engineer, whose duty is the full charge of the complicated machinery.

Next comes the chemist, who tests all sugars and analyzes the soil, when necessary, for the purpose of ascertaining what quality and quantity of manures are required.

The attorney is also in demand, who acts as a sort of consulting physician as to the necessities and general management of the estate and is also a sort of stop valve on the extra expenditure of money by the manager. The book-keeper is also an important personage on the estate, whese duty is to keep the books and make the weekly returns.

The whole are generally a very entertaining and most hospitable lot of gentlemen. They think it no trouble whatever to show a stranger around the estate, give him all the information he asks for in the pleasantest style, entertain him to dinner, drive him round the estate and make him feel that he is welcome. I am sure that if any of my readers have ever the good fortune to visit the places of their sugar battles, they will cheerfully bear out my statements, and I can say from experience that the only way you might offend them is to refuse a "snap," a "swizzle" or a cigar. Having returned to the Tower hotel, after a very pleasant and profitable journey, we found some difficulty in parting with our colored cabman.

These "colored gentlemen" are ever on the lookout for strangers, and as soon as they get one for a "fare" they seem to delight in robbing him by charging him double fare for a single journey. However, our cabby was not so successful as he might have been. We handed him the sum which we thought was sufficient for his trouble, but he immediately showed signs of making a scene in the street for having been, as he stated, "underpaid." In order to square matters a little we reseated ourselves and ordered our cabby to drive us to the police station, and, after finding the superintendent and stating the facts of the case, left it in his hands and returned to the hotel on foot. I afterwards found that our cabman was charged with trying to cheat his "fare," and was dismissed with a caution.—*Corr. Newcastle Leader.*

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THE SUGAR-CANE BORER.

(Chilo Saccharalis).

Uery little investigation has been carried on in this State in connection with this insect since March, 1881, when Mr. L. O. Howard, of the Agricultural Department at Washington, visited Louisiana to investigate the sugar-cane borer *(chilo saccharalis)*, the sugar-cane beetle *(ligyrus rugiceps)*, and other insects which had been causing trouble throughout the State.

Late during the sugar-cane season of last year, too late in fact to accomplish much, it was my privilege to study, to some extent, the sugar-cane borer,* and it is with the object of furthering this investigation and with the view of enlisting the assistance of the sugar planter and others who may be interested, that this preliminary bulletin is published. As the time afforded last season was entirely too short to carefully complete the life history of different broods, I am compelled to resort to the statements as made by investigators in other countries in order to complete the circle from the egg to the moth. The statements may differ somewhat from those which our future investigation will show, on account of different localities, yet they will aid in forming a basis upon which we can work more intelligently than if these facts were entirely unknown to us.

No careful estimate of the loss occasioned by the ravages of this insect has yet been made, but, as nearly every well-informed sugar-house man will tell you that it is very much harder to make sugar from cane which has been attacked by

*In countries where more than one borer is present in the sugar cane, this one is called the "stalk borer."

the borer than when not, it is my opinion that the average planter is not aware of the loss he is sustaining, or the inconvenience he is put to by the presence of this insect. On many plantations the crop has been severely attacked, especially after warm and open winters. Sorghum has been known to be more seriously injured than sugar cane, a decided decrease in the per cent. of sugar being apparent in the injured stalks.

On plantations where the borer is present it is usually the case that a much larger percentage of cane is bored than the owners are really aware of.

DESCRIPTION OF THE DIFFERENT STAGES.

EGG.—The following is the description as given by Prof. Comstock in his report on "insects injurious to sugar cane:" "The eggs, which, however, we have only seen upon the corn, are flat and circular, one mm. (one twenty-fifth of an inch) in diameter, and are white when first deposited, turning yellow as they approach the hatching point." Many have expressed themselves as to the difficulty in finding the eggs. I have discovered the shells of eggs which answer to the above description upon the axil of the leaf or just where the leaf ceases to encircle the stalk. Eggs from which true borers have been hatched in other countries have been found in the same position. In our future study we hope to clear up many undecided points in connection with the deposition of the eggs upon the plant.

LARVA OR CATERPILLAR.—The amount of time required for the eggs to hatch has not, as far as I can learn, been yet ascertained in America. The time given by Miss Ormerod is nine days, but the difference of climate is likely to influence, slightly, the length of time.

The young larva, on emerging from the egg, begins at once to bore into the cane, upon which it feeds for some thirty-one days, as given by Miss Ormerod; however, Prof. Comstock raised it up to pupa stage on a corn plant in thirty days, and, with him, I am of the opinion that in Louisiana and in warm districts the period taken for the growth of the caterpillar will be even less than thirty days. When full grown it is about one and a half inches long, and contains four violet stripes on its body (running from head to caudal end), divided by the intervening portions of the body, which are white. Over the body are distributed a few hairs, arising from each dark spot (except spiracles), which appear scattered over the body in regular form.

PUPA.—As stated, the larva assumes the pupa condition in from thirly to thirty-one days, and perhaps less, after hatching. The chrysalis is of a light brown, about 3-4 of an inch in length and 1-6 of an inch in diameter; however, the size of the pupa will vary according to the amount of food the caterpillar has had, which has entered into it. If poorly fed, or if it has received some check so as to cause it to enter pupa condition sooner, the chrysalis will be smaller than if well fed and allowed to fully mature. The time spent in this stage is some fourteen or fifteen days.

MOTH.—The general color of the moth is grey, but when the wings of the female are spread it will be noticed that the hind wings are very much lighter than the fore, or than either pair of those of the male. In Prof. Comstock's report, before referred to, it is there stated that the male is the one possessing the light hind wings, but, from my own study as well as that of others, this proves to be the female. The body of the female is usually a little larger than that of the male. The size of the moth varies, ranging, from head to caudal extremity, from one-half to a little over three-quarters of an inch, and one from tip of wing to the other, when expanded, from one and one-sixth to about one and one-half inches.

HABITS IN DIFFERENT STAGES.

LARVA OR TRUE BORER STAGE.—On coming from the egg it bores through any leaves that encircle the stalk at the point where it is hatched until it reaches the cane proper, when it penetrates it, very often eating through to the pith before attempting to go up or down the cane. It invariably commences its work of destruction near an eye, and when it reaches the pith continues its burrow either up or down the stalk. It has been stated that it invariably goes up, but, from the fact that so many canes are bored down through the center to even below the surface of the ground, and a great many of them to near the surface, either of these places being beyond where it might enter, it seems quite conclusive that when once it reaches the pith it has no particular choice of direction. The eggs being generally deposited upon the leaves which come from the upper or soft part of the cane, the holes upon the lower portions of the stalk, made from the outside, however, indicate that the cane has been attacked when quite young.

Small caterpillars are sometimes found in the passages made by larger ones, but, as the walls surrounding the older made passages become very hard, the functions of the cells being destroyed by the way, the young larva prefer, as a rule, to make their own passages.

During the growth of the caterpillar it sheds its skin five times; however, this is modified to some extent by the growth. Its habit of leaving its haunt and coming to the outside of the cane, renders it more liable to the attack of enemies, as well as accounts for the difference in the size of the numerous holes made in the one stalk. On being disturbed when outside of its burrow, it suspends itself by a web, and thus may be blown from one place to another. From the protection it receives from its habit of living inside of the cane, the body of the borer is naturally very soft, and hence the adequacy of being suspended by a web, as by falling to the cultivated soil below it would not be able to regain its position upon the plant, and would thus perish. When attacked by an enemy, its violent movement often repels the intruder, but seldom does the parasite give up after the first attack.

The borer is veay destructiue to corn as well as sugar cane and sorghum. Some of the corn crops near Fredricksburg, Va., have been almost completely destroyed by this insect.

When the larva becomes full grown it prepares itself a place for its escape (when metamorphosed to a moth), by enlarging its burrow near the outside of the cane, and it is in this enlarged portion of its haunt that it assumes the pupa condition, where it remains, if not disturbed, until the imago or moth condition is reached.

PUPA OR CHRYSALIS CONDITION.—In this condition it is capable of considerable movement, and, when irritated, may wriggle itself out of its passage; hence the reason why we often find the pupa cases upon the ground. In Mauritius it is said that this insect often assumes its pupa condition among the leaves of the cane, and thus we may conclude that the climate changes, in a measure, the habits, showing that it accommodates itself to circumstances. It is usually considered that this insect hibernates in the larval condition; but this has yet to be fully confirmed regarding this pest in Louisiana. From the fact of its being a tropical insect seems to indicate that whenever full grown it will go into pupa condition. This point will be referred to under the head of "preventatives and remedies."

The Moth.—In this stage in has the peculiar habit of remaining in the same position for a considerable length of time. This we have instanced several times this fall; however, the specimens were in captivity, but the cages were sufficiently large as to allow of considerable movement. Darkening the cage did not seem to have any influence in arousing motion. The moth is said not to be attracted by light, but several were captured by having a regular insect lamp situated on the turn-roads between certain tracts of cane. This point will be more fully demonstrated next season. Moths were kept in captivity in order to ascertain some idea as to the length of their existence. Some lived four days, others five and others six.

PREVENTATIVES AND REMEDIES.

Considering the fact that this insect has made its appearance in Mississippi, Georgia, South Carolina and Virginia, and done considerable damage to the corn crop, we have greater reason to anticipate more serious effects from its presence in Louisiana, and especially in the northern portions of the State.

It is true that when cane containing the borer has been introduced into the northern portion of the State, that the insect did not reproduce there, but since it has been introduced into Virginia, and has there gotten a foothold, whether it be that the manner of curing and housing the corn has protected it, or that its habits have been somewhat changed, more serious results may be expected. If it has assumed the pupa condition to hibernate in, and thus be better fitted to withstand the cold, the name of "tropical borer" may be recognized as a misnomer to those, at least, which are produced in Virginia and further north. If this supposition be true, an invasion of this insect into the cane fields of North Louisiana may be expected from the north instead of the south.

Commercial fertilizers have been recommended by some, particularly "acid phosphate," but no difference in the frequency of the attack could be noticed in the cane, which was fertilized with a fertilizer containing acid phosphate, and in that which received other fertilizers.

During the process of extracting cane juice all the borers contained in the cane are destroyed; hence the mode of handling this crop is a means of keeping it in check, which is not characteristic of the modes of handling the corn crop. This, with the complete burning off of all tops and refuse, as well as with the aid of parasites, whether animal or vegetable, are the only means we may look to by which the cane crop may be rescued from the ravages of this insect. The complete burning of the tops is of the first importance in the checking of this insect's depredations; for if only a few tops are left containing a few borers, these will be sufficient to cause considerable damage the following season. As the borer is always worse after a mild winter, and as but few borers are ever found in the stubble, this complete burning or incineration is particularly necessary in order to completely keep them in check.

Soft cane is subject to greater injury than hard cane, as it offers much less resistance to the borer; hence the propriety of using the "purple" and "ribbon," or such other hard varieties as may be found of equal value.

In selecting cane for seed, choose that which has not suffered from the borer, or is but slightly attacked.

In importing foreign varieties into our State, or even importing varieties containing the borers, into a locality or localities which have not grown sugar cane, or if they have, have not had the borer, the imported stalks should be subjected to a treatment that will free them from insect pests, and dipping them in hot water (120 to 125 degrees, Fahr.), or a one per cent. solution of carbolic acid is recommended. It will be well to resort to this in the importing of foreign canes especially, and protect ourselves from other species of borers as well as other insects injurious to sugar cane.

If the results from sorghum continue to be unsatisfactory, and there be any increase in the attack of the sugar-cane borer, it will be well to abandon the cultivation of sorghum in the event of its being so subject to injury by the borer. It has been observed that tracts of sugar cane in the vicinity of sorghum have been more seriously injured than those more distant. This would indicate that sorghum acts as a breeding ground, as it ripens much earlier than cane, and thus many moths are bred, lay their eggs, and larva are hatched that would have perished were it not for the sorghum.

Ants have been found, by some, to prey upon the eggs of the borer moth, but this has not come under our observation.

THE PARASITE.

During the early part of the time spent in the study of the borer, a parasite was discovered which proved to be the larval condition of a soldier beetle *(Chaugliognathus Pennsylvanica)*, and was found to readily devour the borer. Many of the parasites were found lurking between the clasping leaves and the stalk, and, on dissection of the cane, to find specimens of the borer; these little friends were often found in the passages in pursuit of their prey. Several specimens each of the borer and parasite were procured and placed in boxes, and it was but very few minutes before the borers were completely eviscerated, nothing being left but their heads and their skins. Pupa cases were placed in the boxes, and although they did not take hold of them with the same degree of vigor, yet the pupa cases were eventually emptied.

This discovery was made too late in the season for any definite results of the benefits of this insect to be estimated. The observations were made upon the sugar experiment station of this State, and it was the opinion of those in charge that this insect diminished the number of the borers very considerably. It may be that this insect has long been a means of keeping the borer in check, but nothing has, to my knowledge, been recorded which would indicate the knowledge of its being parasitic upon the sugar-cane borer.

Herewith we give a few questions which we are desirous of having the planters consider carefully during the coming sugar-cane season, and if any information can be given, apart from that brought out by the bulletin and by these questions, we shall be pleased to receive it. It is our intention to have these questions, and perhaps others, put up in proper form and distributed to the different planters next fall. If they will kindly answer these as far as possible, much practical information may be procured, which will be of prime importance in the study of this insect.

1. Have you the cane borer upon your place?

2. Have you ever been troubled with it, and are now free from its ravages?

3. By taking average rows of your cane in several portions of the field, give an estimate of what percentage of these canes are attacked.

4. Have you noticed any difference in the amount of damage done between that of plant and stubble cane?

5. Do you find any particular kind of fertilizer destructive to the borer in any way? If so, which one?

6. Do you always burn off your stubble, and have you at any time left your stubble unburned, or partially so, and noticed an increase in the amount of damage done by the borer?

7. Do you select your seed cane, and do you attach much value to the selection of seed cane from a borer standpoint?

8. What year do you consider that the borer has been worst with you and can you attach any special cause for its prevalence?

9. Have you ever detected a decrease in the percentage of sugar in cane badly attacked?

10. What time during the plant's growth are the first attacks usually made, and at what time during the season do you consider them at their worst?

11. Is it your experience that after a warm and open winter the borer is more prevalent than after a severe one?

12. Have you noticed anything preying upon the borer, and have you any preventatives or remedies to suggest?

Any habit which you think worthy of mentioning, kindly record it.—*Corr. Baton Rouge Bulletin.*

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Farmers do not keep accounts as they should. Too many know nothing of their business except by totals. A merchant could not run a store a month on such business principles.

HINTS TO SMALL AND LARGE FARMERS.

Don't put all your eggs into one basket. It is only once in a great while that a farmer makes a decided hit with a special crop. A mixed husbandry gives better chances. Besides, such a course is apt to dovetail time. Wheat is a special crop and dependence on it has run clear across the continent. There was a time when western New York was boomed for wheat, and it held its own until the Hessian fly took successive crops. The only remedy was to quit growing wheat entirely. Then Ohio, Indiana, Illinois, Iowa and Nebraska, in succession, were the wheat growing States, and while in all these States wheat, to some extent, is now successfully grown, it is only once in a great while that a farmer makes a decided hit, grows a large crop and obtains a high price. Wheat, years ago, reached the Pacific coast and had its run in California under very fortunate conditions. Wheat, for many years, was the only grain which would bear the expense of transportation. When the people of Northern Illinois hauled the grain to market in Chicago, twenty-five cents per bushel was paid for that service from Rock River, and it is a fact that wheat has been sold for forty-two cents in Chicago. There was no chance to make money in that direction. And yet the old settlers who remember that time and are living now are, almost without exception, forehanded, if not rich. How did they do it?

By diversified farming. I know of no instance except to oblige a new comer or a neighbor who had run short that ever hay has been baled and sold from the farms, and unless corn and oats brought very good prices in a near market, these grains were fed to stock on the farm. Said a neighbor of mine at that time: "If I have a large crop of wheat and no coarse grain, my horses are thin in flesh, also my cows, and I scarcely make enough pork for my own use. I manage always to have a load or two of wheat on hand if I must have a little cash, but when I have lots of corn I have fat horses, fat steers, fat hogs and fat gardens, plenty of butter, lard, milk, eggs, wool, sheep and lambs, besides all the poultry we can take care of."

So it becomes evident that on the crop of corn hinges many important items which make farming pay.

We must not overlook the fact that while corn has some insect enemies, it has successfully withstood them from Maine to California, and is therefore the foundation, as it were, of successful farming.

Again, the animal industry is a potent factor to success. A bunch of steers, a span of well-bred and matched colts or horses, a few dozen lambs in their season and a wagon-load of dressed poultry bring many dollars, and generally at a time when the farm operations do not demand every hour to take care of and cultivate the land or secure the ripe crops.

In the years when peaches are a failure early apples will be in demand, but few of these will, when ripe, bear transportation to any great distance; with full ripeness comes decay.

The canning of fruits, sweet corn, tomatoes, cherries, etc., has been so far perfected that, where canning factories have been erected, many a dollar can be taken for what, under other circumstances, would be of little value, if not utter waste.

There is one condition to make farming a success which, in every essay on the subject my eyes have seen thus far, has been omitted, namely, to take care of the dollars and implements already gained. It costs comparatively small sums to provide sheds for wagons, reapers, mowers, plows, harrows, rollers, etc. If no other material is at hand, a few posts set firmly in the ground and some brush with straw or hay for a roof will answer, and the savings of a few years will furnish the needed cash for lumber to build more permanent and lasting sheds. "Poor Richard" said: "Take care of the pence; the pounds will take care of themselves;" therefore, "Be careful of your money," as the old song has it.

I would not have you be parsimonious or stingy. Among farmers, I am happy to say, there are no skinflints. They are hospitable, obliging, self-sacrificing and benevolent to a marked degree; we mean as a class, and they are none the poorer for these traits. "There is that scattereth abroad and yet increaseth, and there is that withholdeth more than is meet and it tendeth to poverty." Take care of your farm and it will take care of you and yours. Feed your land and it will more than feed you. Plough deep while the sluggard sleeps. Take a look at the farm that lies underneath the one you have looked at for years. Repair the barn floor before your cow or horse breaks a leg. Repair the fences before the cattle break in and destroy the grain or the garden, or, worse yet, stray away and are lost. Make all the manure you can and put it on the land at the first opportunity ; if you cannot do that, fork it over or have it done, and thus arrest as much as possible the escape of ammonia. There is one man in my mind's eye who never went to town on week days but what he carried something, if only a load of corncobs, which, he sold for summer fuel or kindling.

Time is money ; we should be as economical in its use as we are with our cash. A rolling stone gathers no moss. You will seldom find a man who has lived in six or seven States that has made farming pay. If he has made and saved money it has been by a lucky hit in a real-estate deal. Our purpose in this article is simply to call your attention to old facts, and bring to your mind well-known and frequently uttered counsel and advice. These things, if they are old and well-known, men are apt to let slip. Let everything be done, by way of putting in crops, as early as the season will permit ; drive your work before you and let not your work drive you. Sell your surplus in its most concentrated form. Sell beef, pork, mutton, poultry, butter, eggs, cheese, etc., instead of corn, hay, oats and coarse grain, which latter, is heavy, bulky, hard to handle and, in comparison with the former, low in price. Never sell immature animals when it is possible for you to keep them to maturity. Keep posted as to the markets and sell when the price suits you. Never run into debt for anything you can do without, and never hanker after your neighbor's forty or eighty acres.—*St. Louis Republic.*

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THE WORLD'S CROP OF SUGAR.

The London *Grocer* says that "at this season of the year the task is not an inappropriate one to consider what are the crops of sugar the world has to depend on for its supplies for another year, and also whether the comparison with other seasons leaves an increase or decrease to calculate upon in the near future. We will take the estimates of cane sugar first, as they relate to the oldest descriptions that have been known in the history of the trade, and for that purpose we select the figures prepared by Mr. Licht, of continental fame, who publishes the probable amounts that will be yielded in the cane-producing countries for 1890-91, as cantrasted with the actual out-turns in the two previous years, which are as subjoined:

	1890-91.	1889-90.	1888-89.
Cuba, tons	675,000	536,638	486,454
Java, "	360,000	331,951	411,315
Louisiana, tons	190,000	128,000	145,000
Brazil, "	180,000	150,000	235,000
Philippines, "	160,000	116,175	264,602
Sandwich Islands, tons	130,000	125,000	120,000
Mauritius, tons	115,000	123,985	128,917
Demerera, "	115,000	116,114	115,619
Barbadoes, "	65,000	71,173	62,656
Trinidad, "	50,000	47,870	52,306
Guadaloupe, tons	50,000	47,527	45,016
Porto Rico, "	45,000	59,634	54,886
Reunion, "	40,000	36,375	25,418
Egypt, "	40,000	35,000	50,000
Martinique, "	35,000	36,022	37,519
Peru, "	30,000	30,000	30,000
Jamaica, "	30,000	30,000	28,000
Antilles, "	30,000	28,000	26,000
Totals	2,340,000	2,149,464	2,318,708

"From the above totals it appears that the production of cane sugar for the present season is of only average weight, neither particularly excessive nor remarkably deficient, and hardly large enough, one would think, to meet the extra big requirements that are likely to grow out of the measure about to pass into law in the United States, where the admission of sugar free of duty will give such an impetus to the consumption that, for a time at least, considerable and unwonted demands will be made upon the powers of production all over the globe. The extremely low prices that have been current in Europe for many years past have been very detrimental to the cultivation and importation of cane sugar, as has been repeatedly shown by the heavy and continuous falling off in the consignments to the United Kingdom, and had it not been for the more remunerative rates which have been secured in other and foreign markets, supplies of cane sugar would have been alarmingly reduced.

"As it is, some stimulus of better prices will be needed to work up the aggregate supply to a higher amount than 2,340,000 tons before sufficient sugar will be produced to fully satisfy the world's consumption, which, it is no exaggeration to say, is now nore evidently than at any previous time progressing faster onward than the general supply. To complete the sum total of the yield of sugar throughout the world, so far as it can possibly be ascertained, we here add the quantities derived from the article, beet, which is grown on the continent, and which has assumed such extraordinary dimensions since it was first taken thoroughly in hand about thirty years ago, or 1860-61, when the entire European crop did not exceed 387,000 tons. The same authority that furnished particulars of the cane crops compiles the statistics pertaining to beet, the crops of which (estimated and raised) between 1887-88 and 1890-91, inclusive, were as under:

	1890-91.	1889-90.	1888-89.	1887-88.
Germany, tons	1,325,000	1,264,607	990,664	959,166
Austria, "	760,000	753,078	583,242	428,616
France, "	700,000	787,989	466,767	392,824
Russia, "	530,000	456,711	526,387	441,342
Belgium, "	200,000	221,480	145,804	140,742
Holland, "	65,000	55,813	46,040	39,280
Other places, tons	80,000	80,000	87,000	79,980
Totals	3,660,000	3,619,678	2,785,844	2,481,950

"The combined crops of 2,340,000 tons of cane and 3,660,000 tons of beet sugars for the ensuing season thus represent a gigantic total of exactly 6,000,000 tons, and beet sugar, which two or three decades ago contributed the smallest proportion to the whole available supply, now affords the largest, and makes up a heavier crop by 1,320,000 tons than that turned out by cane sugars. It is also worth while to note that the yearly consumption of sugar in England is equal to about 1,266,000 tons, and that in the States embraces nearly 1,500,000 tons, so that, putting these amounts together, we get a total of 2,766,000 tons as the quantity necessary to meet the regular wants of consumers in England and America, which does not allow more than 3,234,000 tons as the consumption of sugar for the rest of the populations of the universe that can be enumerated ; a fact highly suggestive of the pertinent question : Whence shall be bought sugar that these may eat and be filled ?"—*Bradstreet's.*

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SUGAR IN GERMANY.

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EXTRACTS FROM GERMAN NEWSPAPERS.

(Echo, May 14, 1891.)

The German Reichstag passed the Sugar Bill in third reading. For three years the export bounty will be 1.25 ms., and for two years 1 ms. Heretofore the bounty was 4.25 ms. (about $1) for 50 kg. (about 110 lbs).

SPEECHES IN GERMAN REICHSTAG, APRIL 27TH, ON SECOND READING.

Freiherr von Maltzahn, Secretary of the Treasury—"Is it right to subsidize the unnatural growth of an industry against the laws of offer and demand ? In 1871 the beetroot crop amounted to 2,000,000 tons, and in 1891 to 10,000,000 tons. This fact would not be deplorable if the increase was on a sound basis. The export premium paid in 1877-78, amounted to about 2,000,000 marks ; in 1881-2, 8,000,000 ; in 1887-8, 28,000,000 ; in 1888-89, 15,000,000 ; in 1889-90, 20,000,000 ; in 1890-91, 21,000,000. Total for thirteen years, 213,243,873 marks (about $50,000,000). The industry cannot deny that this sum has been paid cash by the German taxpayers without equivalent."

Dr. Witte—"By means of our export premium, the world's market price of sugar has been extraordinarily reduced ; but not that alone, it has demoralized the prices. As soon as we pay no more bounty, the business will be on a sound basis."

Reichskanzler von Caprivi (Bismark's successor)—"By continuing the present system, we will have an unhealthy increase of beet sugar factories on unfavorable grounds, and I might quote that an overdone sugar industry will hurt the general agriculture."

Representative Barth—"It is perfectly true that our export premiums reduce artificially the world's market value of sugar. So we receive less for our sugars than we would receive without premiums, and this loss is made good by the bounty. We must state that this is a nameless nonsense. This means that we take twenty millions from our taxpayers and make a present of them to the English people. The bounty is a foolishness, and I do not understand how anybody can wish the bounty to be continued for one day. The fact is this, we have artificially demoralized the world's market price. During 1890, in England, the sugar consumed was ¼ cane sugar and ¾ beet sugar; and of the total consumption of sugar, 45 per cent. was imported from Germany. The price in England depends consequently on the price in Germany. April 29."

Dr. Witte—"We heard several talk about the American competition, but it is a fable; the whole American sugar industry is in the air and exists only on paper. There are only three American factories, which have a bare existence. By abolishing our bounty the World-market prices will be established on a solid basis. France cannot increase the production of sugar in spite of all high premiums. The limit has been reached."

R. Schrader—"The French Government will be compelled to reduce the bounty for financial reason, if the export should become too large, and another unhealthy competition would be stopped."

(Berliner Tageblatt, April 28.)

In consequence of the bounty system the production of sugar has increased to about 1,300,000 tons, of which 500,000 tons have been consumed in Germany and 800,000 tons have been exported. Germany's sugar industry is the largest in the world; our beets are the best.

In Austria likewise the production of sugar has been stimulated by bounties (but this will be abolished by treaty between Germany and Austria.)

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Most farmers spend time enough in the stores or in gossiping over a neighbor's fence to plant and care for a fruit garden. No farmer can afford to buy his supply of fruit.