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THE latest quotation in New York, June 3d, for Cuban centrifugals, 96 test, was $7.72 per 100 lbs.

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THE Paia, Spreckelsville, Wailuku, Waihee, Grove Ranch and Hamakuapoko plantations, on Maui, have taken off all their crops, which have turned out, in each instance, better than was estimated at the start.

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THE weather on Hawaii, Maui and Kauai has been very hot and dry for the past two months, interfering somewhat with fluming and mill work. In Kohala and Kau particularly, the cane fields have been suffering for want of rain, though by latest advices light showers are reported as having fallen. The prospect for the crop of 1890, however, looks at present rather disheartening.

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IT is currently reported that the Hamakuapoko Plantation Co., Maui, will erect a first-class diffusion plant, to be completed by the end of this year. It will embrace the most recent improvements known. Besides this, the mill will be provided with two of Young's superheaters. Paia and Wailuku mills are also to be provided with Young's superheaters. Mr. Koelling informs us that a diffusion plant has been ordered for Hanalei Plantation, and it is expected to be in operation before the end of this year, so as to take off the next crop. Thus it will be seen that our planters intend to take advantage of the present high prices of sugar, and devote a large share of their income to improving their mills, and thus secure all the sucrose, instead of allowing part of it to run to waste.

WITH OUR READERS.

The subject of the proper width of cane rows apart is treated by Dr. Stubbs, on page 249, who made experiments in Louisiana, the details of which are given in tables accompanying his report. As a result, he strongly advises close planting, the same as is now practiced by Hawaiian planters, who make their rows about four feet apart, with continuous plants in the rows. This admits of thorough cultivation when the cane is young, and one or two strippings, after which it requires no farther care till harvesting. Where cane is irrigated, a little more space between the rows is required in order to allow the ditches to be kept in working order.

From the same source we copy the article on the best manures for sugarcane. The large crops now being taken from cane-lands are surely and rapidly exhausting their fertility, and every planter should study the wants of his soil. Already many of our plantations are trying different kinds, with the object of ascertaining which is the best for their use. This is the only way to make sure. It is stated that the annual consumption of manure and fertilizers here is now between two and three thousand tons. That made by Olandt and Buck, of San Francisco, gives satisfaction to most planters. Their advertisement will be found at the close of this pamphlet.

With the desire to call attention to a new product which might be introduced and cultivated here, we insert on page 256 a very interesting account of Buhach, the well known insecticide, which is grown now in California, and is superceding most others. We have not heard of the introduction of this plant into these islands, but presume it can be obtained, for experimental purposes.

On page 259 will be found a full and valuable *resume* of what is known in relation to efforts made to propagate seedling canes. The writer clearly shows that seedlings have been propagated chiefly in the West Indies, and attributes to them the various known varieties of cane. To those interested in this subject, it will be found a valuable statement.

If the account given on page 264 of a new variety of Japanese orange, superior to any other known, be correct, efforts should be made to introduce it from that country, with which we have now frequent communication. An orange tree which will come into bearing in three years, and produce the finest fruit of its kind, is too valuable to be left long without a trial. A grove of these trees planted near Honolulu will become a profitable investment in a very short time.

"A Sugarcane Borer," described on page 265, will be recognized as the pest which has caused the loss of hundreds of thousands of dollars' worth of sugar on these islands, but, which we have reason to believe, is not so abundant or destructive as formerly. Better and more intelligent cultivation and care of the cane-fields, with frequent burning of the stubble-fields, has helped to check, though probably not entirely destroy, the borer. It was probably introduced here from Tahiti or the Marquesas. We have never heard of its destroying banana plants, though we see no reason why they should be exempted from it here, if it attacks the plant elsewhere.

Anent this reference to bananas, the trade in them between these islands and California is very cleverly told by a writer in one of the San Francisco papers, whose article is copied on page 267, who says that the demand for the fruit already exceeds the supply, and hints that if the cultivation could be developed so as to warrant it, steamers specially fitted for the banana trade would be laid on between San Francisco and Honolulu. In a late number of this journal we referred to this same subject, the increasing demand for our bananas, which can be procured nowhere so well as here, and urged cultivators to extend the area of their banana fields to supply the Pacific Coast States. There is no finer locality for this plant than the region now being opened up by the Oahu Railway Company. It will furnish transportation to this port for 20,000 bunches per month. The only trouble may be finding shipment to San Francisco. This must be done by steamers provided specially for the banana trade.

"Grey Beard's" method of estimating the value of the sugar on an acre of cane, by counting the stalks and measuring their length, will amuse rather than enlighten the practical planter.

The short article, on page 273, from a Watsonville beet-sugar planter, gives the first real insight into the cost and profit attending beet culture that we have seen. The best returns stated are $69.21 per acre.

The facts presented by Senator Stewart, in his speech in Congress, page 280, on the value of irrigation in the Rocky Mountain States, will be read with interest. Congress voted $200,000 to investigate this irrigation subject, and ascertain what ought to be done by the Government, and the best way to do it.

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Successful Insecticide.—Col. Geo. F. Hooper, of Sonoma, whose success in olive-growing and oil-making has proved so notable, was a welcome caller at the *Rural* office a few days since. In his experiments at "Sobre Vista," the Colonel informs us that he has disposed of the black scale pretty effectually by keeping his olive trees properly pruned, and spraying them with whale-oil soap and sulphur wash, at 120 deg. to 128 deg. Fahr., once in February or March and again in July or August. He follows this up in October or November with a soda solution, applied warm; and this, in connection with the subsequent rains, cleanses the trees. He tries to manage this treatment so as not to interfere with the buds.

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FINE MANGOES.

The *Demerara Argosy* notices an improved variety of mango, grown in that colony, which it describes as "two or three times the size of ordinary mangoes. The weight varied from one pound to 1¼ pound each fruit, which shows that it is one of the largest kinds. In shape it is rather globose, about five inches long by four inches wide, with a considerable depression on the inner side near the end, which makes it rather kidney shaped, as many other mangoes are. The color is a light, rather clear green, with a slightly yellowish, often warm, tinge toward the base; the flesh is short, firm and luscious, and the flavor excellent. The stone is flat, weighing about one-half ounce, so that deep solid slices of the fruit are obtainable on each side. In the collection cultivated here, it is second in size and about fourth or fifth in quality, if indeed, it be not equal to some. Taking its several characters together; it certainly must be classed in the category of the best mangoes we have; and it possesses the great and very important merit of being in season when other kinds are not."

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BEET VERSUS CANE SUGAR.

Official statistics published in Germany show that the best yield of sugar now obtained from beets in that country is 12 per cent, or 12 pounds to every 100 pounds of beets, or 240 pounds of sugar to every ton of two thousand pounds. When beets were first cultivated for sugar making, a century ago, the yield was but four per cent, the increase being attributed solely to skillful cultivation and selection. Sugarcane during that period has not shown a like improvement, and taking the average of different countries indicates little or no advance.

Commenting on the above facts, the *Louisiana Planter* says that "Bulletin No. 18 of the U. S. Department of Agriculture reports the average sucrose in the mill juices at Magnolia plantation last season to have been 13.69 per cent, and that 15.55 per cent was reached, so that our basis of 14⅔ per cent for a yield of 200 pounds of 96 test sugar per ton of cane should not be difficult of attainment, and we shall hope to see this content of sucrose and the 200 pound yield generally reached by our best sugar-houses within a very few years.

"No house in this State now realizing under 150 pounds of sugar from a ton of cane can hardly claim to be doing even creditable work. There are faults somewhere, and they may be impossible of remedy, but we should try. At 75 per cent extraction every ton of cane gives 1,500 pounds of juice, and if it test but 11 per cent sucrose it contains 165 pounds sugar, and it should all be obtained or accounted for. The theory that the glucose prevents one to one and one-half its own weight of sucrose from crystalizing seems not to be true; and we think it is a fair proposition to assert that in such cases as just cited 150 pounds of sugar of 96 test should at least be procured from a ton of cane; and, further, that the lands should be made to yield juice that will show more than 11 per cent sucrose, and then if 11 per cent juice will give us 150 pounds sugar per ton on 75 per cent extraction, $14\frac{2}{3}$ per cent sucrose would give us 200 pounds sugar per ton on the same extraction."

Here in these Islands, while the yield of sugar per acre has been largely increased over what it formerly was, and over the best returns of other lands, yet the yield of sugar per ton of cane—has probably not been improved in the same ratio. It is impossible to state what it is, because as a rule, the cane is not weighed before being ground. But it would certainly be very desirable if these facts could be ascertained. From several plantations where the cane ground has all been weighed, we hope to be able to give the figures in a future issue.

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THE PROSPECT FOR SUGAR.

The advance in the price of sugar, which had been expected for six or eight months past, came during May with a suddenness that startled sugar men in every part of the world. Yet it was a natural rise which no human power could arrest. The increase in consumption of sugar has been steady, calling for increased supplies both for manufacturing or canning purposes and for food and drink. This increase in America is about seven per cent. each year, and considerably less in Europe. Taking five per cent. as a fair average for the world's annual increase in consumption, and estimating the consumption for 1888 at 5,000,000 tons, the natural increase in the demand for 1889 must be 250,000 tons, or a total of 5,250,000 tons; and if the rates keeps the same it will exceed 5,500,000 tons for 1890. This subject of the steady increase in the demand for sugar has not been so thoroughly investigated by sugar statisticians as it might be, and must be in future.

The production of cane-sugar cannot be increased to any great extent beyond the yield of 1888, which may be called an average good one. Cane planters have to contend with various drawbacks, such as drought, hurricanes, and insect diseases or blights, which check the growth and reduce the crops, often to an extent that is disheartening. These are not confined to one country or district, but each has to bear the burden of disaster in turn. If we look back in the history of the past we will observe that in periods of about ten or twelve years—some say every eleven years—droughts and hurricanes are more prevalent throughout the world than in the intermediate seasons. Whether these are produced by solar phenomena, such as a decrease in the sun's rays and heat is a question for philosophers to solve; but there are many who believe that the sun is the prime cause of the disturbance. Be this as it may, the fact remains, that every ten or twelve years there is an unexpected falling off in the production of cane sugar, which disturbs prices in every market.

It is to beet sugar the world must look for a supply to meet the steadily increasing demand. And, for this reason, we look hopefully to the efforts now being made by Colonel Spreckels and his associates to introduce the growth of the sugar beet and its manufacture in California, the climate and soil of which are admirably adapted to it. All the beet sugar that can be produced in that State for the next twenty-five years will not supply the annual increase required for the sixty millions of inhabitants of the United States, which is now sending to Europe to procure its raw sugars. We sincerely wish the California beet sugar enterprise success, and are confident that it can never affect the demand for Hawaiian cane sugar, which for certain purposes cannot be dispensed with.

In *Sugar Cane* for May, we find some remarks by a writer, M. Dureau, which possess interest in this connection:

"The interesting point will be to know the amount of the consumption of 1888-89. It appears probable that it will be in excess of that of 1887-88, at any rate, the experience of former years leads us to presume so. But what will be the increase? We do not know. The *Prager Zuckermarkt* lately admitted that the figure would reach 5,300,000 tons. Under these circumstances, the production of cane sugar (for export) being reduced to 2,307,000 tons in consequence of the Cuban deficit, and the production of beet sugar being 2,622,000 tons, the total supply for 1888-89 would be 5,420,000 tons, and deducting the amount taken for consumption, there would only remain 120,000 tons for the general visible stock on the 1st October next. This figure may be doubled, if you like; none the less, the situation would be excellent, and, in any case, the production of 1889-90 will have to increase to a very notable extent for this situation to be modified in an unfavorable sense. Undoubtedly there are requirements which will have to be met by the producers, but the manufacturers will do wisely not to over-increase their production ; the statistical position of the article has become excellent, and its maintenance is henceforth dependent simply on the prudence and the moderation of the producers."

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THE NEW HONOMU SUGAR MILL.

Under the efficient management of Mr. Wm. Kinney, the Honomu plantation, after a long and hard struggle of ten or twelve years, has been brought before us as a first-class plantation, promising for the coming crop not less than 2,000 tons sugar. Heretofore Mr. Kinney has had to take off his crops with the most primitive machinery. He had a fairly good mill driven by water power, but frequently, when the cane was ready the water wasn't, and when the water was ready the cane was not. But a very favorable change has dawned on the plantation, and the company's stock has jumped up within a few months, from $25 to at least $110. A new mill and boiling house, embodying all the best modern improvements hitherto introduced in these islands, are now about to be erected. The machinery is being furnished by the Honolulu Iron Works Co., and consists mainly of the following : A 30x60 inch five-roller mill, with heavy double gearing, driven by a Putnam engine 18x42 inch, of the most improved make. All the mill shafts are steel, as also all mill and gearing pinions.

The juice will flow by gravitation from both mills into five clarifiers, and when treated will further flow into five precipitators. Both clarifiers and precipitators have float-pipes, etc. The juice is drawn from the precipitators into the vacuum cleaning pan and cleaned automatically, from which, when cleaned, a tank of suitable dimensions receives it. On the same floor with the vacuum cleaning pan is a six-foot triple effect, which then takes the juice, concentrates it, and delivers it into a storage tank for vacuum pan. The main vacuum pan is 8x10 feet and will strike about eight tons sugar, the pan platform is about six feet above the triple effect floor, but in a line with the triple effect. The pan discharges its sugar through an 18 inch gate into centrifugal mixer, to which are suspended four of Weston's most recently improved 30 inch centrifugals. All the coolers will be on wheels, and on the same floor as the vacuum cleaner, triple effect and preciptators, and will be arranged to tip into the mixer, thus avoiding the labor and muss of digging the contents out and also all other inconveniencies connected therewith. The sugar, when discharged from the bottoms of the centrifugals will drop into the packing-room, the floor of which is about nine feet below the baskets and tubs. The sugar boiler on the platform of his vacuum pan can see everything from clarifiers to where the sugar is loaded in bags on the cars that take it to landing for shipment. The molasses from centrifugals will be pumped in the usual way to blowup tank from which it will flow to storage tanks for secondary vacuum pan which occupies a convenient position to discharge, either into the coolers or into the mixer of centrifugals. This admits of keeping the large vacuum pan for number one sugar only.

On a level with the centrifugal platform is the lower floor of the building finished off with cement. On this floor stands the vacuum pumps and other pumps belonging to the vacuum cleaner, triple effect, etc., storage tanks for juice and molasses, as also three iron mud-presses and pump, and tank for the reception of all skimmings, washings, settlings, etc., etc., for nothing is supposed to be wasted that will yield sugar.

The works are capable of making twenty tons sugar a day. Everything will be arranged so that the minimum number of hands will be required to run the works. The cane will slide from flume on to the cane carrier of the three-roller mill and the trash from the two-roller mill will drop in front of the boiler furnaces. The steam boilers consist of two pairs Hind's tandem boilers 5½ feet diameter and usual length, fitted with a pair of Young's exhaust steam superheaters similar to those in use at the Waiakea plantation, so that a great portion of the heat, that would otherwise go off up the chimney, will be absorbed by the exhaust steam and carried off to do duty in vacuum cleaner, triple effect, vacuum pans, etc. Ordinarily no live steam will be used save for the engines and pumps. It is anticipated that by this method of working, a very considerable degree of maceration water will be used on the trash from three-roller mill, without using any other fuel than the trash burned right from the two-roller mill.

It should be mentioned that vacuum cleaner, triple effect and vacuum pans are to be mounted on iron staging, and that the buildings will be wood frames covered with corrugated iron and set on solid stone foundation. The boiler-setting will be principally of brick. The mill and engine foundations will be of stone laid in cement mortar, and under the mill-beds will be "iron-bark" timbers 16x24 inches. It is thought that this set of works, though not by any means as large as some, will be the most complete in the islands, not excepting the now celebrated Waiakea mill.

We learn that the erection as well as the management of the works will be in the hands of Mr. John Sherman, who has had many years' experience on some of the largest plantations on these islands, in whom, we believe, Mr. Kinney will find very able support.

CORRESPONDENCE AND SELECTIONS.

LOUISIANA SUGAR EXPERIMENT STATION—WHAT DISTANCE APART SHALL WE GIVE OUR CANE ROWS?

[From Dr. Stubbs' Field Experiments in Sugar Cane, Bulletin No. 20, we copy the following articles on distance of cane rows and best manures for cane.]

To test this question, a plat of ground was selected that had been two years in oats, followed each year by pease broadcast. The ground was broken and carefully laid off in experiments of three rows each :

Experiment 1, three rows 3 feet wide. Experiment 2, three rows 4 feet wide. Experiment 3, three rows 5 feet wide. Experiment 4, three rows 6 feet wide. Experiment 5, three rows 7 feet wide. Experiment 6, three rows 8 feet wide.

These rows were two acres long, and were divided into equal parts. Upon the upper part, plant was used for seed ; and on the lower, stubble. Each of these parts was again equally divided, and upon the southern half of each part manure was used, the same amount to each experiment. This gave each row the same amount of manure, but very varying quantities per acre. Bradley's Fertilizer was used on the part planted with stubble, and Bowdker's Fertilizer on that with plant. These goods were especially prepared in Boston, for Mr. Frank Ames, for his sugar plantation, and by him presented to the Station.

The previous culture of this plat (thirteen) was 1885, in cane; 1886–'87, in fall oats, followed by "solid pease," which were removed for hay. The ground was broken with four-horse plows in September, directly after the pea-vines were removed. It was harrowed, rows laid off, and cane planted in the open furrows (two stalks and a lap), October 24th ; covered with plow, and land-bedded out, and the middles and drains opened. All except one row in the six-foot plat germinated early in the spring, and gave a good stand. This row happened to fall about an old open water furrow, previously used to divide the plats of oats and to drain the soil. It was several inches lower than the other rows, and the cane did not appear until some weeks after the stand was secured elsewhere. This row never caught up with the rest, and its effects are plainly shown in all of the results of the six-foot row experiments. It also clearly illustrates the value of thorough drainage and the disadvantage of spots depressed even a few inches.

On May 10th, the manures were applied after the cane had been off-barred. This was distributed by hand, throwing the fertilizer from the open furrow on one side across the row to the open furrow on the other side. The soil was then returned to the cane and the middles split out. Up to this time the cultivation had been uniform and easy, but subsequently the three and four-foot experiments received no cultivation. Two attempts were made, after the cane had reached several feet in height, to cultivate these rows with a two-horse plow, by driving the mules "tandem," but a failure was made each time. The soil was too stiff. The other experiments were cultivated, like the rest of the cane on the station, in the usual way.

The difficulty of cultivation must always remain as a serious objection to narrow rows for cane in stiff soils. In light soils a one-horse plow may do all the work effectually. However, in these experiments our narrow rows do not show any loss from lack of cultivation, nor from the absence of high ridges and deep middles, though the subsequent seasons were extremely unfavorable.

A diagram of plat No. 13, with yield, sucrose, glucose and available sugar per acre, is here presented. Also the results of experiments with manures, and yields and analyses:

DIAGRAM.

PLAT 13—DIFFERENT DISTANCES IN THE ROW. 3 ROWS EACH.

FRONT.

	3 ft. rows.	4 ft. rows.	5 ft. rows.	6 ft. rows.	7 ft. rows.	8 ft. rows.		
Yield per Acre, tons	31.37	23.53	20.82	16.22	17.10	19.75	No Manure.	Plant Cane for Seed.
Analysis								
Sucrose	13.00	11.9	12.00	12.70	12.30	12.90		
Glucose	1.01	.96	·83	s92	.86	.40		
Available sugar per Acre, lbs.	5046.18	3545.78	3136.32	2570.54	2635.79	2190.57		
Yield per Acre, tons	35.91	31.44	27.71	21.29	21.91	18.40	Bowker's	
Analysis								
Sucrose	11.20	12.20	11.20	11.90	9.50	12.50		
Glucose	.86	1·07	.86	1.06	.87	.96		
Available sugar per Acre, lbs.	4982.15	4665.70	3845.87	3023.	2515.27	2849.06		
Yield per Acre, tons	34.41	25.93	24.91	21.69	24.89	20.65	No Manure.	Stubble for Seed.
Analysis								
Sucrose 11 20								
Glucose .75								
Available sugar per Acre, lbs.	4432.58	3659.24	3575.30	3060.99	3576:48	2914.13		
Yield per Acre, tons	39.38	38.55	34.04	30.87	29.69	21.59	Bradley's.	
Analysis								
Sucrose	14.10	12.50	13.40	12.80	12.70	12.40		
Glucose	.78	1.15	.97	1.15	1.08	.97		
Available sugar per Acre, lbs.	7128.57	6748.56	5694.89	4788.55	4605.57	3177.91		

REAR.

RESULTS OF PLAT 13—DIFFERENT WIDTHS OF ROWS IN PLANT CANE.

Widths of rows, feet.	Fertilizer used.	Amount Fertilizer per acre.	Yield per acre in tons.	Analyses. Degree Baume	Analyses. Total solids.	Analyses. Sucrose.	Analyses. Glucose.	Purity co-efficient.	Glucose Ratio.	Lbs. available sugar upon 70 per ct. extraction. Per ton.	Lbs. available sugar upon 70 per ct. extraction. Per acre.
3	Bradley.	1336 lbs	39.38	9.	16.2	14.1	.78	87.03	5.33	181.02	7128.57
4	"	1002	38.55	8.4	15.1	12.5	1.15	82.78	9.12	150.90	6748.25
5	"	800	34.04	8.8	15.8	13.4	.97	84.81	7.23	167.30	5694.89
6	"	668	30.87	8.5	15.3	12.8	1.15	83.66	8.98	155.12	4788.55
7	"	573	29.69	8.4	15.2	12.7	1.08	83.55	8.50	155.12	4605.51
8	"	504	21.59	8.2	14.8	12.4	.97	83.78	7.82	153.30	3177.91
3	No manure		31.41	7.3	13.2	11.2	.75	84.09	6.75	141.12	4432.58
4	"		25.93	7.3	13.2	11.2	.75	84.09	6.75	141.12	3659.24
5	"		24.91	7.3	13.2	11.2	.75	84.09	6.75	141.12	3515.30
6	"		21.59	7.3	13.2	11.2	.75	84.09	6.75	141.12	3060.91
7	"		24.69	7.3	13.2	11.2	.75	84.09	6.75	141.12	3516.48
8	"		20.65	7.3	13.2	11.2	.75	84.09	6.75	141.12	2914.13
3	Bowdker's.	1336	35.91	7.5	13 5	11.2	.86	82.96	7.67	138.79	4982,15
4	"	1002	31.44	7.8	14.0	12.2	1.07	87.14	8.77	148.40	4665.70
5	"	800	27.72	7.4	13.4	11.2	.80	83.58	7.67	138.74	3845.87
6	"	667	21.29	7.9	14.2	11.9	1.06	83.80	8.90	144.31	3023.00
7	"	573	21.91	6.7	12.0	9.5	.87	79.16	9.15	114.80	2515.27
8	"	504	18.40	7.8	14.	12.5	.96	89.28	7.68	154.84	2849.06
3	No manure		31.37	8.0	14.4	13.	1.01	90.27	7.76	160.86	5040.18
4	"		23.53	7.5	13.6	11.9	.96	87.50	8.06	146.44	3545.73
5	"		20.82	7.9	14.2	12.0	.83	84.50	6.91	150.64	3130.32
6	"		16.22	8.2	14.8	12.7	.92	85.81	7.32	158.48	2570.54
7	"		10.10	8.0	14.4	12.3	.86	85.41	6.99	154.14	2635.79
8	"		19.75	8.4	15.1	12.9	.90	85.43	6.97	161.70	3190.57

COMPARISON OF RESULTS OF PLAT 13.

	3-foot rows		4-foot rows		5-foot rows		6-foot rows		7-foot rows		8-foot rows	
	Tons.	Available sugar	Tons.	Available sugar	Tons.	Available sugar	Tons.	Available sugar	Tons.	Available sugar	Tons.	Available sugar
Bradley's......	39 38	7128.37	38.55	6748.25	34.04	5694.89	30.87	4788.55	29.69	4605.51	21.59	3177.91
No manure.....	31.41	4432.58	25.93	3659.34	24.91	3575.30	21.69	3060.99	24.89	3576 48	20.65	2214.13
Bowdker's......	35.91	4982.15	31.44	4665.70	27.72	3845.87	21.29	3033 00	21.91	2515.27	18.40	2849.06
No manure.....	31.37	5046.18	23.53	3545.73	20.82	3136.32	16.22	2570.54	17.10	2635.79	19.75	3190.57
Average.........	34.52	5402.87	29.86	4654.73	26.87	4048.09	22.52	3380.77	23.39	3318.26	20.12	3032.92
Excess of 3-foot rows ove.r....	.....	....	4.66	747.64	7.65	1354.28	12.00	2021.60	11.13	2084.11	14.40	2569.45
Excess of 4-foot rows over.....	.....	....	.....	....	2.99	606.64	7.34	1273.96	6.47	1336.47	9.74	1621.81
Excess of 5-foot rows over.....	.....	....	.....	....	.....	....	4.35	667.32	3.48	729.83	6.75	1015.17
Excess of 6-foot rows over	.....	....	.....	....	.....	....	.....	....	.....	62.51	2.40	347.85
Excess of 7-foot rows over	.....	....	.....	....	.....	....	.....	....	.....	....	3.27	285.34

The sugar content in these experiments seems to depend upon factors other than widths of rows, though the average of the three-foot rows experiments show (slightly) the highest amount of sucrose and lowest of glucose.

This was expected on account of imperfect cultivation and closeness of rows. The following table gives the average sucrose and glucose of each group of experiments:

TABLE SHOWING AVERAGE SUCROSE AND GLUCOSE OF EACH GROUP PLAT 13.

	Sucrose.	Glucose.	Group.
Average of 3-foot rows	12.76	.88	1
" 4- "	12.20	1.06	2
" 5- "	12.20	.89	3
" 6- "	12.80	1.04	4
" 7- "	11.50	.90	5
" 8- "	12.60	.94	6

In the above experiments the cane planted with "stubble" had, for two years, received an application of Cotton Seed Meal, Phosphate and Kainite on oats, while that planted with "plant" had received only Phosphate and Kainite. This accounts in part at least for the increased yields of the Bradley fertilizer and its "no manure" over the Bowdker and its "no manure."

To plant an acre in cane, with rows seven feet apart, using "two stalks and a lap" for seed, will require about four tons of cane; at the same rate there will be required for seed:

In three-foot rows, 9⅓ tons per acre; in four-foot rows 7 tons per acre; in five-foot rows 5.6 tons per acre; in six-foot rows 4⅔ tons per acre: in seven-foot rows 4 tons per acre; in eight-foot rows 3⅓ tons per acre.

Subtracting these quantities from average yield above will give net cane per acre over the amount used in planting as follows:

Three-foot rows, 25.19 tons; four-foot rows, 22.86 tons; five-foot rows, 21.27 tons; six-foot rows, 17.86 tons; seven-foot rows, 19.39 tons; eight-foot rows, 16.62 tons.

It is unwise as well as unscientific to draw conclusions from a single year's experience, yet the above results strongly suggest thought and reflection. Have we not in our efforts at easy and thorough cultivation passed the boundary of maximum yield of sugar content in the width of our rows? Do not wide rows and late cultivation also tend to large immature canes at harvest? The frequent remarks of planters that "cane never grows well until laid by," and "cane never grows fast until it shades the ground," cause the inquiring mind to ask the reasons for these popular axioms. May not the frequent rupture of the roots in cultivation, which wide rows permit to be extended (perhaps) beyond the requirements of the plane, and the growth of grass and weeds, which flourish longer (because unshaded) in wide rows (the killing of which often requires the late cultivation), have much to do with originating these popular beliefs? It is certainly desirable in this climate to have early maturing cane. To do this, obstacles or checks upon its growth must be presented in some form in order that it may do the only thing left it—*i. e.* mature These obstacles may be found in want of drainage or lack of fertility. The last obstacle may be presented by withholding fertilizers, absence of deep plowing, want of rain and crowding the land with cane, etc. May not a width of rows just sufficient for good cultivation, varying according to soil, be better than the conventional seven-foot row now almost everywhere found? The station will continue to test this question.

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MANURES FOR SUGARCANE. SUMMARY OF RESULTS.

The year just closed has served to emphasize, in a most positive manner, the deductions of former years. Never before have properly compounded manures exhibited such results in tonnage and sugar content. Early in May the rains began, forcing the roots of the cane near the surface, thus restricting their foraging areas. Those plants which were properly manured grew well developed stalks, despite the limited areas, wet weather and unfavorable seasons: while those unmanured, limited in all their resources, made small and watery stalks. It has not been, however, a year of heavy tonnage or large sugar content; but pre-eminently one of low glucose content, thereby making nearly all of the sugar present available. The experiments here are sufficiently pronounced in their results to convince the most skeptical of the efficacy of manures on cane, when they are properly compounded and intelligently applied.

Many of the questions last year were propounded to plant cane, with satisfactory replies. This year the stubble has been permitted a hearing, and its reply is fully in accord with the recorded evidence of the plant cane. Let us hear the year's testimony.

1st. That the upper portion of the cane is the equal, if not the superior, to the lower part, giving unmistakeable evidence of this both in its first and second year's growth.

2d. That there was but little difference in the stubble of those plats whereon different number of stalks were used in planting.

3d. That seed from good first year stubble has given as good results the first and second year as seed from plant.

4th. Conclusively that stubbles (ratoons) come equally as well (and perhaps better) from the original sprouts as from suckers.

5th. That Nitrogen in some form is badly needed by our soils to grow cane, and while Sulphate of Ammonia furnishes it in a form slightly better adapted to our wants, there is, however, no marked superiority over any of the leading forms; a gratifying fact, permitting the use of Cotton Seed Meal, a cheap home product, instead of an expensive imported article.

6th. That excessive quantities of Nitrogen are always injurious to sugar content, and this year have only been partially utilized by the crop, suggesting waste and extravagance. Quantities varying from 21 to 42 pounds (that which is found in from 300 to 600 pounds of Cotton Seed Meal) to the acre, are strongly suggested as the limits of profitable production by the experiments of the past three years. However, to produce maximum results, Nitrogen should be properly combined with Mineral Manures.

7th. The Mineral Manures alone are without decided effects (save on new grounds and pea vine fallows, and often here much improved by proper combination with Nitrogen), but combined properly with Nitrogen, are productive of the highest results.

8th. That the Phosphoric Acid needed by our soils is best supplied in the soluble form as Acid or Superphosphate. The insoluble forms in Charleston Floats, Orchella and Grand Cayman Guanos, seem also to be available after awhile; the time depending upon character of soil and fineness of fertilizer.

9th. That excessive quantities of Phosphoric Acid, while not beneficial, are not, as commonly supposed, lost—since this substance, neither leaching nor evaporating, may serve the plant in the future. The practice of supplying excessive quantities to the plant is, to say the least, *not economical.* The limits of profitable production seem to be between 40–75 pounds per acre.

10th. That Potash under any form, in small quantities, is without visible effect either upon tonnage or sugar content; but when used in excessive quantities for several years upon same soil, has given increased tonnage without enhancing the sugar content.

11th. That the influence of a crop of pea vines turned under is more perceptible to the stubble than to the plant cane.

12th. That draining lands by tiles has increased the yields in '86–87 by about 35 per cent, and '88 by 50 per cent.

13th. That the effects of tiles are yearly increasing and are now perceptible in adjoining plats.

14th. That growing cane in narrow rows has given this year increased tonnage and *sugarage* per acre, and is worthy of further investigation.

15th. That the station has this year grown forty-eight varieties of foreign cane, some of which are full of promise.

With these deductions the intelligent planter can easily formulate a manure adapted to his soil and crop. If his lands are fresh or have just been in pea vines, his plant cane will need only small quantities of Nitrogen, but a goodly portion of Phosphoric Acid. One part of Nitrogen to two parts of Phosphoric Acid will probably be the best proportion for his mixture. These are obtained by mixing Cotton Seed Meal and a 14 per cent Acid Phosphate in equal parts.

On succession cane, or stubble cane, or even plant cane upon poor or black stiff lands, more Nitrogen is required, and the quantity should be increased just in proportion to the poverty or stiffness of the land and the age of the stubble. Nitrogen may equal, or even greatly exceed, the Phosphoric Acid. A mixture of two parts of Cotton Seed Meal to one part of Acid Phosphate furnishes Nitrogen and Phosphoric Acid in about equal parts; while three parts of Meal and one of Acid Phosphate will give one and a-half times more Nitrogen than Phosphoric Acid—a mixture very desirable sometimes upon old stubble or land long subjected to continuous (succession) cane. Under no circumstances ought the above mixtures to be used in quantities larger than 900 pounds per acre, and it is highly desirable that the minimum limit should not fall below 500 pounds. More than this maximum quantity cannot be assimilated by the cane plant prior to the desired time of maturing, viz: early in September. Less than the minimum quantity gives an early vigor of leaf and root to the young plant, which is too soon summarily checked by the exhaustion of the manure, and the plant either prematurely ripens or languishes into a slow and unhealthy growth.

In the application of manure great care should be exercised that it becomes as thoroughly mixed with the soil as possible. It is advisable to apply, at least, a portion of the manure under the cane at the time of planting. Phosphatic and Potassic manures can then be used with impunity, for they neither leach nor evaporate. Indeed, it is positively asserted that Potassic manures, to succeed best, should always be applied several months before needed by the plant. Only Nitrogen manures suffer loss by leaching, and hence a portion of these may with propriety be withheld till the cultivation of the plant. However, in our soils, the leaching out of Nitrates is done in such small quantities as to elicit little or no uneasiness. As a rule, Phosphatic and Potassic manures, particularly the latter, should be put at the depth required by the roots of the plants. They become fixed as soon as they come into contact with the soil. While Nitrogenous manures should always be placed above the roots of the plant, since they have a tendency downward, some of them are best applied as top dressing, while all do best when not buried too deeply.—*Louisiana Field Experiments.*

BUHACH.

While the real meaning and derivation of the word Buhach may be left to the researches of linguists and philologists, since it has been adopted as the trade mark and name for a California product, it has become a familiar word throughout the United States. There have been insect powders and insect powders upon the market for many years, but none so effective as Buhach, and its wonderful insect-destroying properties have made it a necessity in every house in the land.

Buhach is a fine powder made from the blossoms of the plant *Pyrethrum Cinerariæ Folium.* This plant is a native of Persia, Asia, where its peculiar properties were first discovered. It was afterward introduced into Dalmatia, Austria, and has been extensively cultivated there and in the adjoining states, Herzegovina and Montenegro, for many years, and the importance of the industry was considered so great that especial efforts were made to prevent the sale of the seeds or plants for export, in order that its production might be confined to that country. Insect powder made from the Dalmatian plant was first put upon the European markets about thirty years ago, and it has been found in the leading markets of the world ever since that time. Trieste, Austria, is the great market for the product, from whence it has been shipped to all parts of the world. Large quantities of the flowers and powder are imported from that city to the United States, a single house in New York having imported on an average 150 tons per annum for the last ten years.

The plant was first grown in California by G. N. Milco, who being a native of Dalmatia, and knowing of its value to that country, was after many efforts enabled to procure seed from which he successfully grew the first plants about twelve years ago. After making many experiments in order to find the soil and climate best adapted to the plant, he in 1880 associated himself with J. D. Peters and A. C. Paulsell under the name of the Buhach Producing & Manufacturing Co., and commenced the growing of the plants on an extensive scale upon a tract of land situated near Atwater, Merced county. Mr. Paulsell soon retired from the company, and the business was continued by Messrs. Peters and Milco until the death of the latter in 1886, from which time it has been prosecuted by J. D. Peters, who had from the organization of the Buhach P. & M. Co. furnished the capital for inaugurating the industry. From the blossoms grown upon the Buhach plantation in Merced, the insect powder now so generally known as Buhach has been manufactured. The flowers are shipped from the plantation to Stockton, where the mill is located in which the Buhach is manufactured.

At present the company has about 300 acres under cultivation in this plant, and the area is being annually increased as the demand for the powder becomes greater. Its cultivation requires careful and intelligent supervision, and it cannot be successfully grown except by irrigation. It requires at least three years from the seed to grow plants capable of producing a paying crop of flowers, and then the plant will continue to produce for four or five years longer, although it is in its prime and most productive when four and five years old. It grows to a height of about thirty inches, and is planted in rows four feet apart, and from fifteen to twenty-four inches apart in the row. The flowers are generally harvested in the latter part of May. The stalks are cut at the roots of the plant, and then by hand the flowers are broken off by passing the stems through a sort of comb, which detaches the flowers, which fall into a box and are then carried to the drying ground, where they are spread upon sheets and exposed to the rays of the sun during the day, being often turned in the meantime, and at night are covered to prevent them from absorbing any moisture. The perfect drying of the flowers is a most important operation, as in order to retain the volatile oil which gives to the powder its insecticide properties, it is very necessary that the flowers should be dried quickly and thoroughly, and be protected during the process from all moisture. A light dew falling upon the flowers during the drying process will color them and reduce their insecticide properties. In this respect the California-grown flowers are better cured and consequently more valuable than those grown in Dalmatia.

It is also a well-known fact to those familiar with the Pyrethrum flowers, that they are liable to be adulterated by the admixture of flowers of no value, which, however, closely resemble the Pyrethrum, and experts may be deceived unless the powder manufactured from the combination is thoroughly tested to prove its insecticide qualities. In the year 1888, a large quantity of the flowers of the Hungarian daisy was placed upon the market, mixed with a small proportion of the true Pyrethrum insect flowers, and the powder made therefrom was sold at prices very much in excess of its true value.

As the Buhach manufactured and put upon the market by the Buhach Producing & Manufacturing Co. is always made solely from the flowers of the California grown-Pyrethrum, it is of better quality than any other insect powder, and can always be relied upon to be as represented when purchased in the original packages, on which is the trade mark of the company. Powders are sometimes manufactured from the whole plant, including the stems, leaves and flowers, which possess, to a certain extent, the insecticide properties of Buhach, and are undoubtedly far superior in strength to many of the insect powders that are found upon the market; yet as the blossoms of the Pyrethrum plant are richer in the essential oil which gives the peculiar insecticide properties of the plant, powder manufactured solely therefrom is the strongest and best that can be made.

The best demonstration of the truth of the above statement is shown by the rapidly increasing demand for Buhach. For several years after the company commenced the manufacture of the powder, the demand was moderate and could be easily supplied. The situation is very different at the present time, for now the whole product of the plantation is readily sold, and the company is forced to use every effort to enlarge the area devoted to the cultivation of the plants to meet the increasing call that is made upon them by their customers

Having determined that they will not put anything upon the market under the name of Buhach except that which is manufactured from the best Pyrethrum flowers, they are unable to manufacture it excepting from flowers of their own raising, which are acknowledged by experts long in the business of dealing in flowers to be the best produced in the world, as the peculiar condition of the soil and climate of the locality where the plantation is situated seems to be particularly favorable to the production of a plant rich in the essential oil which makes it so effective in the destruction of insect life.

Although the industry may still be regarded as being only in its infancy, it has required a large expenditure of capital to place it in its present position. Many thousands of dollars have been expended in advertising, and many more in experiments before the proper methods of cultivating the plant and of manufacturing the powder were ascertained. Pluck and perseverance have, however, overcome all obstacles, and the future of this industry is now very promising.

The use of Buhach in almost every house to prevent the ravages of moths, and to suppress the annoyances so long suffered from mosquitoes, flies, and other troublesome insects, has become too general to require any explanation in an article like this. It is used by thousands of people, and all who use it fully indorse its efficacy. It is now sold in every State in the Union, in Mexico, Central America, the Sandwich Islands, Japan and Australia, and everywhere it is once introduced it gives satisfaction, and is pronounced the chief of its kind.—*Pacific Rural Press.*

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The Botanical Gardens, London, have succeeded in cultivating the kermes oak (*Quercus coccifera*), which, when punctured by one of the coccus insects, produces the ancient blood-red dye supposed to have been used by Moses to tint the hangings of the tabernacle. The kermes oak is a dwarf, bushy shrub, somewhat resembling a holly, and grows profusely in Spain.

THE SEEDLING SUGARCANE QUESTION.

A few weeks ago Mr. Scard, Chemist to the Colonial Company, Limited, who was on his way to Trinidad, wrote me from Barbados: "I have been to-day with Mr. Wolseley, to see the seedling canes at Dodd's, and from what we observed I have no doubt of the genuineness of the discovery. Not only did we see old canes which had been grown from the seedlings originally accidentally discovered among the experimental canes, but also seeds in the actual stages of germination and subsequent growth. The seeds are gathered from the actual arrow, when the latter has matured, and are sown in boxes, but only a small per centage appear to germinate. Those that do, as soon as the sprouts appear above the soil, are transplanted into baskets, and carefully tended. The seedlings are extremely delicate. Mr. Bovell kindly gave me a specimen—a little plantlet with leaves hardly an inch and a half long—for you, which I am leaving in his care until my return. The variation exhibited by the first-discovered seedlings, which have now matured, is a very remarkable feature. Their production seems to have been the result of spontaneous cross fertilization, and as they were discovered on ground where different kinds of canes were growing, this inference is probably correct. Mr. Bovell said there appeared to be about ten different varieties among them. These had been sorted as carefully as possible and replanted, the whole cane being cut up for the purpose. The young canes from the latter are now springing vigorously, and when ripe ought to admit of definite determination. It would have been interesting to have gathered seed from the matured seedling canes, but, curiously enough, from some unexplained cause, they arrowed very feebly. I shall bring over for you on my return some seeds in different stages of germination, and the young plant mentioned above. I think it must be admitted, as a settled fact that canes do seed, and can be grown from the seed. What a grand future this this opens out!"

Mr. Scard returned by last mail, and brought the plant and seeds mentioned in his letter. As he says, from the evidence adduced, there can be no doubt now that at least, certain kinds of sugar cane, under favorable conditions, do produce fertile seed. By gathering the spikelets from the panicle (arrow), sowing and rearing plants therefrom, Mr. Bovell has demonstrated this beyond question, and removed the doubts, which I dwelt on in the issue of these columns of January 29th last, left on the subject after Professor Harrison's initial communication. What variety of cane the seed was gathered from, beyond the fact that it was a colored cane, and whether more than one kind seeded, Mr. Scard did not ascertain.

Now I come to the remarkable fact that though the seminal fertility of the sugar cane has all along during the commercial history of the plant, been denied or discredited by the great and overwhelming majority of those most in a position to be informed as to the fact, it has nevertheless existed all through, manifesting itself at rare intervals to observers, who from time to time recorded the fact. It is easy to be wise after the event, but we are able now to look at the question from the impartially critical point of view, and see where the great body of observers went wrong. Their argument was founded on an *a priori* judgment; they had been engaged in cane cultivation for a lifetime, perhaps or many years; the cane had been under their notice daily for the time, and they had never seen seed or seedlings; hence their conclusion that those who asserted that the cane did seed had been mistaken; and this view had come to be the traditional belief of mankind. They were hardly to be blamed either, for the negative evidence, unreliable as we now see it was in character, was vast beyond proportion to the meager and scattered affirmative evidence, which reached most countries as a rule, at wide intervals of years, only as a faint echo from a distant land. Yet the matter has not lain silent; from time to time it has been discussed, more often however in an academical rather than a practical way, in almost every cane sugar producing country. Many years ago the, now defunct, Royal Society of Jamaica took up the subject, and instituted a series of more or less careful and comprehensive inquiries with a view to settle the doubtful point. The result of the enquiry was—"that no variety of sugar cane was known to perfect its seed (or indeed to produce anything like seed) either in the West Indies, China, the Straits of Malacca, Egypt, or even in the South Sea Islands, as in all these countries the cane is entirely propagated from cuttings."

But whenever a subject gains sufficient prominence to occupy a more or less general public attention, it is almost immediately found that much more is known regarding it than was at first supposed. This question of the sugar cane breeding is no exception to that rule, and now that the matter has been carefully looked into, abundant record is found that both seed and seedlings—the latter both spontaneous and raised and grown to maturity by hand—have been repeatedly seen, over a period extending back many years, and through many generations of the plant, chiefly in Barbados, but occasionally also in other parts of the world. Looking back at the records of the subject now, we see that the evidence in regard to Barbados seeds and plants has throughout been of a character to command unquestioned acceptance from every impartial person, and why it was overlooked or discredited so long, except for the reasons already given, would puzzle one to conjecture. It may be—and indeed seems in fact to have been—that the possible great importance of the discovery was not sufficiently realised, and emphasised, by those who first made, or repeated it, and hence it did not become so widely known as to take its place as part of the settled information of mankind. As was to be anticipated, it is the colored varieties of cane, as approaching more nearly in character to what is inferred to have been the original type, that have now and hitherto demonstrated the fact. Probably under the favorable conditions that seem to prevail in Barbados to realize this end, Mr. Bovell, by his intelligent interposition and observation, will be able to say in a year or two whether the function of seed bearing is confined to the colored canes, or is shared in, to any extent, by the generally superior yellow and white varieties, as to which we have no information at present. Yet, though the seed bearers appear to have been limited, there must have been a large amount of cross-breeding, many varieties having contributed to the fertilization of the few. This interposition of numerous kinds as males, is evidenced by the great variety of character manifested in the seedlings, now grown to maturity, which were first found on the ground, as described in the communications from Professor Harrison, republished in these columns a few weeks ago. But even among the colored canes that seed, it seems that not many ovules are fertilized, very few actual seeds being produced, or that, at least, germinate, from the many hundreds of flowers borne in a panicle. To the minuteness of the seed, which is so small as not to be distinctly seen without the aid of a lens or simple microscope, must be attributed chiefly the doubt that has so long prevailed as to its existence. Hence, too, the very delicate character of the young plants, which but for this delicateness would no doubt survive in such numbers in the canefields as to have never allowed the fact ever to have been doubted. As to what will be the economic and commercial bearing of the matter, now that it has been again and forever demonstrated, on the cane sugar industry of the world, there can be little doubt, From what we know of the great improvement that has taken place in other cultivated plants through selection in seminal generation, the discovery can hardly prove other than important and beneficial. An improved variety on the best we now have may not be obtained, possibly for several years, but we may be confident that if the better kinds do, or can be induced to breed, with systematic attempts, carefully conducted to control the operation, and careful trial and selection of the progeny, improved forms will in time result. Turning now to what I may venture, not altogether inappropriately, to call the literature of the subject—which, as I have said, proves now that attention has been universally directed to the subject, not so entirely obscure as was generally supposed when the question was raised a few months ago, I am indebted to Mr. M. Francis, the Government Analyst, for the following, among other references to it in the pages of the *Sugar Cane.* I regret that considerations of space do not permit of my giving more copious extracts, to afford a more adequate idea of the many highly interesting papers and notes, for and against, that have been published on the subject; and I must too confine myself only to those papers and notes which affirm, or tend to affirm, the fact within the past twenty years. The first extract (*The Sugar Cane,* Vol. III, p. 203) is from a report of Mr. J. Caldwell, member of the Chamber of Agriculture, Mauritius, in 1870 or '71, on sugar cultivation in New Caledonia. He says: "It has been hoped by many persons that we might come across the cane seed in New Caledonia, where the plant was asserted to be indigenous, and that hence might be propagated many useful varieties. * * But of finding this fertile seed in New Caledonia I have no hope whatever, * * * I met indeed at Noumea, with Mr. Belangcon, a French botanist, collecting for the Cabinet d'Historie naturelle of Paris, who is considered an authority on grasses, but who had not paid any particular attention to the cane flower before I brought it to his notice. He showed me what he considered seed, but as he could not get it to germinate, and I have not since heard from him on the subject, I conclude he has come round to the same opinion as others. In fact, I took upon myself to say to him that I was sure the Chamber of Agriculture would gladly make it worth his while to collect a certain quantity of cane seed, *if he could get it to grow.*"—Again at p. 215: (*Ibid.*) "At one of the last sittings of the Chamber of Agriculture of Mauritius, a letter was read from M. Lemerle, of the Island of Reunion, informing the Chamber that he had been so fortunate, on his estate at *Riviere-des-Creoles,* to establish the possibility of the reproduction of the sugarcane from seed."—*Journal des Fabricants de Sucre.*—At p. 374 (*Ibid.*) appears the following: "Through the courtesy of Mr. Wm. Drumm we have received a few seeds of the sugarcane raised by him of the purple variety. We are taking steps to ascertain whether plants can be raised from them in this country under suitable conditions of temperature, etc. We hope Mr. Drumm will be successful in raising new and improved varieties of cane. The subject is one of great importance; we are glad that it is receiving attention."—The following letter is from *The Barbados Reporter* of April 25th [1871]; "To the Editor.—Dear Sir, We learn from *The Sugar Cane,* for April, something further as to sugarcane seed, showing us that the suggestion of Mr. William Drumm as to the reproduction, crossing, and improving of the sugarcane by growing it from seed, has been followed up with good promises of success in New Caledonia, and also established in the Island of Reunion. ante, p. 203 and 205. Here, in Barbados, as it is chiefly the transparent or purple cane which arrows and seeds, we do uot care much for that variety, being fully satisfied that its seeds are procurable and fertile, as natural grown plants, and perfect seeds have been shown at our annual exhibitions. We would advise all who desire to procure sugarcane seeds to follow Mr. Drumm's advice, and cover the arrow or flower of the cane with a fine muslin bag, as soon as it opens, and keep it covered and tight on the stem till the whole is fully ripe, and then to pick out the few perfect seeds from the multitude with a magnifying glass of good power. The sugarcane seed shown for the last few years at our exhibitions, aud now to be seen at No. 1 Broad Street, cannot be seen distinctly with the best of good eyes, but with a magnifying glass they show themselves perfect seeds, very much like miniature oats. We are advised that we can have some cane seed plants to show at our next exhibition, and we have as good a right to hope and expect success with the sugarcane, as the foresters of America had when they crossed the wild fox grapes of the prairies with the cultivated kinds and procured the prolific wine and luscious table grapes of that continent. It is a fact, that we want *new* and better varieties of the sugarcane.—Respectfully yours, Drumm & Co,"

In the first volume of *The Sugar Cane*, p. 162, Oct. 1, 1869 is published Mr. Wm. Drumm's original letter on the subject, from which I quote only the part that is most to the point: "All the sugar books say that the plant will not *now* seed, or will only give imperfect seed, and that such a seed is quite unknown. True; but it need not be so, for any sugarcane planter who will allow a sugarcane plant to fully ripen and arrow, and on its arrowing or flowering will then envelope the flower or arrow in a muslin bag until it is fully ripe, and then search it, will find the seed in abundance.* * * * The seed has been planted and grown previously by a Mr. Clarke in this island, but this story was discredited. An accidental discovery of natural grown seed plants is also on record here, having been shown and published at our Agricultural Society's Exhibition, and is beyond any doubt as they produced vigorous transparent canes."

To a curious article, p. 529, vol. 3 of *The Sugar Cane,* (Nov. 1st, 1871), by Dr. Auguste Vinson, in which fact and nonsense are most pretentiously blended and confused, the following editorial note is appended:—Seeds of the sugarcane have been obtained and sent over to England by Mr. Drumm of Barbados. They have been distributed to various hot-houses in different parts of the country, some having been forwarded to Kew

Gardens. As yet, however, it is not known whether they are growing." [There must be some record at Kew of this transaction.—Ed].

But Mr. Drumm is not the only authority in regard to seedlings having been raised in Barbados years ago. At different times seedlings,—apart from those found growing spontaneously,—were raised by different planters of that island, some of whom grew the plants to maturity. If the reports of the meetings of the Agricultural Society of the island, and files of the newspapers or agricultural correspondence, of twenty years ago or more were looked up, doubtless additional information might be gathered. I suggest this research to anyone on the island desirous of writing the local history, or of compiling a bibliography, of the subject.

Bruce, in his travels, seems to have been the first to record that cane, like other grasses, seeded, and that in the East plants were raised from seed.

This much has been so far gained. We are now able to account for the numerous varieties of sugarcane that exist. These, no doubt, were all produced from seed naturally shed, without the intervention of man, the greater number probably before historical days. Having at last discovered nature's secret man may now direct her operations to his own advantage.

Finally, to sum up the results of this brief and partial inquiry. The extracts that I have quoted show that this is not the first discovery of either cane seeds or seedlings, especially in Barbados, which country from the first has contributed the most reliable evidence on the subject; but the matter is now placed on a sure foundation from which it can never again by ignorance or discredit be shaken, and for demonstrating this beyond cavil or question Messrs. Bovell and Harrison are entitled to due credit and the thanks of the sugar planting world, A door, revealing a limitless vision, is opened to breeders and experimenters, whose duty in regard to which, and the lines along which they should work for success, having said so much already in this paper, I will leave for detail another day.—*The Demerara Argosy.*

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JAPANESE ORANGES.

Being somewhat of a fruit-grower in this part of our county, though with but modest pretensions as a horticulturist, last year I made a hopeful attempt at orange-growing at Tres Pinos. The variety in which I ventured was the Oonshui or Satuma, a hardy Japanese tree. Fifty trees were received from Japan, a number of which I planted at my place, the balance being distributed among different parties in the county.

As a result of this test I was delighted to find that these trees, though quite small and clearly exposed and absolutely unsheltered, withstood all of our winter frosts and freezings (which for several mornings presented ice one-half inch thick) in open gardens, with leaves as crisp and waxy as those reveling in the "land of flowers," or enjoying the balmy clime of the "City of the Angels."

Besides the hardiness which this variety has evinced here and which is now acknowledged, some of the trees developed quite a number of blossoms during the summer following their planting, thus showing, as is claimed for them, that they will produce in two or three years, or as soon as sufficiently vigorous to mature fruit.

These two facts, learned from experience, together with the best authority for the excellence of the fruit, has induced me to start an orchard of them this year. Many of my neighbors and others have also planted numbers in their gardens. In all there are about 200 trees to my knowledge distributed through the county.

For a full and impartial description of the real merits of this orange, together with a plate (illustration), etc., see the United States Agricultural Report for 1887, California Horticultural Reports, and the *Pacific Rural Press* of February 16, 1887, all of which corroborate my statements as to this orange, as regards its wonderful hardiness, great prolificness, early bearing, profuse fragrance, seedless fruit of medium size and excellent quality.

Professor C. C. Grorgesion says of it: "It is, perhaps, the finest orange in existence. It is par excellence the queen of oranges in Japan, and needs only to be known to be appreciated in America."—*California Exchange.*

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A SUGARCANE BORER.

(*Sphenophorus obscurus* Boisd.)

[Prof. Riley, Entomologist of the Department of Agriculture at Washington, publishes the following relative to the beetle known here as the cane-borer. We may add that it is a small insect, seldom more than five-eighths of an inch in length, and is found only in the lower joints of cane growing on lowlands or in swampy districts. It seldom bores higher than twelve inches above the soil. It is difficult to eradicate this pest when it once enters a field, but its increase can be greatly checked by burning off the cane fields after harvest.]

In August last we received from Mr. E. J. Wickson, of Berkeley, Cal., a piece of sugarcane, brought from the Hawaiian Islands, infested by borers, which were reported to do considerable damage. The specimens were sent to Prof. Dickson by

Prof. LeRoy D. Brown, President of the State University of Nevada, who collected them in June, while visiting the Hawaiian Islands. Prof. Brown's attention was called to the subject by his Majesty King Kalakaua, who requested him to bring the specimens to this country for study. The cane received at the Department proved to be infested by the larvæ of a large Snout-beetle of the genus *Sphenophorus*, several species of which are known to bore into the stalks and roots of corn in this country. Our Annual Report for 1881–2, p. 138 *ff*, contains an account of the habits and transformations of the species which more particularly affect corn in the United States, and which are known as Corn Bill-bugs

The only previous notice of Sugarcane Borers, in the Hawaiian Islands with which we are familiar is from the Hawaiian PLANTERS' MONTHLY for July, 1883, but this refers to the Lepidopterous borer *Chilos Saccharilis*, a species which is widely distributed wherever sugarcane is grown. Another species of *Sphenophorus* affects sugarcane in the West Indies and South America, and was described by the Rev. Lansdown Guilding in his prize essay on "Insects Affecting Sugarcane." (Trans. Soc. of Arts, Vol. XLVI., 1828) as *S. Saccharis*, while the well known *Rhyncophorus palmarum* is also mentioned as injuring the cane in the same locality.

We succeeded later in rearing the adult beetle, but failing, with the literature at our command, to recognize it among the vast number of described species, we sent a specimen to Dr. David Sharp, of England, who kindly gave us the following references quoted from the "Memoirs on the Cleoptera of the Hawaiian Islands," by T. Blackburn and D. Sharp, a work which we could not consult:

"Genus CXXVI. *Sphenophorus* Mun. Cat., VIII. p. 2646 360. *Calandra obscura* Boisd. Voy. Astr. 11, p. 448. Fairm. Rev. Zool., 1849, p. 474.

"Ins. Oahu. Introduced. Tahiti, New Ireland. In the stems of banana, on the mountains. This insect is apparently omitted in the Munich Catalogue of Cleoptera."

Judging from the specimens of sugarcane received from Mr. Wickson, the damage caused by the beetle must be very great since the stalks were completely riddled with the galleries of the larvæ, several of the latter being in a piece of cane about eight inches long. The galleries are wide when compared with the diameter of the larvæ, and not long, mostly running longitudinally, but some also across the cane. They are filled with macerated fibre which the larvæ apparently pushes behind itself. When ready to pupate the larvæ somewhat enlarges the channel and forms a coarse cocoon of fibre in which the transformation takes place. The outside of the infested cane shows several small round holes which probably represent the place where the egg has been inserted by the parent beetle, and several large, oblong openings which are probably the exit holes of the emerging beetle.

As we received no other notes on the natural history of the species we can say nothing as to time and mode of oviposition, the duration of the larval state, hibernation, etc. The only other information is that contained in the quotation from Blackburn and Sharp's Memoir on the Hawaiian Cleoptera, viz: That the species attacks also banana stems, and further that it has been introduced (no doubt with sugarcane or banana plants) on other islands in the Pacific Ocean.

In the absence of any more definite information it is difficult to suggest any preventatives or remedies for this pest. Since the larvæ apparently works in the lower part of the canes and probably also in the roots, many larvæ will no doubt remain in those parts of the plants after the rest of the cane has been cut and carried off to the sugar-houses. The remaining stubble should be carefully examined and all infested stumps destroyed. Ths same should be done with all diseased or dying banana plants.

Since neither sugarcane nor bananas are cultivated in California there is but little danger that this *Sphenophorus* will become acclimated in that State from the Hawaiian Islands.

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THE BANANA TRADE.

Although the climate of even the most favored portions of Southern California is not suited to the growth of the banana, otherwise than for ornamental purposes, the local consumption of the imported article reaches proportions which entitle the subject to more than a passing notice.

The increase in the local importations within the last few years is remarkable. In 1886, 49,554 bunches were brought into this port, which at the very moderate estimate of 100 bananas to a bunch, would make a consumption of half a million. In 1887 the number of bunches rose to 53,708; in 1888 they wers 73,031, while during the first three months of the present year 21,888 bunches were imported. The last figures would give a total of 80,000 bunches, equal to nearly a million of bananas as the present year's consumption.

Every one knows that the banana is a very delicate and perishable fruit, very palatable and wholesome when ripe, but exceedingly colicky and unwholesome when raw or decomposed. It is hard to say what sort of a hereafter should be the portion of the pedlers who buy up unsound and condemned bananas for sale to the poor. Chickens and hogs fatten rapidly on such food and defy its assaults on the mucous membrane of the intestines, but with human beings the case is different. A banana should be like an egg, a shirt-collar, an oyster or Cæsar's wife—above suspicion.

For the past few days the local market has been entirely depleted of bananas, but few understand the reason. In the first place the demand is large and increasing, while the supply is fluctuating and confined entirely to one source—the Hawaiian Islands. The steamers plying between these islands and San Francisco are run without the slightest regard to the interests of importers of perishable commodities, so that whereas two steamers from Hawaii may dock at San Francisco within a few days of each other, glutting the market, there will be an interval of nearly a month before another arrives. In the interval the market runs short and all the perishable cargoes of the banana class reaching the Hawaiian ports too late for the steamer must be counted as dead loss to the producers.

The local merchants are keenly alive to the disadvantages they suffer in this respect as compared with their Eastern neighbors. It is said that if the demand for bananas should increase in the same ratio as in the past three or four years, there may be a combination to build and run small fast steamers to Honolulu specially for the perishable trade. This is the plan pursued in the East. Five steamers averaging 1,000 tons, and carrying both passengers and freight, ply between Boston and Port Antonio, Jamaica, making the run in six days. This is about the same time that would be occupied in a trip from Honolulu to San Francisco by the same class of vessels.

It might be supposed that the numerous sailing craft plying between the Hawaiian Islands and this port might be usefully employed in bringing bananas to market, but such is not the case. Even if the fruit is cut from the tree quite green, and packed with the utmost care, it will not stand a sea voyage extending over more than ten or twelve days. The moment the fruit is bruised decomposition sets in and spreads with great rapidity. It is for these reasons that attempts to introduce a separate supply from the East and from Central America have failed. A few years ago six carloads of the West India red-skinned banana were shipped to San Francisco by way of Florida, and the overland route. They were only nine days in transit, but the failure of the enterprise was conclusive. The shaking up on the cars damaged the fruit to such an extent that the sales of what was sound left a margin of only $2 on the carload. Two of the cars were unloaded here, one at Sacramento and the others at Portland, Oregon.

There is an abundant supply of bananas in Central America, but the fruit cannot be brought to this market in good condition with the present means of transportation, the trip occupying from twelve to fourteen days. Another circumstance which interferes with the use of this route is the unsatisfactory atmospheric conditions. Bananas require to be kept in quarters having a steady temperature of about 70 degrees, and, as before remarked, they must be handled with special care in loading stowing and unloading. The Central American ports have no wharfage facilities, and cargoes are loaded in a heavy surf, on lighters, from which they are transferred to the vessel. It thus appears that for years to come the banana supply of San Francisco and California must be restricted to the Hawaiian Islands.

The principal plantations are in the vicinity of Honolulu and on the Island of Maui. The variety chiefly grown is the Chinese. It is not as delicately flavored as the Tahitian or Cuban banana, but it bears transportation better. The bunches are cut as soon as the fruit is fully grown, but still green. Each bunch is wrapped in the large dried leaves of the plant itself, and shipped exclusively by steamer, as the fruit will not bear more than a six days' voyage without decaying. None but the largest and finest bunches are shipped, and, therefore, thousands of pounds of the fruit are thrown away each year because, growing in small bunches, though each banana is as fine as any sent abroad. The experiment of drying this fruit for export is now being tried.

The cultivation of the banana requires special care, and has been reduced to an exact science. The land is plowed up and the sprouts are put in about eight feet apart in line. It takes from ten to twelve months before the fruit is sufficiently grown to be cut from the trees, which reach from twenty to twenty-five feet in height. An expert goes over the field every other day. When he sees a tree whose fruit is well grown and ready for the market he takes a sharp knife about two feet long and cuts the bunch half way through. As it drops over slowly and bends down he catches it by the stem and gives another swift cut, so that the bunch is borne to the ground without damage to the fruit, which is then perfectly green. It is taken from the field to a storage place located near by, thence carried carefully in carts to the wharf, where the steamer is in waiting to receive its cargo.

Like the oyster the banana is best eaten raw, but those who prefer to employ the art of the cook will find the fruit available for treatment in a variety of ways. It may be cooked either green or ripe, fried alone or in batter, baked with the skins on like a potato, or made into puddings, pies or cakes. In Central America, where bananas form the staple food of the population, they are cut into strips and dried or pounded into a paste. In the green state they contain a considerable quantity of starch, which is converted into grape sugar in the process of ripening. In 100 pounds of bananas there are 74 pounds of water, 20 of sugar and two of gluten or flesh-forming substance. The deficiency of the latter requires that a small quantity of meat or other nitrogenous food be added to constitute a full dietary for human consumption; but there is probably no single article of food supplied by nature so nearly filling all requirements as the banana. Humboldt says that the land which, when planted with wheat, will feed one man, will feed twenty-five when planted with bananas.

The Spaniards, who saw religious emblems in every natural object, discerned in the transverse sections of the banana a resemblance to a cross, and hence supposed it to be the forbidden fruit of Genesis, in which Adam saw the mystery of redemption by the cross.

There is a common notion that the plantain and banana are the same fruit, but this is not so. They are varieties of the same species. The plantain is larger, coarser and less luscious than the banana. It is common in Central America, and is always cooked before being eaten. The two fruits are easily distinguished when bunches of each are laid side by side. The plantain fruit is longer, larger and much more sharply curved, so that the bunches have a straggling appearance. There is also a deep purple stain on the banana, which is wanting in the plantain, and the sheaths of the latter are angular at the extremities instead of being rounded, as in the banana.

Notwithstanding the development of the banana trade in California, it is insignificant in comparison with that of Massachusetts and the Atlantic States. Over 100,000,000 of bananas were brought into Boston last year, and from $1,000 to $5,000 is often cleared from the cargo of a single steamer. The capital invested by New England firms in their West India banana plantations amounts to many millions of dollars, yet they can hardly supply the demand.—*S. F. Chronicle.*

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TONNAGE OF CANE, ETC.

An idle hour spent in a little "figuring for the curious," gives results which may be utilized by even the practical planter in judging of the tonnage of standing cane and some other matters connected therewith.

Basing the average weight of cane, when cut for the mill, at one-half pound to the running foot, a five-foot stalk will weigh two and a-half pounds, and this is accepted as the approximate average in what figuring may follow. This estimate of the weight of sugarcane is deduced from some careful work in 1886, upon cane of the Lower Coast, which cut eight feet for the mill—polarization 12½ per cent, the average result per stalk being: Juice, 57.6 ounces; dry bagasse, 6.4 ounces; total weight, 64 ounces; equal to four pounds, or one-half pound to the running foot.

A square acre of land measures nearly 208.7 feet to each side, this giving 29.9 seven-foot rows, or 6,240 running feet of cane rows to the acre. Now, if there be a *stand* of only one stalk to the running foot, and that stalk being a five-foot one of two and a-half pounds weight, then the tonnage per acre would be 15,600 pounds, or 7.8 tons, from which, by complete extraction, there would be 14,040 pounds, or 7.02 tons of juice. If this juice, after making due allowance for reducing sugar, polarizes 10 per cent, the yield of sugar, if no "waste in the sugar-house," should be 1,404 pounds, which at five cents per pound, gives *seventy dollars per acre*, which last—dollars and cents—is the only truly practical answer to the questions of "How many tons to the acre?" or "How much sugar to the ton of cane?" Reconcile these two questions by asking a third one of "*How much money to the acre?*"

Returning to the tonnage, the following table of figures is based upon a five-foot stalk of cane weighing two and a-half pounds. To utilize the table for cane-cutting more or less than five feet for the mill, add to or subtract, as the case may be, from the results or figures in columns three, four, five and six, one-fifth of said results for every foot more or less than five feet. Thus, if five-foot cane gives $100, seven-foot cane would give two-fifths *more*, or $140. Four-foot would give one-fifth less, or only $80 per acre.

TABLE GIVING RESULTS FOR DIFFERENT STANDS OF CANE.

Number of stalks per foot.	Number of stalks per acre.	Tons of cane per acre.	Tons of juice per acre.	Pounds of sugar per acre.	Dolllars and cts. per acre at 5 cts. a lb. for sugar.
1	6,240	7.8	7.02	1,400	$ 70 00
2	12,480	15.6	14.04	2,800	140 00
3	18,720	23.4	21,06	4,200	210 00
4	24,960	31.2	28.08	5,600	280 07
5	31,200	39.0	35.10	7,000	350 00

By a little practice in measuring with the eye and mental calculation, one can closely approximate the tonnage of standing cane. There is some truth in the saying "the bud in August measures the length for the mill;" yet, in measuring by the eye, the tendency is to overestimate the *stand*—stalks to the running foot—as well as the length for the mill. Have you not heard the exclamation of "That is a solid stand!" meaning cane to cane, forming a continuous wall of one cane in thickness.

Supposing such a solid wall or stand of eight-foot cane; a little figuring will show a result approximating 150 tons of cane, 135 tons of juice, 27,000 pounds of sugar, which at five cents per pound represents $1,350 per acre!

"What's the use of figuring out such wild theoretical possibilities?" Much, very much, to both the theorist and to the practical planter, if he will only act in accordance with the progressive thought suggested thereby. Let the practical cultivator of the soil *figure*—figure out practical results in dollars and cents—from the data of his daily observation in the cane field, and he will soon find ways of accomplishing more than simply "good enough." Even wild, theoretical possibilities become valuable guide-posts to improvement and advance in the sugar industry of the State. How many of the 3,000 or more sugar planters, managers and overseers of the sugar belt of Louisiana can tell the average number of cane eyes planted to the running foot, and what proportion of the same that germinates? If the planter acquaints himself upon this one point, he will be forced to admit that there is vast room for improvement, even in the *planting* of cane. Let us do a little figuring right here; The average number of eyes to a foot of seed cane is two and two-thirds. Planting "two canes and a lap" equals about two and a-half canes, which multiplied by the number two and two-thirds, gives practically seven eyes to the running foot in planting. If they all germinate, and give only two suckers each, there will be twenty-one stalks to the foot, which, if cutting five feet for the mill, equals from 150 to 160 tons of cane, or $1,250 to $1,500 per acre. What does this figuring, wild though it may be, emphatically argue? Incidentally, that at the best, you loose five out of every seven eyes you plant. What waste of dollars and cents! Can you still stick to the "good enough" theory—a theory which is not only the mother germ of all decadence in art and science but of nations?

A few more words on "tons per acre?" or "sugar per ton?" There is a medium ground between these two points of discussion which the *dollars per acre* most feelingly endorse. The settling or location of that "medium ground" can be accomplished by figures which are left for others, lest the reader should think that too much figuring is being done by

—*La. Sugar Bowl.* GREY BEARD.

SUGAR BEETS.

RESULTS OF A SEASON'S EXPERIENCE AT WATSONVILLE.

Recently the *Appeal* published a letter from a Feather River farmer who discussed the subject of sugar-beet culture for this part of the State, reaching an unfavorable conclusion. Desiring to have any misapprehensions relative to the industry cleared away, and to obtain accurate and trustworthy information on the subject for the benefit of our farmers, the *Appeal* sent the published communication to the Western Beet Sugar Company at San Francisco with a request that it be fully answered. The matter was referred to the company's agent at Watsonville, who courteously responded with the following valuable communication:

WATSONVILLE, April 1, 1889.

Editor Appeal: In your paper of the 24th ult., " A Farmer" compares beets with potatoes, and from the figures he gives draws a conclusion unfavorable to beets and favorable to potatoes. Before I discuss his figures I will remark that his standard of comparison is a bad one for this valley, as nearly every one lost on potatoes.

I differ considerably from all "Farmer's" figures, He begins by setting the price paid for beets at $4 per ton, which is too low. The average last year for the crop of 14,000 tons was $5 04: of this 7000 tons were delivered before the fall rains set in, and averaged $5 50 per ton. As in future the factory will receive the entire crop before the rain, I think it is fair to take the latter rate as an average.

I hardly understand what the "Farmer" means by "digging" beets. I see he estimates the cost at $1 50 per ton, so I suppose it is to be done by manual labor. Here they dont dig them at all, but plow them out with a plow especially made for the purpose. A man and two horses can plow out two or three acres per day, and besides an enormous saving in labor, the crop will be about five per cent larger, as in digging by hand the spade cuts off the end of the root, which is left to waste in the ground. The beets thus loosened are pulled up, the loose dirt shaken off, laid in rows and are ready for topping. A woman in Germany will top about four tons a day, and the American laborer after a little practice should certainly equal this. Reckoning wages at $1 50 gives 40 cents for topping, 15 cents for plowing up and 15 cents for loading into wagon, making a total of 70 cents per ton. This amount was not exceeded by many practical farmers last year.

I will now take the hauling, the expense of which is set down by "Farmer" at $1.50 per ton. It may surprise "Farmer" to learn that at this rate many patches were not only hauled, but also plowed and topped by contract, and the contractors made money. The hauling here was done partly by the farmers themselves and partly by teamsters. The price paid for hauling one to two and a half miles was 50 to 75 cents per ton. These teamsters acknowledged good wages. I infer it costs a farmer a little less to do it with his own team.

Taking 70 cents for plowing up, topping and loading into wagon, and 75 cents for hauling, make (at "Farmer's estimate of twenty tons to the acre, which is a fair yield for bottom land), cost of harvesting $29 per acre, and reckoning the beets at $5.50 per ton, leaves $81 per acre for plowing, planting and thinning.

In support of the above, I will give you the results of beet-raising of a few farmers here. In all the instances the work done by the farmer himself or by his teams is reckoned at the price he would have to pay for hire, so the actual profits are rather larger than they appear. I may add that all the gentlemen named have contracted for an increased acreage this year.

F. Therwachter, Watsonville, three miles from the factory, 10 acres; plowing, etc., $50; thinning, $190; topping, $133; hauling, $150; total $544.

Yield, 154 tons; value, $972.80; net profit, $429.80; per acre, $42.98.

W. M. Gorham, Watsonville, 1½ miles from factory, 5 acres; plowing, etc., $25; thinning and hoeing, $90; topping, $115.20; hauling, $85; total, $282.20.

Yield, 132 tons; value $570.81; net profit, $288.61; per acre, $57.72.

J. B. Hudson, one mile from factory, 10 acres; expenses of cultivating and harvesting (no details given), $614.33; yield, 260 tons; value, $1,306.96; net profit, $692.13; per acre, $69.21.

T. Mitchell, one mile from factory, 6 acres; plowing, etc., $30; thinning, $96; topping, at 75 cents per ton, $108; hauling, at 50 cents, $72; total, $312.

Yield, 144 tons; value, $621.76; net profit; $309.76; per acre, $51.62.

A. F. Richardson, two miles from factory, 11 acres; plowing and harrowing, $110; sowing, $6; harrowing after sowing, $3; four days' cultivation, first time, at $2, $8; 23 days' thinning, at $1.25, $28.75; 24½ days' thinning and hoeing, at $1.25, $30.65; five days' hoeing, at $1.25, $7.59; nine days' hoeing, at $1.75, $15.75; seven days' hoeing, at $1.75, $12.25; nine and a-half days' hoeing, second time, at $1.75; 16.65; one day's hoeing, second time, $1.75; four days' hoeing, second time, at $1.75 $7; fixing plow, $250; one plow, $15; three knives, $2.35; two knives, $1.50; four baskets, $3.50; topping and loading 170 1-20 tons at 80 cents, $136.04; hauling, at 50 cents, $85; plowing up at 20 cents, $34. Total, $535.94.

Yield, 170 1-20 tons; value, $921.81; net profit, $385.87; per acre, $35.08.

These results speak for themselves, and were obtained in a year when everybody was new to the enterprise. With the experience gained and by the help of improved machinery I am confident that every one of the expenses will be reduced, and every succeeding year establish sugar-beet raising as one of the most important and profitable of California industries.—*Cor. Marysville Appeal.*

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A Profitable Cherry Tree.—It is in print that the owner of a cherry tree which stood in the way of a German railroad extension near Niederlahustein, asked $900 for the tree. Experts were appointed who finally agreed to award him his seemingly large claim, and the tree was then removed.

MANUFACTURE OF BEET-SUGAR IN GERMANY.

When beets are brought to the factory by the farmers, the first thing done to them is to thoroughly cleanse them, which is accomplished by pouring them into a hopper from which they pass into a canal through which they are washed by rushing water which carries them into the wash-house, where they are thoroughly cleansed. The washing of the beet removes all earth, gravel and other dirt clinging to them. The first principle of beet-sugar making is to keep it as nearly as possible free from all contamination and impurity. In the wash-house they pass through a machine which cleanses them thoroughly and which is too complicated in its character to be fully described here. The water used is of a warm temperature, consisting partly of steam condensed from the boiling apparatus from the adjoining factory; this water being about thirty-five degrees Centigrade, greatly assists in the cleaning, particularly when the beets are slightly frozen. After being thoroughly cleansed, the poor parts of the beets are cut away, the greenish upper part and all parts which are decayed and undesirable for use being removed. These parts are cut away as the beets are carried through the wash-house on a long endless belt or transporter of wire, which moves slowly so that the work-people beside it can cut away the defective parts of the beets as they pass along before them, which they do with great facility. From this endless belt they fall upon a large circular sieve which revolves horizontally and which permits the water to drain out and which, as it turns around, revolves before other workmen who remove the defects in the beets left by those who work upon the transporter. From this sieve they are carried by a belt or chain, having cups or buckets attached to it, to a large box or car upon a truck, which, when filled, is pushed along upon rollers to the weighing machine; here the beets are weighed and then are carried to the cutting machine, and by the time they are ready for this machine about thirty per cent of the weight has been removed by the washing and trimming processes.

The cutting or slicing machine cuts the beets into very thin slices. This machine consists of a disc revolving on its own axis at a great rate of speed and fitted with sharp knives; the slices slip down under the knives and fall into another transporter which receives them and which carries the sliced beets to the diffusion vessels. By the diffusion process nearly all of the saccharine properties of the beets are extracted. Heat is an important factor in the process; the higher temperature the more rapid the diffusion. The diffusion machinery consists of twelve vessels called diffusers, each having a heater for raising the temperature of the beets to the degree desired before they pass into the diffusion apparatus which is called a battery. The diffusers are cylindrical receptacles having water-tight and hermetically closed covers. The beets are thrown in from the filling transporter until the receptacles are filled, then they are closed by an hermetically shutting lid. It takes about ten minutes to fill a diffusor; where there are twelve used, one is always being filled and one emptied while the remaining ten are being operated. The diffusion juice, which consists of about sixty per cent of the diffuser, is obtained by adding fresh water under a pressure of one and one-half atmospheres. The water is drawn from a reservoir high enough to produce the required pressure and into which it is raised by means of a water pump. By separating out by means of compression pumps applied from the last diffuser to the last diffuser but one, the juice collects and leaves a diffuser which is being filled with other slices of beets which have been brought to the desired temperature, which is done by the application of a system of steam-pipes through which circulates the juice which streams through from diffuser to diffuser.

In the first six diffusers the juice is kept at about seventy degrees Centigrade, but from this point the temperature declines so that the last diffuser, when emptied, is only about thirty degrees Centigrade. The diffused juice being drawn from the diffusers, is then conveyed into a measuring cask. The juice having been drawn off from the diffusers, the slices from which most of the juice has been extracted remain in them; the manholes at the bottom of the diffusers opened, the slices are emptied out and the diffuser thoroughly cleansed before it is filled with fresh beets. The slices, after being taken from the diffusers, are carried by transporters to powerful presses which extract nearly all of the moisture from them, the residue being used as feed for cattle, and in which remains less than three per cent of the original saccharine properties of the beets. From the measuring cask into which the diffused juice passes, it is drawn off and treated with lime and carbolic acid, which precipitated all of the non-saccharine or foreign substances which would interfere with the crystalization of the sugar if pains were not taken to remove them from the juice. This process being completed, the juice passes through what are called sand-catchers, from which it goes into the filter-presses, which consist of a number of four-cornered plates over which cloths are stretched and through which the fluid passes before leaving the press. It is treated to another process of milk of lime, after which it goes through a second series of filter-presses; it is then treated with sulphurous acid, after which it goes through still another series of filter-presses.

After being thoroughly cleansed the juice is re-heated and run into the evaporating apparatus. The temperature of the juice, when it arrives at the evaporating apparatus, is about seventy-five degrees Centigrade. This apparatus consists of one or more vessels; the more there are the more economically it works. The evaporating apparatus is freed from air by the aid of a great air pump, which is required for making the juice boil at a temperature of less than 100 degrees Centigrade. The steam from the boiling juice passes into a condenser, from which the water is first pumped and carried by pipes into the wash-house, where the beets are cleansed, which we described in the beginning of this article. The juice contained in the last vessel of the evaporating apparatus is called syrup, which is pumped out, purified and filtered, after which it goes to the vacuum boiler. From the vacuum boiler the steam is condensed by an apparatus very similar to that used in the condensers we have described, in which the juice is brought to the required thickness. In the vacuum boiler the syrup is manufactured either into raw sugar, or into sugar ready for consumption, much depending upon its treatment, though it is not always possible to make the sugar in the vacuum boiler of the degree or property desired to be attained. When sufficiently evaporated for crystalization, the sugar is run out of the boiler into receptacles, where it is cooled and stirred until brought to the proper degree of granulation. It is then carried to the centrifugal machines which consist of cylinder drums over which are stretched finely perforated sieves which revolve with great rapidity, the syrup being drawn out of the sugar by centrifugal force; that which remains in the centrifugals after the syrup has been removed is the yellow or raw sugar of commerce.—*Grocer's Criterion.*

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HOW TO PRESERVE THE FORESTS.

A plan for the conservation of the forests on the lands which belong to the nation has recently been presented by *Garden and Forest* Almost the only forests remaining on the public lands are those of the mountain region of the Pacific States, and these forests have a special interest and value because of their relation to the agricultural capacity of a vast extent of country lying along the streams which have their sources in these mountain wood. These regions adjacent to the streams, or near enough to be irrigated from them, are not fertile in their present arid condition, but they are capable of great productiveness. All the elements of fertility are in the soil in abundant proportions, except water. This can be supplied only by irrigation. It does not come to these thirsty lands naturally, by rainfall, but must be assisted by the ingenious devices of man on its way to thousands of fields which will thus be made to blossom as the rose, where nature, unhelped, leaves wide expanses desert and unproductive. This water, which is the magical element by which this wilderness is transformed into a fruitful and populous country is stored in the everlasting hills, where the rivers have their springs, and the forests are its natural custodians and distributers. The water supply is abundant, and while the forests stand guard around the sources of the rivers, their flow is as everlasting as the hills themselves.

A mountain forest has more functions than most people have considered. It covers the hills with a vast mat or net-work of living root-fibres, and holds in place the ever-accumulating mass of mold and decomposing vegetable matter, which absorbs and retains the water of the rainfall and melting snows. Such a forest is a great sponge, which receives all the water that falls on the mountains, and allows it to escape gradually, so as to maintain the steady flow of the rivers which it feeds. A forest is thus a natural reservoir for the storage and distribution of the water which falls upon it; and it is far more efficient, as well as far more economical, than any system of artificial storage reservoirs that can be substituted for it. If the forest is removed, this mighty sponge is destroyed, and there is then nothing to perform its function of holding back the water, which will rush down in overwhelming floods and torrents.

The first thing to be noted is that the water will thus all run away at once, at a time when but little of it is wanted, and there will be little or none of it left for the season when it is most needed. The rivers which have been fed by the mountain springs will soon be dry a great part of the year.

The next thing to be observed is that when the forests are destroyed the hills themselves are not everlasting. When the great sponge-like mass or cap of living root-fibres, mold and decaying vegetation which the forest held in place as a crown for the hills is destroyed, the mountains themselves begin to crumble and melt away. The soil which for thousands of years has been meshed and matted along the steep slopes and around the shoulders of the hills has now nothing to keep it in place, and it begins to slip and sink away. When it is heaviest with accumulated water whole hillsides are dislodged from their supporting framework of rocks, and descend with resistless force to the plain below, carrying ruin in their path, and leaving the once beautiful face of the mountain seamed and scarred. The rivers are choked, their channels silted up, and the valleys and adjacent plains are buried irrecoverably beneath the vast accumulations of sand, gravel and *debris*, which the resistless annual floods bring down from the dissolving hills.

All this has been tried in every part of the civilized world, with the same unvarying result. There appears to be serious danger that these disastrous and fatal experiments will be repeated in our treatment of the mountain forests of the western part of our country; but as the forests now belong to the nation they should be effectively guarded against the short-sighted selfishness which would thus ruin them and, by destroying them, forever prevent the development of the regions along the course of the streams below.

The plan proposed by *Garden and Forest* for the protection of these important forests embraces three essential features.

The first is the immediate withdrawal from sale of all forest lands belonging to the nation.

The second step is to commit to the United States army the care and guardianship of the nation's forests. It is shown in the article referred to that there is in time of peace no other work of national defense or protection so valuable as this which the army can perform, and that the national forests cannot be adequately guarded and protected by any other means. It is obvious that the measures which have been tried, including those now in operation, or nominally in operation, have proved almost entirely ineffective. The officers of the army are picked men, educated at the expense of the the nation, and already in its paid service.

The third step in this plan is the appointment by the President of "a commission to make a thorough examination of the condition of the forests belonging to the nation, and of their relation to the agricultural interests of the regions through which the streams flow which have their sources in these forests, and to report with the facts observed a comprehensive plan for the preservation and management of the public forests, including a system for the training, by the Government, of a sufficient number of foresters for the national forest service. . . . A National School of Forestry should be established at a suitable place in one of the great mountain forests on the public lands, and its equipment should be as thorough and adequate for its purpose as is that of the National Military Academy at West Point."

The plan thus proposed has the merit of being practical, and of providing the means and instruments for its own effective and successful administration.

Nothing else at once so direct and efficient, and so thoroughly adapted to accomplish these most important objects, has hitherto been presented for the consideration and action of the American people in connection with this department of our national interests. It should be adopted and put in operation as soon as possible.—*The Century, June, 1889.*

IRRIGATION IN THE ROCKY MOUNTAIN TERRITORIES. EXTRACTS FROM THE SPEECH OF SENATOR STEWART OF NEVADA.

There is on the western slope of the Rocky Mountains an arid region which is an empire of itself. In its length nearly a thousand miles from British Columbia to Mexico, and in width about three hundred miles. Vast streams head in this great range of mountains, with flats and places for artificial lakes. We hardly know what may be done by irrigation. The works of irrigation four thousand years ago were superior to any works constructed in modern times, previous to English engineering in India during the last twenty-five years. We read of Egypt and its vast population, and we wonder at the prominent place it occupied in the world at the time of the Pharoahs. Recently English engineers have discovered a defile leading from the Nile, whether natural or artificial they cannot tell, but across it there is a dyke constructed of masonry, with regulating gates, and they describe it as equal to, if not surpassing, any work of modern times. Below where this ends there is a basin of 250 square miles and of great depth. Evidences all around this basin show where the ancients resided. There is a vast country below this basin which was once irrigated and sustained a large population. The English propose to repair this work and utilize this basin, and reclaim a large part of Egypt which has been a desert for thousands of years.

This Egyptian work is pretty authentically ascertained to have been constructed eighteen hundred years before the commencement of the Christian era. By references to it by Greek writers and other evidences its age is pretty accurately ascertained.

In the little Island of Ceylon we have authentic history of irrigation for about five hundred years before the commencement of the Christian era, and for nearly fifteen centuries every ruler of that island vied with his predecessor and tried to surpass him in irrigation works and in making lakes to save water, and they increased the population so that it rose to be between fifteen and twenty millions, and when these works were destroyed by invaders the people died and and were reduced to less than 2,000,000 in number, which has been increased somewhat since the British rule, and is now about two and a-half millions, and they are largely supplied with food from India.

In India there are works of very ancient origin which show the highest state of engineering. A large portion of the surface of India is covered with reservoirs and artificial lakes, which support a vast population. In Palestine, Professor Marsh tells us, that at every step you see ruins of hydraulic works, showing it had once been densely populated.

So of Persia, parts of southern Europe, Arizona, Mexico and South America. More than half the people of the world have always subsisted by irrigation. Perhaps more than two-thirds of the people now living pursue that practice.

We are especially benefitted, especially blessed here with an area larger than any other on the globe, where there is sufficient rainfall to prosecute farming without the necessity for irrigation. Between the ninety-ninth parallel of west longitude and the Atlantic Ocean the country will generally produce crops without irrigation. West of that to the Pacific Ocean requires irrigation. There is but a narrow strip that does not require it, the northwest corner of California, and those portions of Oregon and the Territory of Washington that lie west of the Cascade Mountains. The arid region has an area of more than 1,200,000 square miles and is capable of sustaining, on any reasonable calculation, a population of 200,000,000 people, perhaps more. The railroad is in this region, and it has produced vast results. The people on their own account, without surveys by the Government, adapted to it, without laws making it convenient, have already irrigated 6,500,000 acres.

Mr. Cockrell—What States?

Mr. Stewart—In the United States—all the States put together. I have been examining that, and had Professor Powell assist me, and I find there is an area approximating 6,500,000 acres under irrigation in the United States.

Mr. George—Is the soil of that irrigated area good?

Mr. Stewart—The best in the world. The country seems to be a barren desert, utterly worthless, where nothing but horned toads can subsist. Put water upon it, and it will produce beyond anything you can comprehend. You have only seen the cultivation by rainfall.

Mr. Chandler—How about the sage-brush?

Mr. Stewart—Wherever you can find sage-brush you can rely upon fertile land. The land there is as productive as any other land in the United States. It is not leached to the extent that other land is. There is a combination of mineral and vegetable matter that is washed down upon it from the mountains, and irrigation, when properly conducted, fertilizes the land. The water from the mountains brings down what is called silt and fertilizing material, which is just suited to produce large crops, and land which is properly irrigated from running streams will produce crops for thousands of years without any other fertilizer. The valley of the Nile, that has been cultivated, according to history, more than 4,000 years, is as rich today as it was when first cultivated. Irrigation renews and refreshes it, and there is no end to the fertility of our arid lands if they can be properly irrigated. Irrigated land will produce such enormous crops and so continuously that I would hardly dare tell what I have seen, because I do not want to entirely lose my reputation for veracity on this floor.

Now, we have this great field. It is barren, and it is the common fate of man to be at war with the desert. The desert has driven him back, and he has subdued the desert in turn, and the whole history of man from his first attempt to cultivate the soil has been a struggle with the desert. The people of the United States have not until now been brought face to face with this problem, because, as I said before, we occupy the largest area of land suitable for cultivation without irrigation in the world. There is no other section on this habitable globe equal in extent to the land in the United States which can be cultivated without irrigation; but mankind first chose the deserts. The deserts were easier to cultivate, easier to subdue than the forests. The region from the Atlantic to the line of prairies on the West—say to Indiana, about that longitude—that region all through the Atlantic and in the South which is heavily timbered was much more difficult to reclaim than this desert as we call it. Those timbered regions required a greater expenditure of labor, of toil, of time, and are a great deal more difficult to reclaim than the arid regions.

If California had been first settled the immigration would have spread over the desert; it would have been occupied at once, and the Atlantic coast would have been untouched. The chance we have for the settler in the West is better if we can appreciate it and enable him to appreciate it. It is as great a heritage as we had for him in the prairie, for forty acres of land properly irrigated, anywhere in the arid region will support a family as well as 160 acres in a region cultivated by rainfall. On land cultivated by rainfall you must constantly use fertilizers. Fertilizers do not hurt any land, but they can be dispensed with to a greater extent where you irrigate.

Great Britain started first to build railroads, and built them all through India. They found that the roads without irrigation were useless, and they then devised a scheme to irrigate the land so as to supply business for their railroads. They first estimated $115,000,000 for irrigation. Much more than that has already been expended, and the result has been entirely satisfactory. In the railroads and in the works of irrigation they constructed, they spent a thousand millions in round numbers, and they increased very much the revenues of India.

About 300 miles of the Central Pacific Railroad is in the valley of the Humboldt, in Nevada. This valley, before any portion of it was irrigated, was the most forbidding in appearance of any section of the overland line. A small part of it has been irrigated, and it has proven to be equal in fertility to any land in the United States. There is sufficient water running to waste in the Humboldt river and its branches to irrigate this entire valley. If this water were stored and conducted over the land by proper hydraulic works during the irrigating season, at least 4,000,000 acres of land could be reclaimed in this valley alone. The irrigated land would be worth at least $50 an acre, and would support a population of more than 300,000. The entire farm area of Massachusetts, according to the tenth census, is not equal in extent to the land susceptible of irrigation in the Humboldt Valley alone. A few millions of the debt of the Central Pacific, if used in works of irrigation for this valley, would create wealth and support a population sufficient to contribute annually to the revenue of the United States more money than could be collected from the company by any funding bill that could be devised. The Central Pacific Railroad, as before stated, occupies this valley. There is no inducement for a parallel road; and in many places the road occupies the sites which will ultimately have to be used for reservoirs, etc., and the road-bed must be changed before the valley can be reclaimed. If the Government insists upon the payment of the debt, without any portion of it being expended for the development of the country or the improvement of the road, the road will remain where it is, and the greater portion of this valley will also remain a desert. Congress can remedy all this by requiring the company to change its road-bed and expend a portion of the money due the Government for that purpose, and also for the construction of the necessary hydraulic works. The Central Pacific Railroad also passes through the valley of the Truckee River, the outlet of Tahoe, Donner and other lakes. Here again is a vast area of several hundred thousand acres of land that can be easily reclaimed by storing the flood-water in the mountain lakes and distributing it by canals on the fertile lands below.

Prof. J. W. Powell, who from his position on the Geological Survey, is well qualified to speak of the possibilities of this Rocky Mountain region, has recommended an appropriation for Experimental Artesian Wells for a similar purpose. In a Report on Lake Tahoe he deals with the irrigating problem in this wise :

"This lake, whose altitude is 6,208 feet, has a catchment basin of five hundred square miles, and an actual surface of one hundred and ninety-five square miles. It is probable that an acre foot of water, that is, an acre of water one foot deep, will abundantly irrigate any acre of land throughout one season ; and it is possible to store in Lake Tahoe 500,000 acre feet, which can be made to irrigate 500,000 acres of land. The catchment basins of Donner, Independence and Webber lakes and of the intervening region is about three hundred square miles, giving the Truckee basin a water-shed of eight hundred square miles and a water storage capacity sufficient to provide irrigation for 800,000 acres of land, The immense snowfall and rainfall of this great basin could be stored and conveniently carried in a ditch or system of ditches to the arable lands of western Nevada. The Truckee River sweeps in a semicircle from Tahoe to Boca, eight miles below Truckee; and in this simicircle it gathers the waters of Donner, Independence, Webber and of the entire circlet of lakes and storage valleys which nestle under the precipitous crest of the Sierra Nevada. Heretofore these 800,000 acre feet of waters have spent their untold wealth in raging floods and foaming torrents, and have idly lavished their treasures upon the parched sands and burning sunshine of Pyramid and Mud lakes. Dams that are almost if not quite sufficient for all purposes of irrigation are already constructed at the mouths of Tahoe, Independence and Webber; but their only use in past times has been to temporarily restrain sufficient water to accommodate log-driving operations."

DIVERSIFIED FARMING.

This phrase has been used so much, and printed so often that it often causes a smile calling up disappointments similar to those that succeeded the era of "mineral resources" soon after the war. The truth is, our people will have to get out of the old ruts, for what now goes by the plain name of trucking receives commendation and makes money has been severely ridiculed by the old planters and farmers. In the days of ridicule down South they called it "dude farming," and we make an extract from a humorous speech of Colonel W. H. Dudley, of Mississippi, on the subject:

"About four years ago I was doing well as a cotton planter. I was raising cotton that cost me ten cents a pound, and was selling it for nine cents. I was getting rich so fast that I concluded I would retire and make way for those who were more needy. About this time I read of a man down at Crystal Springs, Miss., who had sold $1,000 worth, gross, from an acre planted in tomatoes. My ambition was fired. What one man could do another could. Why not plant 200 acres in tomatoes, make $200,000 and retire? I was not greedy. I did not want so much money. I thought $5,000 would be about enough for one year's work. So I settled on five acres as the amount of ground I would plant in tomatoes. I knew I should be near the depot, so I rented my land and moved into Canton, Miss., on the Illinois Central Railroad. As it was a new business, of course it became the town talk. Everybody discovered suddenly that it was a big thing, and promised fortunes to those who went into it. There was soon a tomato craze in the town. Before I planted a seed I found out that everybody was going to plant tomatoes. Some wild man proposed to organize a society. Everybody jumped at the idea. The society was formed with a great burst of enthusiasm. There was high old scuffling and log-rolling for positions. By much manœuvering I sailed in as secretary and raised the dust with an extempore speech of thanks for the unexpected honor conferred upon me. I had worked for it like a ward bummer. Our meetings were frequent and very interesting. Every man was told what he knew and a great deal more. One man told about a vine in a rich spot in his garden which grew up over his kitchen, on up over his two-story residence to the top of an oak-tree, but he did not get any tomatoes. It was voted by the society that rich land would not do for tomatoes. Another man told about a little vine on a poor red spot in his garden from which he had gathered a peck of nice red ones. He did not tell about having buried a dead cow on that spot a year before. It was voted by the society that poor, red ground—the redder the better—to give a fine color, was the kind of soil for tomatoes.

"Of course there were many skeptical cusses in our town who snickered at our enterprise, and laughed at our society. One old negro politician, in a speech, went so far as to use this language: 'What's all dis I hear 'bout raisin' vegetables to sell? Now dat will do for dese ha'r-pin-legged dudes 'bout town to be carryin' on dis dude farmin', raisin' Tom Thum peas and permattuses, but it won't do for de genewine farmer.' It was too good a thing for the boys to miss, so they dubbed us dude farmers, and it stuck. But I was not intimidated by jeers or ridicule. I pushed along with my work, built extensive hot-houses, covered my land with cold frames until it looked like a Bulgarian army was camped upon it. I thought I had better study up a little on gardening, so I got a quantity of books. I had not read more than half through before I learned that I would have to know a great many things. In fact, I would have to become a scientist. I found out I would have to study botany and learn the functions of the stamens and pistils—I supposed to keep the pistils from going off and hurting something; that I would have to study entomology and become personally acquainted with bugs and worms, though I could never see what the Lord made them for, except in the case of crickets and redworms for fish-bait. I found out I would have to study biology so as to know what to buy; chronology to know how to keep the crows off; astrology, to know when the moon was in the right place for the seed; geology, to know how to guide a mule; and pathology, to know how to make the business pay.

I crammed like a sophomore trying to grease through a commencement examination.

"During the time I was going through these scientific researches I noticed every day a poor man man passing my place driving a dump cart, hauling manure. He was going to 'Truck Farm,' as he vulgarly called it. I was sorry for that man. He was very poor, with a large family—sixteen children, all boys, but fifteen. I thought it would be an act of Christian charity in me to dissuade him. So one day I stopped him and said: 'John, is it not rather a hazardous business for you, with your large family, to undertake a scientific occupation like this? Why, my dear fellow, you do not know the difference between a rhynchopores *(curculio imperialis)* and a tribute of the early zoic era.' He said: 'No, I don't. But I tell you what I does know. If you puts plenty of manure on the ground and works it right, it always brings truck.' Of course I reasoned no longer with such gross ignorance.

"Well, time flew on. I had a world of beautiful plants. April came at last. I got a regiment of negroes and put them in the field—and such a field. It was a lovely, red, stiff clay, that might have sprouted a pea if the pea had not first opened its eye to see what kind of soil it was in. Toward the last of April I saw a little yellow, sickly bloom. I stuck a stick up by it and walked round and round it every day, putting in my botany. Would even go out at night to see if the "sweet influence of the Pleiades" was doing it any good. About the fourth night a remorseless worm came up out of the earth and it was no more. But the amount of entomological satisfaction I had in dissecting that worm fully repaid me. A drouth came on in May. The plants got sick; so did I. By the middle of July I was through with the crop, or rather it was through with me. For my six months' labor I realized the magnificent sum of $1.60.

"In that day of tribulation I found out there was one ology I had not studied, but which I needed more than any—that was theology. If my wife had not been a Methodist I would have "cussed." I heard that many did "cuss," but it was mostly me, for all had followed my advice and example. There was one man who did not know the difference between a rhynchopores (*curculio imperialis*) and trilobite of the early zoic era. He made money. But I had one year's experience. I made this entry in my memorandum book: 'Tomatoes need rich ground and plenty of water.' I determined to try again. The next year I put a ton of cotton-seed meal to the acre, harrowed the ground flat, and dammed up every place where the water could be held. I then waited for the rains. They came in the greatest abundance. It was the spring when the people of Cincinnati took to the tree tops to get out of the way of the

Ohio River. I was happy. I waded out to see my plants swim. They looked nice for about five days, but when the waters subsided and the sun came out hot, they got sick; so did I. When I gathered and shipped the crop I balanced my book and found I had lost $200. But I had another year's experience. I was getting a little shaky, but I determined to try again. I dared not quit. I stood appalled before the storm of ridicule which I saw gathering in the eyes of the ungodly jesters. If I failed again I would have more time to prepare to skip the town. I made another entry in my memorandum. It was this: 'Make a garden of your land; drain well; treat as you would a garden and plant many things.'

"The third year I moved as cautiously as a kitten in paper shoes. I put one acre in tomatoes, about the same in cucumbers, a smaller area in beans, cantaloupes, Irish potatoes, radishes, spinach, etc. I succeeded beyond my expectations. I found money in every crop. The cucumbers brought about $150 to the acre; the cantaloupes at the rate of $250; the beans about $130, and from the one acre in tomatoes I sold over $900 gross. They were shipped mostly to Chicago and Minneapolis. I was satisfied now. I need not fly to the frontiers as an exile. I had saved my reputation, and demonstrated the fact that there was money in dude farming."—*Southern Planter.*

[We reprint the above as an amusing caricature of pretended science in farming. But we add a Paper which shows what books and newspapers have done for farmers.]—

AGRICULTURAL READING.

Many of our practical farmers think that time spent in reading newspapers is lost. Even papers devoted to the special work of the farmer are considered of little avail. "Book-farming," if not as much decried as formerly, is still neglected, and many men still think that it takes little education and intelligence to make a farmer. A successful farmer cannot be made by the education of the schools alone, but it will also take a long time and much crude thinking to make a successful farmer without education, reading and books. To make a thoroughly well-informed, skilful, successful farmer requires as much brains and study as the most technical trade or highest profession. The world is full of ignorant, slipshod actors in all occupations, from the pulpit to the field, and each has its share of pretenders and shysters. When, from want of ability or opportunity to get early and systematic agricultural training, the farmer feels, as he ought, his deficiency, the newspaper, and especially the agricultural paper, offers the cheapest and most successful means of securing sufficient agricultural information for a sensible farmer to secure fair success in his business. Continental and careful reading of current agricultural literature and sound thinking and thorough examination of what is read, will enable a reasonably intelligent farmer to gather much of the scientific and practical relating to his farm and crops. The editors of agricultural papers will collect, examine and prepare for their less educated readers all that is absolutely necessary to understand about the land crops and stock of the section where they circulate. In this way the intelligent, but uneducated, farmer may arm himself against deception, and at the same time take advantage of the knowledge gained by others in years of study, prepared by the editor to be received understandingly, and acted upon in his fields and on his crops. We know an unlettered man who was lamenting the destruction of a fine cabbage crop by the early caterpillar, when the village newspaper had been publishing for six months a remedy that saved the crop of his more distant neighbors. He did not take the paper, or read it, though it cost but a dollar. The world moves swiftly now; everybody must read or be left, and the farmer must read more than most men, if he would keep up with his occupation in all its branches.

We copy an article on this subject, prepared by Hon. J. W. Lang, member of the Maine Board of Agriculture in 1873, telling what the newspapers had done for the farmers. If the newspapers will take proper interest in this great industry, it will be as true here to-day as it was in Maine then. The following is taken from the *Maine Agricultural Report:*

"WHAT THE NEWSPAPER HAS DONE FOR THE FARMER.

"The newspaper has discussed these topics, and the farmer has learned them and been led thereby to seek other sources of information. Instead of orchards with fruit fitted for little else than cider, we find now the choicest kinds. Small fruits are cultivated where before unknown, unless they grew wild and uncared for. The better varieties have taken the places of the old, and the garden presents an attraction hitherto unknown. The home has been adorned by shade trees, shrubbery and flowers outside, while inside books and pictures lend their charms. There is something deeper, pleasanter, and better in that family circle at the farmer's fireside than before.

"The newspaper—especially the agricultural newspaper—has left the impress of refinement and progress in many a household, and yet its mission is just begun. The future is a broad field in which it will move on to new triumphs, new heights, and new usefulness. We all poorly realize what we owe the newspaper and public journal for the advancement of science, agriculture and civilization have made. Take them away—blot them out, and we retrograde more rapidly than we have ever advanced. Let them be well supported, and they will turn in and support us."