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By M. MAC LEAN.

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AGRICULTURAL.

SOME REMARKS ON THE MANUFACTURE OF MAIZE SUGAR.

By William Webb, of Wilmington, Del.
(Published be the National Agricultural Society.)
Concluded.

"It as a part of the system of cane planting in Louisiana, to raise as full a stand of cane upon the ground as possible; experience having proved that the most sugar is obtained from the land in this way." As far as my experience has gone, the same thing is true of corn. This point must therefore be attended to, and the deficiencies, if any occur, made up by timely replanting.

The next operation is taking off the ears. Many stalks will not produce any, but wherever they appear, they must be removed. It is not best to undertake this work too early; as when the ears first appear, they are tender, and cannot be taken off without breaking, which increases the trouble. Any time before the formation of grain upon them, will be soon enough.

Nothing farther is necessary to be done until the crop is ready to cut for grinding. In our latitude, the cutting may commence, with the earlier varieties, about the middle of August. The later kinds will be ripe in Sept'r, and continue in season until cut off by frost. The stalks should be topped and bladed while standing in the field. They are thon cut, tied in bundles, and taken to the mill. The top blades, when properly cured, make excellent fodder, rtaher better, it is believed, than any hitherto used; and the residuum, after passing the rollers, may easily be dried and used in the same way; another advantage over the cane, which, after the juice is expressed, is usually burned.

The mills should be made on the same general principle employed in constructing those intended for grinding cane. An important difference, however, will be found both in the original cost, and in the expense of working them. Judging from the comparative hardness of cane and corn stalk, it is believed that one-fourth part of the strength necessary in the construction of a cane mill, will be amply sufficient for corn; and less than one-fourth part of the power will move it with the same velocity. It may be made with three upright wooden rollers, from twenty to forty inches in length, turned so as to run true, and fitted into a strong frame work, consisting of two horizontal pieces sustained by uprights. These pieces are mortised to admit wedges on each side the pivots of the two outside rollers, by which their distances from the middle one may be regulated. The power is applied to the middle roller, and the others are moved from it by means of cogs. In grinding, the stalks pass through on the right side of the middle cylinder, and come in contact with a piece of frame work called the dumb returner, which directs them backwards so that they pass through the rollers again on the opposite side of the middle one. The modern improved machine is made entirely of iron; three horizontal rollers arranged in a triangular form one above and two below, the cane or stalk passes directly through, receiving two pressures before it escapes. The lower cylinders are contained in a small cistern which receives the juice. The latter machine is the most complete the former the most expensive. These mills may be moved by cattle, but for large operations, steam or water power is preferable. When the vertical cylinders are turned by cattle, the axis of the middle one has long levers fixed across it, extending from ten to fifteen feet from the centre. To render the arms firm, the axis of this roller is carried up to a considerable height, and oblique braces of wood by which the oxen or horses draw, are extended from the top of the vertical axis, to the extremities of each of the arms. When horizontal cylinders are propelled by animal power, the upper roller is turned by cogs at one end, which are caught by cogs on a vertical shaft. It is said that in the West Indies, the purest cane juice will ferment in twenty minutes after it enters the receiver. Corn juice has been kept for one hour before boiling, without any apparent injury resulting; but so much delay is not desirable, as it may be attended with bad effects.

The process which has been employed in the manufacture of Maize sugar, is as follows; The juice, after coming from the mill, stood for a short time to deposite some of its coarser impurities; it was then poured off, and passed through a flannel strainer, in order to get rid of such matters as could be thus separated; lime water, called milk of lime, was then added in the proportion of one or two table spoon's full to the gallon. It is said by sugar manufacturer, that knowledge on this point can only be acquired by experience; but I have never failed in making sugar from employing too much or too little of the lime. A certain portion of this substance, however, is undoubtedly necessary, and more or less than this will be injurious; but no precise directions can be given about it. The juice was then placed over the fire, and brought nearly to the boiling point, when it was carefully skimmed, taking care to complete this operation before ebullition commenced. It was then boiled down rapidly, removing the scum as it rose. The juice was examined from time to time, and if there was an appearance of feculent particles which would not rise to the surface, it was again passed through a flannel strainer. In judging when the syrup was sufficiently boiled, a portion was taken between the thumb and finger, and if when moderately cool, a thread half an inch long could be drawn, it was considered to be done, and was poured into broad shallow vessels to crystalize. In some cases crystallization commenced in twelve hours; in others, not till after several days; and in no case was this process so far completed as to allow the sugar to be drained in less than three weeks from the time of boiling. The reason why so great a length of time was required, I have not yet been able to discover. There is no doubt but that an improved process of manufacture will cause it to granulate as quickly as any other.

In a manual on the subject of cane sugar, prepared a few years since, in compliance with a resolution of the House of Representatives, some improvements were suggested on the usual modo of operation, which appear equally applicable to the corn. They are at least worthy of trial. The author remarks that "Defecation is the great problem of sugar making, and that it is one of no easy solution is proved by the unsatisfactory experience of centuries. We shall venture to advance a plan relative to this subject, which is in some respect new, and is founded on the view we have taken of the chemical composition of cane liquor. The cane juice, after having been suffered, by standing, to deposit its coarser impurities, should be drawn off to a rectangular vat, having a double bottom, and whose depth is equal to its diameter; in this vessel it must be subjected to a temperature of 208 to 280 degrees. F. From this vessel after a repose of about forty-five minutes, its clear contents are to be drawn, by an orifice placed one inch above the bottom, into a vat of similar construction, whose top is situated four inches above the bottom of the first—taking the precaution to pass the liquor, in its passage from one vat to the other, through a filter of coarse cotton bagging. What remains in the vat is then to be drawn off through an orifice, on a line with the bottom, and suffered to settle in casks, the clea portion being added eventually to the second vat. The filtered liquor, in the second receiver, is now treated with a milk of lime, formed by adding perfectly impalpable slacked lime to water, in the proportion of not less than four cubic inches to a gallon, the steam being let in previous to the addition of the lime. The quantity of temper is to be regulated as follows: after the additions of temper, portions of the liquor are examined, from time to time, by passing it through a fine cloth filter, and adding to it, in a wine glass, a tea-spoon full of clear lime water; so long as a cloudiness appears in the liquor, on the application of this test, more milk of lime must be added. The heat must be carried at 210 degrees F., when the steam must be cut off, after a repose like that above described, it is run off by means of an orifice, one inch above the bottom, until it begins to appear cloudy, when this orifice is closed, and another, situated on a level with the bottom, is opened, and the remainder is run off into a tub or barrel to settle for future decantation. The defecated liquor is made to traverse a bagging filter, as before, on its way to a general reservoir near the grade, and which should be capable of holding one thousand gallons. Sulphuric acid, diluted with twenty times its weight of water, or tartaric acid, dissolved in ten times its weight of water, is added, from time to time, to this resorvoir, in quantities sufficient to maintain its contents, as nearly as possible, in a state of neutralization, or in such a condition that there will be no alkaline reaction on paper stained with yellow by a strong decoction of turmeric.

"The reasons for the foregoing plan are the following: Heat alone is sufficient for the separation of the albumen, and a large portion of the green fecula. The first heating, therefore, coagulates the albumen completely, the greater part of which will rise to the surface in a scum, more or less tenacious, bringing along with it a part of the precipitated fecula; while another portion of these impurities then falls to the bottom, along with insoluble earthy matters, pieces of cane, &c. And on being transferred to the second vat, the quantity of lime required for rendering insoluble the balance of the coloring matter in the juice is greatly reduced, while its mischievous influence in rendering albumen soluble is avoided, since the principal part is already removed. The filters collect those flocculi which had escaped the process of subsidence; and the addition of sulphuric acid, or of tartaric acid, removes from the defecated liquor all excess of lime which it may contain, and the insoluble precipitate of sulphate of lime subsides on the bottom of the general reservour, without going forward to injure the kettles by the formation of a thick crust.

"It will be at once apparent, wherein the present method of defecation has advantages over that where steam vats are employed, since by that plan a large portion of the albumen was rendered permanently soluble by the lime employed for throwing down the green fecula; and besides, no measures were taken for getting rid of the superfluous alkali remaining in solution, after the defecation was completed—the alkali being left to enter into union with the sugar, and by its subsequent action upon it in the kettles, to convert it into gum.

For evaporation, flat bottomed pans are recommended, made either of copper or boiler sheet iron. If the situation will admit, they should be so arranged, that the juice will run from one to the other and thus save the trouble of lading. The lower pan should be furnished with a spout at the bottom, (not less than four inches in diameter,) by which its contents can be drawn off. The shape of these vessels should be oblong, their sides and ends sloping at angles somewhat different in each. In the upper pan where the juice first enters, the sides form an angle with a line perpendicular from the bottom of about 30 degrees. In the lowest pan, this angle should not be less than 45 degrees. Skimmers with rectangular, instead of circular edges, must be employed for removing scum. The syrum is, brought, in the latter vessel, to about 25 dagrees by the saccharometer, when it is withdrawn into a large wooden reservoir, whose depth should be at least three feet. To finish the evaporation the Bascule pan is recommended; this is extensively used in Louisiana, and has over the kettles the advantages of completing the operation with greater rapidity and safety—of enabling the operator to carry the boiling completely to the point of granulation, and then to decant the whole charge instantaneously into the color; also of giving to the syrup time for depositing a heavy sediment of impurities, not otherwise separable from it, but which, on the old plan goes forward to impair the granulation, and to discolor the sugar; and, finally, of allowing the proprietor to superintend in person the concluding and most delicate part of the manufacture, one Buscule pan being sufficient to evaporate to the granulating point, in twelve or fifteen hours, all the juice which two sets of kettles can evaporate in twenty-four hours, to the point of concentration mentioned above. This pan is of a circular form, made of copper, fourteen inches deep, five and a half feet in diameter, and sixteen inches deep near the lip, or in these proportions. It is mounted over a separate furnace—is moveable upon its axis, and is furnished with a large lie, over which the whole contents may be poured into a receiver. On the side of the vessel opposite the lip is a rope or chain attached to a pulley over head, by means of which it is quickly emptied. "In using this pan, the juice is evaporated in the kettles as before, but is struck, between 25 degrees and 28 degrees of the Hydrometer of Baume, into a large cistern capable of containing at least four or five hogsheads, where it cools, and deposites a thick sediment. From this reservoir, it is pumped up, from time to time, into a smaller one situated just above the Bascule pan. The operation with this apparatus is as follows: The gate attached to the reservoir of syrup is raised, and the bottom of the pan covered to the depth of four inches. A brisk fire being kindled under it, boiling soon commences; a slight scum rises, which flows down into the lip, whence it is removed by means of a band skimmer. The striking point is ascertained as in the kettles, except that a thermometer is often made use of to learn its approach. When struck, the thermometer stands from 239 degrees to 238 degrees.

"To assuage excessive ebulition, it is customary to throw in a small piece of lard or of butter just previous to the completion of the cooking; and at the moment of decanting the charge, notice is given to the fire-man, who closes the ash-pit door to prevent the flames from rushing up into the boiling apartment, to the inconvenience of the operator, who is stationed upon the rim of the furnace by the side of the pan. Immediately on its being discharged, it is suffered to fall back to its place, and the gate of the reservoirs is lifted as soon as possible, in order to cover the bottom of the pan before it becomes too hot from the action of the flame.

"The time required to perform the operation varies from twenty to thirty minutes, and the result is a highly improved sugar, with the estimated gain of one hogshead in fourteen over the old method."

Dutrone found, by experiment, that the quantity of matter which unites the most favorable circumstances for crystalizing the sugar, is from fifteen to sixteen cubic feet; and it was from this knowledge, that he regulated the form and dimensions of the cases about to be described. He made many trials of cases differently shaped at bottom, and ultimately fixed upon the following, as most convenient and effective. The crystalizing case is made of wood, and ought to be five feet long and three feet wide. Its bottom is formed of two planes (like a trough) the uniting of which forms a channel. Along this chantiel twelve or fifteen holes, an inch in diameter, are bored for the molasses to drain through; the depths of the case is nine inches at the side, increasing towards the channel, where it is fifteen inches. When syrup is poured into these cases the holes are stopped with plugs; after it has crystalized, these are removed, and the sugar becomes drained. The rooms in which the operations of crystalizing and draining, or curing, are carried on, should be kept at an even temperature of about 80 degrees F.

Enough has been said to enable any one so disposed to manufacture sugar from Maize, either on a large or a small scale. As to the profits of the business, I shall make no positive assertions; experience on the subject is yet too limited to warrant them; and as all the facts in relation to it are now before the public, every one interested can draw his own conclusions. It is said by those acquainted with the cultivation of the cane, that the business cannot be carried on profitably on less than one hundred acres in crop, and that attempts on a small scale will be certain to fail with a great loss of time and labor. How far this may be applicable to corn, remains to be seen.

Some comparison between the cultivation of cane and that of corn may perhaps be interesting.

The cane lands in Louisiana are redeemed to agriculture, by strong embankments along the river, and by numerous ditches, which extend back into the swamp to a considerable distance beyond the line of cultivation. The ground is still further divided by smaller ditches into lots of from one to two acres in extent. It is extremely rich and productive; but the expense of draining, and keeping up the embankments, must be very considerable; this forms the first difference to be noted in the culture of the two plants under consideration.

The best season for planting cane in Louisiana, is in the fall, which is also the time of harvest, when labor is most valuable, and the greatest exertions are required to secure the crop before it is destroyed by frost. But the most striking difference will be found in the cost of seed, and in the labor of planting. The cane is propagated by layers; these are partly furnished from the tops of the plant, when cut for grinding, but are principally rattoons. Of the latter, it requires the produce of one acre to plant three. The grain from one acre of corn will be sufficient for planting forty acres. Therefore, the difference in expense for seed, will be as one to thirteen.

In planting cane, furrows are made with the plough from two and a half to three feet apart; in these the layers are placed in a double row, and the earth drawn over them with hoes to the depth of three or four inches. In the spring, before the plants are up, this covering is partly scraped off, so as to leave them buried from one to two inches.

From this account, it is evident, that no more manual labor will be required to drill fifty acres in corn, than to plant one acre in cane. The labor of cultivating the latter plant during its growth, is also greater; but this may be balanced by the extra work required to take off the embryo ears from the corn. When cultivated in the mode recommended, the stalk of corn is soft, remarkably heavy and full of juice from bottom to top. The amount of power required for grinding them must be much less than is necessary for cane—or, what is the same thing an equal power will do it with greater rapidity. The average yield of cane in Louisiana, is one thousand pounds of sugar, and forty-five gallons of molasses per acre.

From the above comparative statement, it would appear that one half this amount of crop from corn would be equally, if not more profitable.

I will only add in conclusion, that whether or not sugar from the corn-stalk may soon become an article of profitable export—its manufacture in the simplest form will enable every family to supply themselves with this article for common use, now becomes so much a necessary of life, and thus save a considerable bill of expense, yearly paid for foreign sugars.

(Translated at the Patent office, and highly confirmatory of *Mr.* H. L. ELLSWORTH.)

Extract from Annales de la Societe Polytecnique Pratique, No. 22, for October, 1839.

Sugar of Corn.—There is no plant of greater general interest or utility than Indian corn. It can serve, under a great variety of different forms, for the nourishment of man and the domestic animals, and above all, the application of industrious science.

In reference to its saccharine qualities, Maize has not been sufficiently appreciated. Travellers report, that under the tropics the stalk of this plant is so very saccharine that the Indians suck it as in other places they do the sugar cane.

Mr. Pallas, who has made a great many researches on this application of *Maize*, has arrived at a remarkable result—he has found by many experiments both in France, and more recently in Africa, that this vegetable, by a simple modification applied to its culture, is able to furnish a much more considerable quantity of sugar than by the ordinary method.

This method consists in detaching from the plant, immediately after the fecundation of the avaries (after the plant has tasselled) the young ear, and to leave it to develop itself thus deprived of its fruit. Arrived at maturity, the stalk of the Indian corn contains crystalizable sugar in quantity very often double that obtained when the plant is left to manure with the grain. In fact, by the ordinary mode of culture, the grain is nourished at the expense of the sugar in the stalk, as it absorbs a great quantity of this immediate principle, which, by the process of nutrition, is converted into starch. On the other hand, if the young ears are immediately destroyed, the sugar intended to flourish them remains in them where it accumulates, and the Maize plant is thus converted into a true sugar cane, while the fibrous part can be manufactured into paper.

The quantity of sugar is so very great in the stalk of the Maize deprived of the ear, that the pith of this vegetable retains a sensible flavor of sugar even after it has been dried, as is easily proved by examining the specimens deposited by M. Pallas in the Bureau of the Academy of Sciences. These results are so important as to merit experiments on a grander scale, which may obtain thus for France a source of new industry in the manufacture of sugar.

From the Chicago Agriculturist.

GREAT VALUE OF INDIAN CORN.

I believe it is generally admitted that there is no grain grown in the Union of more value as to its general usefulness, for both man and beast, than the Indian corn; and yet with what contempt it is treated by many when it is occasionally placed on our tables in the form of bread. How many have I fallen in with in my travels among nothern people particularly those who are unaccustomed to the mode of living in the middle and southern States, who exclaim against corn bread, or its usefulness any farther than for stock. I think the cause of dislike is more from the want of knowledge how to prepare it for the table, than any thing else.

PLAIN CORN BREAD. Six pints meal, one table spoonful salt, four pints water, thoroughly mixed with the hand, and baked in oblong rolls about two inches thick; use as much dough for each roll as can be conveniently shaped in the hand. Many persons use hot water. In winter it is certainly best. The bread is better to be made half an hour or more before it is baked; the oven must be tolerable hot when the dough is put in. All kinds of corn bread require a hotter oven and to be baked quicker than flour.

LIGHT CORN BREAD. Stir four pints meal into three pints tepid water; add one large teaspoonful salt; let it rise five or six hours, then stir up with the hand, and bake in a brisk oven.

Another method is to make mush, and before it grows cold stir in a half pint of meal. Let it rise and bake as the first.

CORN CAKES. Six eggs well beaten; one pint milk; one teaspoonful salt; two pints mush almost cold; two pints meal and three tablespoonsful melted lard.—Grease the oven, and put one large spoonful of butter in each cake. Do not let them touch in baking.

CORN MUFFINS. Made in the same way as corn cakes. Grease hoops and heat the copper slightly before putting in either corn cakes of muffins. A better muffin is made by putting in two pints flour instead of meal.

The above recipes comprises only a few of the many ways there are in use for preparing corn meal as a healthy and palatable dish for our tables. Economy should be the order of the day; not only with the farmers, but with all who wish prosperity in this present life.

It is not to be expected that our wives and daughters can add much to our wealth in the way of out-door business. I think they should be wholly exempted from all care beyond the garden. Let then wives and daughters look to make their husbands and fathers comfortable, as they come in from their daily labor, with a clean house—table all spread—some warm corn cakes, boiled ham, &c. Much better for the husband than to be addressed, "you must get your own supper or dinner, for I have done enough for one day, and the girls are as tired as I am."

HENRY ANDREWS.
Putnam Co., Jan. 1842.

GYPSUM.

Josiah Bordwell, of South Hadley, Mass., has four acres of pasture ground, and applies to it annually one thousand pounds of gypsum. The same application, and at the same rate, has been made 35 years in succession. On this lot he pastures annually one large yoke of oxen, one horse, two cows, and some years three cows. Prior to the use of plaster, Mr. B. says it required at least six acres of this land to afford as much feed as he has obtained from one acre, by using plaster.

He has also a piece of mowing ground which contains four acres. Two crops of hay are taken from it regularly. On this ground he uses plaster of Paris freely, and applies a top-dressing of manure.—His annual product of hay is fully sixteen tons.—*Genesee Farmer.*

HORSE RADISH FOR ANIMALS.

Austin Randall, Esq., of Paris, writes to us as follows: "I have seen in your excellent paper no notice of the value of the horse radish for cattle. I have found it very useful for them. If given to cows in doses of a pint at a time once a day, it will materially aid their appetite, and will prevent or speedily relieve cows of the disease called cake in the bag. I feed it freely to any animal of mine that is unwell, and find it of great service to working oxen troubled with the heat. I have had one ox that would eat greedily a peck at a time. Few animals refuse it; and if they do, it may be cut up and mixed with potatoes or meal." Mr. R. cultivates his corn without hilling, and his success with his last crop (78 bushels per acre) is a favorable commentary on the practice.—*Albany Cultivator.*

IRISH POTATOES AND OATS IN NEW LAND.

From the N. H. Monthly Visitor.

We have heretofore endeavored to impress upon our readers the value of our rough mountain lands. There yet remains much land in the upper counties of this State considered of little value that may be made valuable. In conversation with Winthrop Folsom, Esq., of Dorchester, a few days ago, we gathered the following facts:

Four or five years ago he purchased a lot of eight acres of uncleared rocky land, for which he gave three dollars per acre; this land, covered with a growth of wood, he cut down, cleared, burnt and fenced at an expense of eight dollars per acre—making the cost of land eleven dollars per acre. It was planted with potatoes; he charged himself one dollar for every day's work done, and twenty-five cents per bushel for the seed potatoes. He called the potatoes raised that year on the ground worth sixteen cents the bushel; and he found the gain of this year's operations, above the cost of land and clearing and the expense of seed and labor, to be ninety dollars, or nine dollars per acre. The next succeeding year he raised on the same ground four hundred bushels of oats: since that time the same land has produced a decent crop of hay, and is now good pasture land.

Mr. Folsom has more recently purchased a lot of three hundred acres of these wild lands at the price of one dollar an acre. On this land he has commenced clearing. His first clearing was fifteen acres at the cost of eight dollars an acre. His first crop of potatoes on this ground was 3,100 bushels. Three thousand bushels sold to the starch manufacturers at one shilling the bushel, brought $500—one hundred bushels drawn home worth $17—making the year's product $517. The cost of land, fencing and clearing, $160, would leave the clear gain of this year's operations on these fifteen acres, three hundred and fifty-six dollars. The second year, (which was the last year, when the crop suffered much from drought) the same land produced 475 bushels oats, worth at 50 cents, 237 50, and 14 bushels of rye worth $1,00, making $251. After the two crops were taken off, it would not be high to value this land at five dollars the acre.

The method of planting the potatoes is extremely simple. After the ground has obtained a good burn, the planter proceeds with a bag of cut potatoes swung over his shoulder—strikes a sharp hoe into the ground through the outside root turf—covers with the foot, making each hole at the distance of about eighteen inches in the row, and the rows three feet apart. Planting in this way makes three fair days' work to the acre, worth $2 25. The digging of an acre of potatoes at four shillings per day, six days' work, is worth $4. No hoeing during the season is necessary; and so well does the seed operate in the ground, that the vines often grow to a sufficient size to cover the land. The whole expense of raising potatoes on burnt ground, after the ground is cleared, Mr. Folsom informs us, will not much exceed six cents a bushel.