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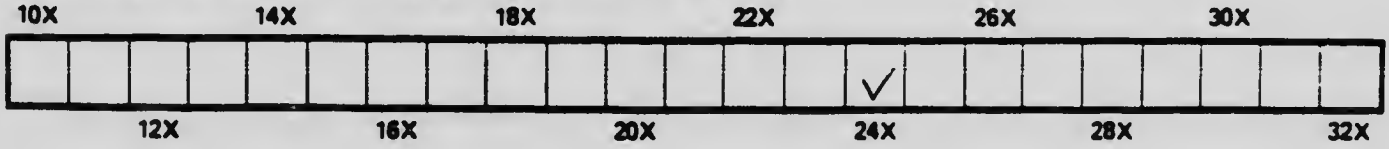

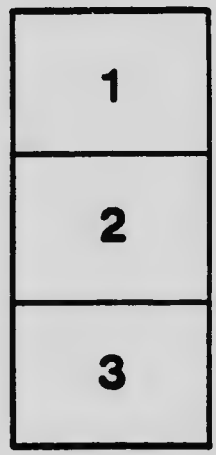

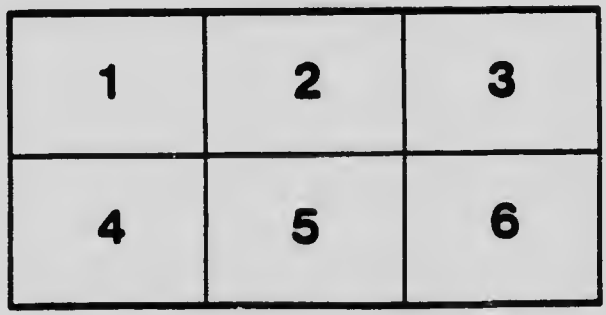

CORN FOR ENSILAGE AND THE SILO

A PAPER

READ BY

J. H. GRISDALE, B. AGR.

Director, Dominion Experimental Farms

BEFORE THE

STANDING COMMITTEE OF THE SENATE

ON

AGRICULTURE AND FORESTRY

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CORN FOR ENSILAGE AND THE SILO

BY

J. H. Grisdale, B. Agr.

Director, Dominion Experimental Farms.

Corn for forage or ensilage corn can be grown to advantage in almost all parts of Canada at present occupied by farmers or stockmen. Results have not been satisfactory in every case where efforts have been made to grow it, but this has often been due to wrong cultural methods practised, or unsuitable varieties grown, rather than to adverse climatic peculiarities.

REASONS FOR GROWING FORAGE CORN.

The ... growing or making an attempt to grow this forage crop wherever live stock ... in any numbers are numerous and cogent. A few of them follow:—

1. As a plant capable of yielding a large amount of valuable forage under a great variety of soil and climatic conditions, corn is without an equal.

2. When properly preserved, whether as ensilage or dried, it can be used as material to render other less palatable roughage more acceptable to farm animals.

3. It is the best plant or crop for ensiloing that can be grown to advantage in Canada. It is practically a perfect crop for this purpose, hence it helps to solve the great problem of how to furnish an abundant and cheap supply of succulent food for winter or summer feeding of dairy or beef cattle.

4. When properly grown and well preserved as ensilage, it is the equal of or superior to roots in feeding value and palatability. It can, however, generally speaking, be more cheaply grown and more easily preserved than roots.

5. The labour of growing an acre of corn is of a character much more agreeable to perform and much less arduous than that of growing an acre of roots of any description.

6. Corn being a cultivated or hoed crop, serves well to clean the land, that is, free it from weeds, so fitting it for grain growing, and putting it into shape to seed down to grass or hay.

7. Corn is a gross feeder and may be depended upon to make good use of a never so abundant supply of plant food. It is, for this reason, particularly well adapted to occupy that place in the rotation where humifying vegetable matter and a fairly liberal supply of barnyard manure unite to supply large quantities of plant food suitable for root, leaf and stem growth rather than for seed production.

8. The growing of corn on a fair proportion of arable land on the farm will permit of keeping more cattle, and so increase the revenue as well as augment the manure supply, so essential to the maintenance of soil fertility.

9. Corn, when preserved as ensilage, can be stored much more cheaply in much less space than any other roughage. In addition, stored in this way it will keep inde-

finitely and is always ready to feed. Ten tons silage occupies no more space than one ton hay. One ton hay is worth about two and one-half tons silage.

10. In thirty years' experience in farming in the Ottawa valley, the writer has seen all kinds of grain crops utter failures; he has seen hay so light as not to pay for the making and roots and potatoes practically nil, but in all that time he has never seen a failure in the corn crop. There has always been a fairly profitable return from the fields in corn.

11. It makes it possible to greatly lessen the pasturage, consequently more land can be brought under cultivation.

12. At a moderate estimate, two cows can be kept on the same acreage and at the same cost when corn ensilage is properly grown and used as one on the same farm when cattle are fed on hay or other roughage.

Where to Grow it.

Corn will grow in any kind of soil, provided always that there is good drainage. Under drainage is not absolutely necessary, although advisable here as with other farm crops. On low-lying or level lands, ditches should be in good working condition and water furrows kept open all summer. If a choice of land may be made, then warm-bottomed, light loamy soil may be expected to prove the most satisfactory under most weather conditions.

In the rotation, corn should follow clover hay, pasture or meadow. Stubble land as well as lands that have just been in hoed crops are not suitable, since the supply of humus or humifying material is likely to be small, and, since corn needs much food such as these substances provide, it would probably fall short of a good crop on account of the lack thereof. Corn might advantageously come after grain, or even follow a hoed crop, provided the land were very fertile or a very heavy dressing of manure were applied.

Manurial Requirements.

The best fertilizing material for corn is undoubtedly good barnyard manure. A mixture of one part horse manure to three parts cattle manure applied green at the rate of 12 or 15 tons per acre, may be expected to give very good results. The application might be made in the fall, winter or spring, or during the preceding summer. If ploughed in, only a shallow furrow should be turned. Commercial fertilizers are not necessary, nor are they likely to prove profitable where the above mentioned dressing of farmyard manure can be applied.

Preparation of the Soil.

Where clay land is to be used for corn, it is generally well to plough in the autumn, turning a well set-up, moderately deep furrow (5 to 7 inches deep), being careful, of course, to go no deeper than usual. If light land is to be used it is generally advisable to plough in the spring, turning a flat, shallow furrow (4 or 5 inches deep). In either case the manure may be ploughed in or worked in on the surface with the disc harrow.

The land should be worked down till a smooth, mellow, yet solid seed bed has been prepared. To get the land into such shape, it may be necessary to disc and roll several times as well as work with a smoothing harrow. In any case, no planting should be done until what might be called a perfect seed bed has been prepared. Success or

failure will depend very largely upon this feature of thorough soil preparation before seeding.

Special Preparation for Level or Clayey Lands.

Where either heavy clay land or level land not under-drained is to be used, it is not infrequently advisable to make special preparation by ploughing and working in a special way.

The land should be ploughed in nicely rounded ridges exactly 10 feet 6 inches from centre to centre. All necessary cultivation should be so done as to preserve the rounding surface of the ridges, and the dead furrows should be kept clean and should open into a well-kept ditch, thus insuring good drainage.

In planting, the first row should be run down the middle of the ridge and two others on the same ridge, one on each side 42 inches away. Thus the rows on the whole field will be uniformly 3 feet 6 inches apart and always clear of dead furrows.

When to Sow.

Corn should be sown as early as weather and soil conditions permit. From the 15th to the end of May, according to district and season, is a very good rule. Very seldom will it do to sow later than June 5 or 6. Sow when soil is warm and dry.

Methods of Seeding.

Corn for forage or ensilage may be planted in rows or hills. If planted in rows as usually advisable, the rows should be at least 42 inches apart. The plants should stand about 8 inches apart in the rows. In seeding, it would not be advisable to try to sow as sparsely as this. It is better to give a rather heavier seeding and then thin out to the desired thickness with a hoe when plants are 6 or 8 inches high.

If land intended for corn is very dirty, whether from the presence of weed seeds or couch grass, it is usually advisable to plant in hills. The hills should be at least three feet apart each way, and from three to five kernels should be planted in each hill.

For planting in rows there are special corn planting machines made by various agricultural implement manufacturers. Where the farmer has a grain seeder that sows in rows, he can, by closing up part of the seed spouts, use it as a corn planter, and so get along without the special implement.

If it is desired to plant in hills, here again special horse planters are available. There are also hand planters of various descriptions on the market which will enable a man to plant from two to four acres a day when the land is ready. If no planter is available, planting may be done with a hoe or even with the foot, when the soil is loose and friable.

If the hill planting is to be done other than with a horse planter, it will be necessary to mark the land off into three foot squares, the hills to be at the corners of the squares. This may be done by a man dragging a heavy chain back and forth across the field till it is marked off into three foot strips, then doing the same thing lengthwise till the whole thing is marked off into three foot squares.

A better plan and a much more rapid, however, is to construct a marker to run by horse-power, then mark the field off into squares by running first lengthwise and later crosswise.

Suitable Varieties.

The varieties of corn to sow will depend upon the district where the seeding is to be done. For the Maritime Provinces, for those parts of Quebec north of Montreal and St. Hyacinthe and east of Three Rivers, and for northern Ontario, Manitoba, Saskatchewan, Alberta and British Columbia, the flint varieties should be grown most largely. Some of the best varieties are Longfellow, Compton's Early, Angel of Midnight, North Dakota White Flint and Sandford. In these same districts a few of the dents may be expected to give good results, the best being White Cap Yellow Dent. In those parts of Ontario east and north of Toronto, as far as Muskoka, in the southern parts of Quebec and in the Eastern Townships, considerably larger varieties may be expected to give good results. As varieties suitable for said districts might be mentioned any of the flints, White Cap Yellow Dent, Leaming, and occasionally some of the larger varieties, as Mammoth Cuban or Early Mastodon. In those parts of Ontario south and west of Toronto, any variety, no matter how large, may be expected to give satisfaction. When sowing in rows, it will be found best to sow about 25 lbs. of the flint varieties and about 30 lbs. of the dent varieties per acre. Sowing in hills requires less seed, about 15 lbs. flint and 18 lbs. dent per acre.

Early Crop Treatment.

A few days after seeding, say the third or fourth day in warm weather, or the fourth or fifth day in cool weather, it is well to run over the field with a slant-tooth harrow, or lacking this, with a light smoothing harrow. This will break the crust, destroy any weeds and help warm the soil, thus encouraging growth of the corn. A few days after the corn is up, and when it can be distinctly seen in rows, it is often advisable to run the light smoothing harrow over it again. This time it had better be run across the rows. Subsequent cultivation will need to be done with special cultivators.

Later Cultivation.

For working the land until the corn stands about three feet high in the rows or hills, the two-horse riding cultivator will give the best results. This implement straddles a row and gives the soil on either side thereof thoroughly good cultivation, being in this respect much superior to the one-horse walking cultivator. The latter implement will, however, be found valuable and necessary after it is no longer possible to work the two-horse cultivator.

The cultivator should be run through the crop, shortly after any considerable rainfall or about once a week in dry weather. As the season advances, a lighter and lighter cultivation should be given. Work may be stopped usually when the corn is so high as to hide the horse and driver from view, but sometimes, however, later cultivation will pay. This will be the case when a superabundance of weeds shows up, as may occur in a very wet season, or when the corn suffers from drought in a very dry season.

Very seldom, if ever, will it be found advisable to rib up the corn. Such treatment might occasionally be advisable in a wet season on very low-lying or heavy land, never on light soils.

Hand Work.

A certain amount of hand hoeing is usually necessary. This should be done first when the corn is six or eight inches high The thinning to eight inches apart in the rows should receive attention at this time. Plants should be cut clean out to prevent suckers coming on again. Later it will be found advisable to again go over the field and remove any further weeds that may have come up in the rows. As already stated, when a field is particularly dirty it is advisable to sow in hills and the cultivator can then be worked both ways. The amount of hand hoeing will in this way be very much lessened.

ENEMIES AND DISEASES.

The corn crop in Canada is remarkably free from enemies and diseases. In our experience here, crows at seeding time and smut at harvesting time are about the only troubles worthy of note.

Crows.—The crow generally attacks the crop when first the young plants shoot through the soil, or even earlier. There are two effective ways to guard against this winged enemy:—

First.—If corn is to be planted by hand, the following method will be found effective. Immerse corn for two or three minutes in water as hot as can be borne by the hand. Drain water off and while still damp and warm, add warm coal tar at rate of half a cupful per gallon of corn. Thoroughly mix the corn and tar till every kernel has more or less tar on it. As a drier add a small amount of lime, plaster or even dry road dust. If the mixing and drying has been well done, seed so prepared may be sown by machine.

Second.—When crows are noticed on the field, take some corn, say two gallons, more or less, according to size of field it is desired to protect, and boil for about thirty minutes in water, just sufficient to cover the corn and an inch to spare. To the water and corn, before boiling, add about one-eighth ounce of strychnine, or better still of strychnine sulphate, for each gallon of water. Allow the corn to lie in the strychnine and water over night. In the morning, drain off any water remaining and scatter the corn thinly over the field off which it is desired to frighten the crows.

In making use of the above plan, great care should be taken to pour water off corn into some hole, or on some spot not likely to be frequented by children or domestic animals. Care should also be taken to keep poultry off corn field for some two or three weeks after poisoned corn has been scattered thereon.

Nothing practicable can be done to prevent smut, excepting possibly the gathering and burying of affected ears.

When to Harvest.

Corn will be ready to cut for forage or ensiloing when the grain or kernel is in the dough stage and has begun to glaze. If weather conditions are adverse, that is, cold and wet, it is often advisable to cut before this stage of maturity is reached, when for any reason the crop is late maturing. Frost does not spoil the crop for either forage or ensilage, but the feeding value is quite materially lessened if the leaves and stalks are badly frozen.

Cutting the Corn.

Special machines called corn harvesters are manufactured by various agricultural implement companies, and, where considerable areas of corn are grown, will be found practicable and economical. The farmer who grows only a few acres would not find it to his advantage to invest in such a machine. The corn may be cut with hand sickles of various descriptions or with hoes. A man can cut from three-quarters of an acre to an acre and a quarter in a ten-hour day, using one of the above small tools. With a corn harvester, in ten hours a man with a good team can cut from four to six acres, according to condition of the corn.

Making and Preserving Dry Corn Fodder.

Where no silo is at hand to use in storing and preserving the corn, very satisfactory results may be expected by drying the crop for fall or winter use. To preserve in this way, the corn should be bound into sheaves 8 to 12 inches in diameter, and five or six of these made into an open but firmly built shock, the tops being bound together to lend further strength. These shocks, if well built, may be expected to stand as long as it is desired to leave them in the field. In fact, not a few farmers haul them in as needed in winter.

If barn room is available, they might be hauled in and stored on top of mows or elsewhere, care being taken to place them erect and not to pack too tightly as there is danger of heating or mould. If the corn is fairly dry and the straw is plentiful, the corn might be hauled and stored among the straw, placing it in layers, being careful to have a good thick layer of straw, at least two feet, between the layers of corn sheaves.

Where it is not desired to leave in shocks in the field and no barn room is available, a fairly satisfactory plan is to haul near the neighbourhood of the barn and stand in rows on either side of trestles so arranged as to allow prevailing winds to blow down alleys between rows of corn.

Feeding Corn Fodder.

The best method of feeding dry corn is to run enough of it through the cut box to last a week or ten days. Mix straw or cut hay with this cut fodder corn. This mass will quite probably heat to a certain extent, but this will increase the palatability, unless allowed to lie for too long a time. It is possible, of course, to feed without cutting, but considerable loss of food and comparatively unsatisfactory results may be anticipated when the forage is fed uncut.

Ensiloing.

The really best way to preserve corn and the way to get the greatest returns from the field in the shape of food, is to store it in a good silo. If very juicy or lacking maturity when cut, it is often well to let it lie for a day or two between cutting and ensiloing. If very dry when cut, it is sometimes well when ensiloing to pour a few gallons of water around the wall of the silo for each foot in height as the ensilage rises, say one gallon water to one foot in circumference of the silo at each foot in height of rising ensilage. In any case the corn should be cut into short lengths, the shorter the better, say half-inch lengths, and well mixed, the ears with the stem and leaves all the way up. It is well also to tramp and fill most carefully around the walls.

It is impossible to properly fill the silo at the one time. It should be filled to the top, allowed to settle for a few days then filled again. It is advisable to repeat this settling and filling more than once if possible.

When filled for the last time, the surface should be nearly levelled, slightly higher in the middle if anything, and well tramped. If possible by putting a few barrels of water on the surface, less waste may be anticipated. Particularly is this true if the water is used freely around the wall.

The Cut Box.

Two distinct types of machine exist for cutting corn into the silo, the chain elevator cut box and the blower.

The chain elevator cut box will do satisfactory work with much less power than will the blower, hence is the advisable kind to buy for the man whose motive power is small. A good two-horse tread power will drive a fair-sized chain elevator cut box at moderate speed and raise the silage 30 feet. A very much greater power is required to drive a cut box of the blower type. Another reason in favour of the chain elevator type for the farmer who must own his cut box is the smaller number of men required to handle it economically. However, where all the men and horses necessary can be counted upon and a powerful engine is available for driving, then, the blower type of cut box may be expected to do the work of filling the silo more cheaply and much more expeditiously than one of the chain elevator sort.

In any case, great care should be taken to keep all machinery in good running order, and particular attention should be paid to keeping the cut box knives sharp and properly set.

Using Ensilage.

The ensilage will, of course, always be taken from the top when it is being fed out. The surface should be kept as level as possible, and in winter it will be found good practice to keep the surface a little lower around the wall than in the centre. This will largely prevent freezing to the walls or into the body of the ensilage. Frozen ensilage, once it is thawed out, is, however, quite as good as any other.

Ensilage may be fed directly to cattle just as it comes from the silo, but a better plan is to add to the ensilage a considerable amount, say 10 or 15 lbs. of cut hay or chaffed straw to 100 lbs. ensilage. If floor space is available for the purpose, mixing sufficient cut hay or chaff and ensilage to last several days (three or four) will prove to be a very satisfactory method of preparing feed for the cattle. Any meal to be fed should be thrown on the mixture of straw and ensilage after it is in the manger. Stir the whole mass after sprinkling meal. An average cow will consume about 40 lbs. of such a mixture of ensilage and straw or hay per diem.

Rations including Corn Ensilage.

Corn silage and straw or chaff, while together making a most excellent foundation or base, do not alone constitute a well balanced or suitable ration for any class of live stock. For feeding heifers or young stock, some bran and clover hay should be added. A suitable ration would be:—

For yearling heifers—

Corn silage	25 to 35 lbs.
Straw or chaff	4 to 6 "
Clover hay	4 "
Bran	2 "

For dry cows—

Corn silage	50 to 60 lbs.
Straw	8 to 10 "
Clover hay	4 "
Bran	1 to 2 "

For cow in milk—

Corn silage	45 lbs.
Straw	6 "
Clover hay	4 to 6 "

Meal mixture: bran, oats, gluten or oilcake meal or cottonseed meal, equal parts. One pound meal to three or four pounds milk produced per diem.

For steers running over winter (1,000 lbs. weight)—

Corn silage	60 to 75 lbs.
Straw	8 to 12 "
Clover hay	2 to 4 "

For fattening steers (1,000 lbs.)—

Corn silage	50 to 60 lbs.
Straw	6 to 10 "
Hay	3 to 6 "

Meal, starting at one pound, go up to 10 pounds per diem.

A good meal mixture would be corn, bran, barley and oilcake meal or cottonseed meal. Take bran and corn, bran and barley equal parts, or bran, corn and barley equal parts, to which add an amount of any one of the last three, equal to one-quarter of the total weight of the meal mixture when ready to feed.

Cost of growing One Acre Corn and putting same in Silo.

Ploughing	$2 00
Disc harrowing, ½ day	1 25
Harrowing, ½ day	62½
Seed, 20 lbs. at 2 cents per lb.	40
Planting, ⅕ day with team	25
Harrowing and cultivating (10 times)	2 50
Hoeing, 1½ days	2 25
Cutting, ½ day with team	62½
Hauling, one day team	2 50
Men, loading, unloading and ensiloing, 3 days	4 50
Use of power for cutting	1 00
Use of machinery and twine	50
	$18 40

To this might be added $3 for rent and $3 for part of manure used up. This would make a total cost of $24.50. From an acre of corn worked as indicated from 14 to 20 tons ensilage might be expected. Supposing an average crop, say 16 tons, the one ton corn in the silo, ready to feed, would have cost $1.53.

THE SILO.

The preservation of corn in the form of ensilage necessitates the construction and use of a silo.

The first point to decide when preparing to build a silo is the amount of ensilage to be stored and the size of silo required for such an amount. A good average daily ration for a cow being 35 to 40 lbs., the amount required for a given number of cattle during a certain period may be easily estimated. A cubic foot of ensilage weighs about 50 lbs. It is therefore a simple matter to calculate the dimensions of a silo necessary to hold a given number of tons. In the case of rectangular silos it is of course unnecessary to give containing capacity of different sizes. In the case of round silos, however, not so much variation in size is possible, and the table below will be found useful in helping to decide upon the size necessary to build for the supply required. The figures given make allowance for settling after being filled at least twice. By filling more frequently the amount might be slightly increased.

Depth in feet.	Inside Diameter in Feet.									
	15	16	17	18	19	20	21	22	23	24
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
20	58	66	75	84	94	104	115	126	138	150
21	62	71	80	90	100	111	123	135	147	161
22	67	76	86	96	107	119	131	144	153	172
23	71	81	92	103	115	127	140	154	168	183
24	76	86	97	109	122	135	149	163	179	194
25	80	89	103	116	129	143	158	173	189	206
26	85	97	109	123	137	151	167	183	200	218
27	90	102	115	129	144	160	176	194	212	230
28	94	106	122	136	152	168	186	204	223	243
29	99	113	128	143	160	177	195	214	234	255
30	105	119	134	151	168	186	205	225	246	268

Location of Silo.

The silo should be so located as to allow of a small room intervening between the silo and the cattle. This room should be utilized as a mixing room or temporary storage room where cut straw or hay could be mixed with the ensilage preparatory to feeding.

EQUIPMENT.

Cost of extra equipment necessary to start into corn cultivation and ensiloing on a large scale on a Canadian farm would be about as follows:—

Double cultivator	$ 60
Single cultivator	6
Corn harvester	140
Corn blower cut box	140
Silo—say about	300
Total	$646

Such equipment may be expected to last from 10 to 15 years, say 13 years, or $60 a year. The whole is likely to be repaid in about three years. The silo might quite possibly last 25 years, or in the case of cement or stone silos, indefinitely.

In all silo construction, a most important point is to build as high as possible, since each foot added in height increases by so much the chance of success and gives a more than proportionate increase in capacity due to the greater pressure of the taller column of material.

The silo may be built inside the barn or adjacent to it, as convenient. If built outside it may be expected to prove as satisfactory as if built under cover, though scarcely so long-lived in the case of wooden silos. While in the case of the unprotected silo, a small amount of ensilage may be frozen to the sides, especially to that side exposed to the prevailing wind, this may be mixed as it falls with the rest of the ensilage, and may be used without injury to the stock.

Kinds of Silos.

Silos may be made of wood, cement, steel, brick, stone and lath and plaster. Round silos are much to be preferred to the rectangular silos. Whether the silo should be made of one material rather than another is a matter of small consequence provided it is well made.

The silos most commonly constructed are of wood or cement. The wooden silo is usually of the stave type. It will be sufficient to say something about these two predominating types, the stave silo and the round cement silo.

Construction of Stave Silo.

The Foundation.

Supposing it is desired to construct a silo 20 feet in diameter, a circular trench 18 inches to 2 feet wide and with an outer diameter of 22 feet is dug about 2 feet deep, or below the frost line.

The surface soil over the whole included area and for 2 feet outside is removed to a depth of 10 or 12 inches at the same time.

The trench is then filled to the level of the interior with stone well pounded down, the surface stone being broken quite small and thin cement (one part of cement to four of sand) thoroughly mixed, poured over, well worked in and left for a few days. This is followed by a coat of good cement (one part cement to three sand), care being taken when finished to have the surface level and smooth.

Pure cement sprinkled on dry shortly after last coat and worked in with a trowel will make a superior finish.

Ample drainage should be provided whether the silo be built inside the barn or outside. This is essential to the preservation of both the silo and the ensilage. If any fear of rats be entertained, they may be guarded against by spreading a thin coat of grouting over the area insido the trench.

The above is to be preferred to cementing the entire interior because more economical and equally serviceable.

A stone wall might take the place of the above described foundation, but it would be necessary to line the inside with cement wherever the ensilage might be expected to touch it.

The top of the wall would also require a coat of cement in such case.

The circular line to mark the position of the staves might be drawn by means of some hard pointed article attached to a bit of string half the length of the diameter of the proposed silo. A spike driven in the centre might serve as a pivot.

The Staves.

Any of our common soft woods may be used for staves. Hemlock, red pine or spruce seem to be equally serviceable.

The staves may be from 1½ to 3 inches thick by from 5 to 9 inches wide. The smaller the silo the less must be the width of the stave. The best size is probably 6 by 2 inches, dressed on the inside and sized square on the edge. By using the staves with a tongue and shallow groove, they may be expected to be more easily kept in place.

The parts of the door may be held in place by a 6-inch bar cut to fit the curve and to which each part is firmly bolted.

The Hoops.

Round or flat hoops may be used. Round hoops in two, three or four sections are the most easily handled. They may be joined by means of metal or wooden clips so bored as to admit of putting a nut on the exserted end of the rod, or by passing through the uprights.

They may be held in place by wire fencing staples driven in at intervals. When the silo is exposed to the weather, care should be taken that each stave is so attached to two or more hoops.

It will be found necessary to give the proper curve to the hoop before attempting to put it in place. This is most easily done by using a tire bending machine such as may be found in any carriage or repair shop.

Round iron or steel ¾-inch through will be found strong enough for a 20-foot silo.

The hoops should be nearer together at the bottom and farther apart towards the top.

The first hoop should be not over 4 inches from the foundation.

The second about 18 inches from the first, and the third 2 feet higher.

The space between hoops may gradually increase to 4½ feet at the top.

Where the silo is built outside, it will be found necessary to roof it in most parts of Canada. A conical roof is the best form for the round silo.

When posts form part of the silo wall, they may be utilized as supports for the roof. In cases where posts have not been used, it will be found necessary to erect two or more, or construct a framework from 2 x 4 scantling to carry the roof. In any case, care must be taken to allow an opening for filling.

A Cheap Rectangular Wooden Silo.

When it is not convenient or possible to build a stave silo, a very cheap rectangular one may be constructed by erecting strong (3 x 10) studding around a bay or part of a bay in a barn and lining with one-ply good matched lumber one inch thick. Such a silo has been in use at the Experimental Farm for eight years and has given good results.

Cement Silos.

Cement silos when properly constructed are probably more durable and more satisfactory than wooden silos. Care must be taken, however, when building to prepare a good foundation, use the best materials and properly and sufficiently reinforce the concrete.

The foundation should be dug down below the frost line, say 4 feet deep in eastern Canada and 6 feet deep on the prairies. In digging the foundation, room should be allowed for carrying on the work of building; that is, for a silo 20 feet in diameter the hole dug should not be about 22 feet merely in diameter, but about 27 feet at the surface and 22 feet at the bottom of the excavation. If the foundation has to be sunk lower than 4 feet, then the excavation should be relatively greater at the top. At the bottom of the main excavation, a circular trench should be dug for the footing of the silo walls. This trench should be about 2 feet or 2 feet 3 inches wide and 1 foot or 1 foot 6 inches deep, according to the character of the soil. The looser or softer the soil, the deeper should be the trench.

Level off the bottom of the trench and the bottom of the central part of the original excavation. Fill in the trench to a depth of 1 foot 4 inches or 1 foot 10 inches in the case of loose soils, and the other surface 4 inches deep with a layer of 4 inches of 1:3:6 concrete of medium wetness.

Proceed on top of this layer to build up the walls, using either wooden or steel moulds. Circular wooden moulds may be built by any good carpenter. They must be built in such a manner as to permit of their being loosened, then raised to be set for the next section. Many cement manufacturing companies keep steel moulds which they rent for a moderate sum to be used in the construction of silos.

The moulds should be set at least 8 inches apart so as to make an 8-inch cement wall when the space is filled. Before filling, reinforcing material must be put in the moulds at proper intervals in their upward progress to provide doors for the removal of the ensilage. Provision must be made also for a set ladder to climb up the silo.

A conical roof is the most suitable for such a silo.

The concrete used in silo construction should be carefully mixed. For the footings and floor, the proportions should be 1:3:6, which means one part Portland cement, three parts sharp sand, and six parts gravel or broken stone.

For the walls, the concrete should be mixed in the proportion of 1:2:4, that is: one part Portland cement, two parts sharp sand, and four parts clean, sand-free gravel or broken stone.

Reinforcement.

For reinforcement, plain wire may be used, or better, barbed wire. The reinforcing wires should run horizontally and should be spaced according to strength of wire and size of silo. The larger the silo, the more reinforcement is required relative to the size.

Mixing Concrete.

There are many ways of 'hand mixing,' al having the same good results. The way described here I believe to be the one best calculated to obtain good results with a minimum of labour. In this description I have taken as a basis a 'two bag batch' of 1:2:4 concrete.

First load your sand in wheelbarrows from the sand pile, wheel on to the 10 x 10 'board' and fill the sand measuring box, which is placed about two feet from one of the 10-foot sides of the board. When the sand box is filled, lift it off and spread the sand over the board in a layer 3 or 4 inches thick. Take the two bags of cement and place the contents as evenly as possible over the surface of the sand. Start mixing the sand and cement, each man turning over the half of his side of the central line. Starting at his feet and shovelling away from him, each man takes a full shovel-load, turning the shovel over near the outside of the board. In turning the shovel do not simply dump the sand and cement but shake the materials off the end and sides of the shovel, so that the sand and cement are mixed as they fall. This is a great assistance in mixing these materials. In this way the material is shovelled from the centre of the board to the side then back to the centre. This out and in throw should be done twice.

The sand and cement should now be well mixed and ready for the stone and water. After the last turning, spread the sand and cement out carefully, and place the gravel or stone measuring box beside it. Lift off the box and shovel the gravel on top of the sand and cement, spreading it as evenly as possible. With some experience, equally good results can be obtained by placing the gravel measuring box on top of the carefully levelled sand and cement mixture, and filling it, thus placing the gravel on top without an extra shovelling. Add about three-fourths the required amount of water, using a bucket and dashing the water over the gravel on top of the pile as evenly as possible. Be careful not to let too much water get near the edges of the pile, as it will run off, taking some cement with it. This caution, however, does not apply to a properly constructed mixing board, as the cement and water cannot get away. Starting the same as with the sand and cement, turn the materials over in much the same way, except that instead of shaking the materials off the end of the shovel, the whole shovel load is dumped and dragged back toward the mixer with the square point of the shovel. This mixes the gravel with the sand and cement, the wet gravel picking up the sand and cement as it rolls over when dragged back by the shovel. Add water to tho dry spots as mixing goes on until all the required water has been used. Turn the mass back again, as was done with tho sand and cement. With experienced labourers the concrete would be well mixed after three such turnings; but if it shows streaky or dry spots, it must be turned again. After the final turning, shovel into a compact pile. The concrete is now ready for placing.

Mixing Natural or Bank Sand and Gravel.

Sand and broken stone are not always available, and it becomes necessary to use tho natural mixture of bank sand and gravel as it comes from the pit. This may be done as follows: Spread out the mixture of sand and gravel, as much as the board will readily permit, add enough water to wet the gravel and sand thoroughly, spread the cement evenly in a thin layer over the sand and gravel, and turn over, as described previously, at least three times, adding the rest of the water necessary to get the

required consistency while the materials are being turned. It requires some experience to work up a natural mixture of bank sand and gravel, and if at all doubtful about the concrete made from it, first screen the sand from the gravel and then mix in the regular way.

Measuring by Wheelbarrow.

With a little practice, the sand and stone or gravel can be measured by the number of wheelbarrow loads about as accurately as by measuring boxes.

DRAINAGE.

To insure good ensilage of uniform quality from top to bottom of any silo it is absolutely necessary that good drainage be provided to carry off the extra juice or sap that will gradually settle to the lowest levels of the silo, and very injuriously affect the quality and palatability of the ensilage if not allowed to escape. Thus openings in the cement or concrete floor are necessary to permit of such free juice readily running off.

Another important point in the cement silo is the finishing off of the interior surface with a very thin layer or coat of pure cement. Such a coat may be applied with a whitewash brush, and should be put on when the cement is drying or as soon as the moulds or forms have been off for a day or so. A similar coating on the outside surface is of value inasmuch as it adds to the appearance of things. It is necessary on the inside to insure the ensilage lying next the walls coming through in good shape. Where such a finish is not given, losses are almost sure to occur, due to the absorption of moisture from the ensilage by the too porous concrete wall.

SUMMARY.

1. Corn will grow on any well drained and well manured soil.
2. Thorough soil preparation is absolutely necessary.
3. Corn should not be sown closer than 3 feet apart in hills, or if in rows, 3½ feet apart, 8 inches between plants in the rows.
4. Sow varieties suitable for district. Varieties that will mature fairly well are necessary.
5. Keep field well cultivated and free from weeds.
6. Cut in dough stage.
7. Preserve in silo if possible.
8. Mix chaff or cut straw with ensilage when feeding.
9. Build the silo well.
10. Be sure to drain the silo in order to permit of escape of surplus moisture or juice from the ensilage.