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GROWING CORN IN COLORADO

4-H CLUB MEMBERS' MANUAL

Raymond Condon, Weld County, Making a Field Selection of Colorado 13.

COLORADO AGRICULTURAL COLLEGE
EXTENSION SERVICE F. A. ANDERSON, DIRECTOR
FORT COLLINS

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GROWING CORN IN COLORADO

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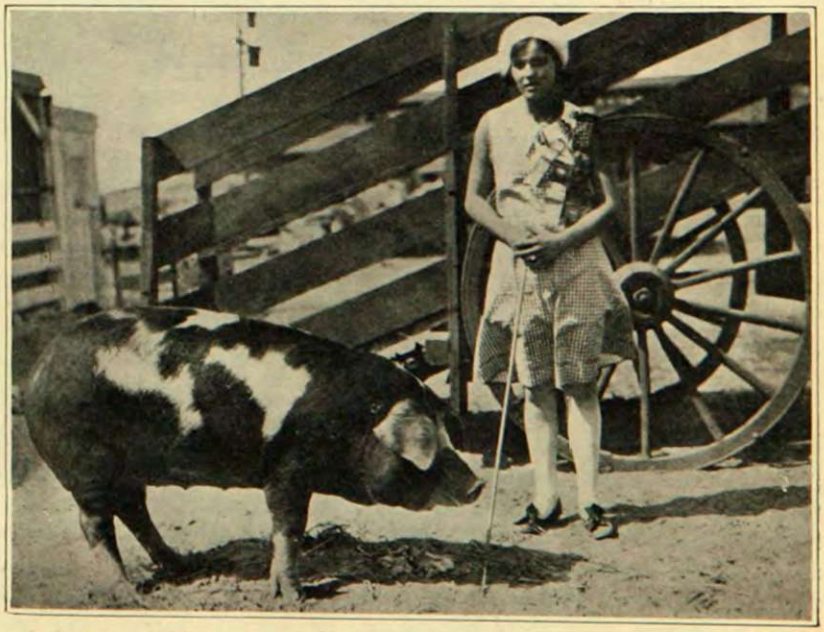
I. Shall I Grow Corn?

Under favorable conditions corn will produce more feed per acre than any other crop. If corn is not adapted, not generally grown in your district, do not experiment by trying to grow the crop. Because of its universal use, corn as a feed is the standard with which all other feed products are compared. The grain of corn is perhaps the safest to feed and best liked by hogs, sheep, cattle and poultry, of any of the grain products grown.

A 50-bushel yield of corn produces approximately 2,399 lbs. of digestible feed per acre, not including the stalks or leaves. A 50-bushel yield of barley produces 1,905 lbs., a 50-bushel yield of oats produces 1,126 lbs., 50 bushels of hog millet or hershey produces 1,937 lbs., and a 50-bushel yield of milo has 2,237 lbs. of digestible nutrients.

Before deciding definitely that you will select corn as a project you must consider which feed crop is likely to give the greatest yield of feed under your conditions and which will be eaten by the animals



One reason why corn is grown in Colorado—to fatten hogs. A pig project and corn project make a good combination.

Baby beef steers and a corn project make another good combination.

that you have. In other words, your feed crop must be adapted to the livestock which you have. Take a pencil and piece of paper and figure out what it will cost you to raise an acre of corn and then decide whether you can buy feed cheaper than you can raise it. Remember that the cost of raising an acre of corn is largely labor which you can do yourself and no great amount of cash is required. The data on pages 5 and 6 secured by farm management specialists of the Colorado Agricultural College indicate the items to be included in the cost of growing the corn crop as well as the possibilities of growing corn in Colorado.

II. Selecting the Field

After you have reached a decision to raise corn as the feed crop, you will need to see if dad will let you have a good field for raising the crop. Also make sure that you will have access to all of the machinery and power for growing the crop. It is well to have a definite understanding or agreement **in writing** with your dad or from whomever you rent, regarding the use of teams, land and machinery; also the portion of the crop which you will give as rent.

Be sure to provide for storage of your crop in the contract. Ask your club leader or school teacher to assist you in writing a business-like contract. (See appended form of Contract.)

In selecting a field for growing corn, remember that corn requires considerable fertility. **Land can hardly be too rich for corn;** however, heavy applications of manure under dryland conditions may cause burning or firing of the crop with a poor yield.

In Colorado the soils which most successfully produce corn are sandy loams or light sandy soils. This is in part due to the fact that such soils are warmer, especially early in the season, than silt and clay loams. Being warmer, they permit planting earlier in the spring. The crop develops more rapidly and matures earlier in the fall. The best corn districts of the plains are almost without exception on sandy land or sandy loam. In only a few localities is corn successfully grown on other than sandy soils, these few localities being located in the hotter portions of the state.

A light sandy soil will not only catch rainfall better but it will give water up more readily to growing plants. In the corn-

COST OF PRODUCING 160 ACRES OF CORN IN 1929
(Non-irrigated Sandy Land, Kiowa County)

Labor Costs:			
Man hours	137 @ 25c	$ 34.25	
Horse hours	1180 @ 10c	118.00	
Contract Labor:			
Picking 3500 bu. @ 11c per bushel (shelled wt.)		385.00	
Shelling @ 2¼c per bushel		78.75	
Listing tractor @ $1.00 per acre		160.00	
Cultivating twice 4-row @ 50c per acre (tractor)		160.00	
			$ 936.00
Material Costs:			
Seed, 5.6 lbs. per acre @ $1.50 per bushel		24.00	
Treating materials		15.00	
			39.00
Other Costs:			
Interest on investment in land, 6 percent of $3,200.00		192.00	
Taxes @ 20c per acre		32.00	
Equipment (wagons)		5.00	
Overhead (10 percent of labor and materials)		97.50	
			326.50
Total Cost of Producing 160 Acres of Corn			$1,301.50
Total cost per acre			8.13
Yield 3500 bu. on 160 acres or 22 bu. per acre			
Total cost per bushel (3500 shelled bushels)			.37

Labor Operations	Man Hours	Horse Hours
Treating seed	2	.....
Weeding	60	.....
Picking	....	1180
Shelling	75	.....

COST OF PRODUCING 12 ACRES OF CORN 1929
(Irrigated Land, Arkansas Valley)

Labor:			
Man hours	308 @ 30c	$ 92.40	
Horse hours	652 @ 15c	97.80	
			$ 190.20
Material Cost:			
Seed, 100 lbs.		5.00	
Water @ $1.50 per acre		18.00	
			23.00
Other Costs:			
Interest on investment in land ($1,200.00 at 6 percent)		72.00	
Taxes @ $4.00 per acre		48.00	
Machinery $1.50 per acre		18.00	
Overhead (10 percent of materials and labor)		21.32	
			159.32
Total Cost of Producing 12 Acres of Corn			$ 372.52
Total Cost Per Acre			31.04
Yield 989 bushels or 82 bushels per acre			
Total Cost Per Bushel			.38

Labor Operations	Man Hours	Horse Hours
Winter irrigation	20	.....
Discing	25	100
Listing	21	84
Cultivating	44	88
Irrigating	8	.....
Husking and hauling	190	380
	308	652

Previous Crops
1915-1924 Alfalfa
1925 Cantaloupes and Cucumbers
1926 Tomatoes and Cucumbers
1927 Beets
1928 Cucumbers

growing sections of Colorado the light soils are quite uniformly planted to corn, while the so-called "hard lands" are planted to wheat. Heavy soils may be described as those made up of finer or smaller particles than sand. The heavy soil does not seem to conduct heat from the sun so readily, and there is that tendency to cling to any moisture which may get into the soil, making the soil damp and cold. Under damp, cold conditions the corn crop is apt to be delayed in early growth so that it will fail to mature before frost in September.

In the plains area, corn is a good crop to follow beans, alfalfa or sweet clover. Corn after corn has been quite successful in the non-irrigated areas of Colorado, tho such a practice is dangerous for any length of time because of the danger of root worms, other insect pests or diseases. Corn for 2 or 3 years in succession followed

by a crop of wheat, then summer fallow before being planted to corn, is a better practice than continuous cropping with corn. Under irrigated conditions, the highest yields of corn are secured following alfalfa, sweet clover or some cultivated crop such as sugar beets or potatoes, which has received barnyard manure.

III. Selecting the Variety to Grow

There are several things to be considered. Most important of all before selecting a variety is to find out which variety is grown in your district. Remember that you are concerned with growing feed for your livestock and if you select a variety that is not adapted to the district in which you live your pigs, sheep or calf may go hungry.

In a number of feeding trials it has been definitely shown that yellow corn produces decidedly larger and more economical gains than white corn, when fed to pigs that are not an alfalfa or clover pasture. This difference in feeding value is due to unseen substances called vitamins which are contained in the yellow corn in greater quantities than in white corn. In feeding cattle or sheep there would not be such a noticeable difference between yellow and white corn because alfalfa, clover or some legume hay which is high in these soluble vitamins is usually fed with the corn.

Local-grown seed of Colorado 13 or Minnesota 13 are perhaps the best varieties to choose for most Colorado conditions except in the Arkansas Valley where the growing season is longer, permitting the growing of Reids Yellow Dent or Iowa Silvermine. Pride of the North, a pale yellow Dent, Logan County White, a selection from Iowa Silvermine, or Rustler, a white dent, are considered good varieties in the plains region as well as under irrigation.

Swadley Dent, Calico, White Australian Flint and Squaw corn are varieties that may be considered in dryland areas. The white Australian Flint is credited with maturing in the shortest growing season, therefore is adapted to higher altitudes than most varieties.

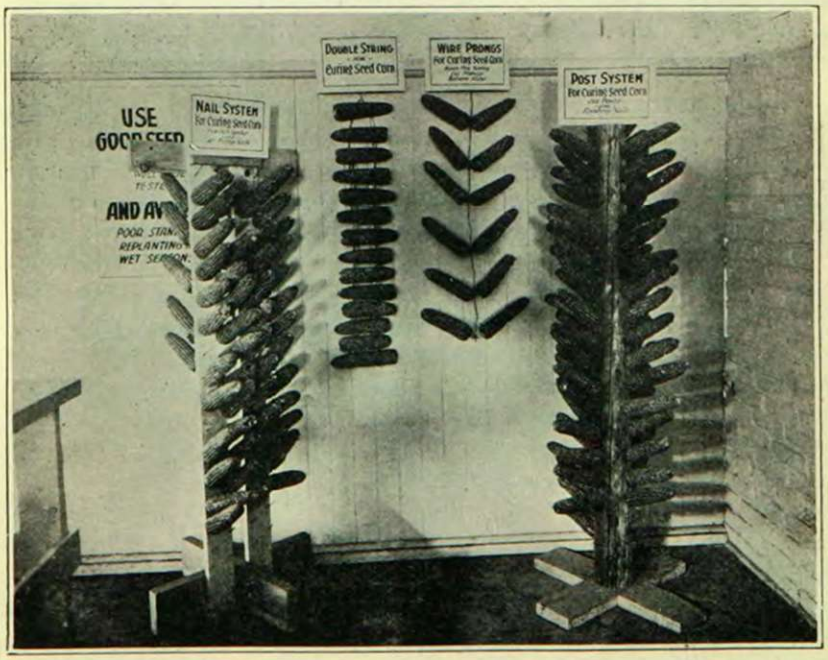
IV. Securing the Seed and Testing

After choosing the variety to grow, the question naturally arises as to sources of seed. Maturity is perhaps the greatest problem of the corngrower in Colorado. Immature corn does not have the feeding value of mature corn and it is very difficult to store "soft" or immature corn without spoilage. The selection of an adapted, high-yielding strain and securing acclimated seed is more important than the selection of a variety. The best seed corn for the farmer to buy

is usually found somewhere within his own district; therefore inquire around to find out who the good corngrowers are in your community or county. If you will drop a card to the Extension Agronomist at the Colorado Agricultural College, a list of registered-seed corngrowers in your county will be supplied.

If it is discovered that there are no corn breeders or seed growers in your county, the next best thing to do is to ask your county agent where corn that is adapted to your conditions may be secured. If you have made your decision to grow corn as a club project, early in the fall before corn has been harvested you will have the chance to field select your seed as outlined later in this bulletin from your dad's crop or from a neighbor's field. It requires 4 to 7 lbs. of seed to plant an acre under dryland conditions, and 7 to 10 lbs. under irrigated agriculture. Approximately 140 ears of medium-sized Colorado or Minnesota 13 will shell out a bushel of desirable seed which will plant 6 to 8 acres. **Good seed is a paying investment even tho the price may seem high.**

Testing Seed Corn.—If the farmer purchases registered seed corn he will be supplied with a registration tag which will show the



Various methods of storing seed corn. All good methods permit air circulation around the seed ears so they will dry quickly.

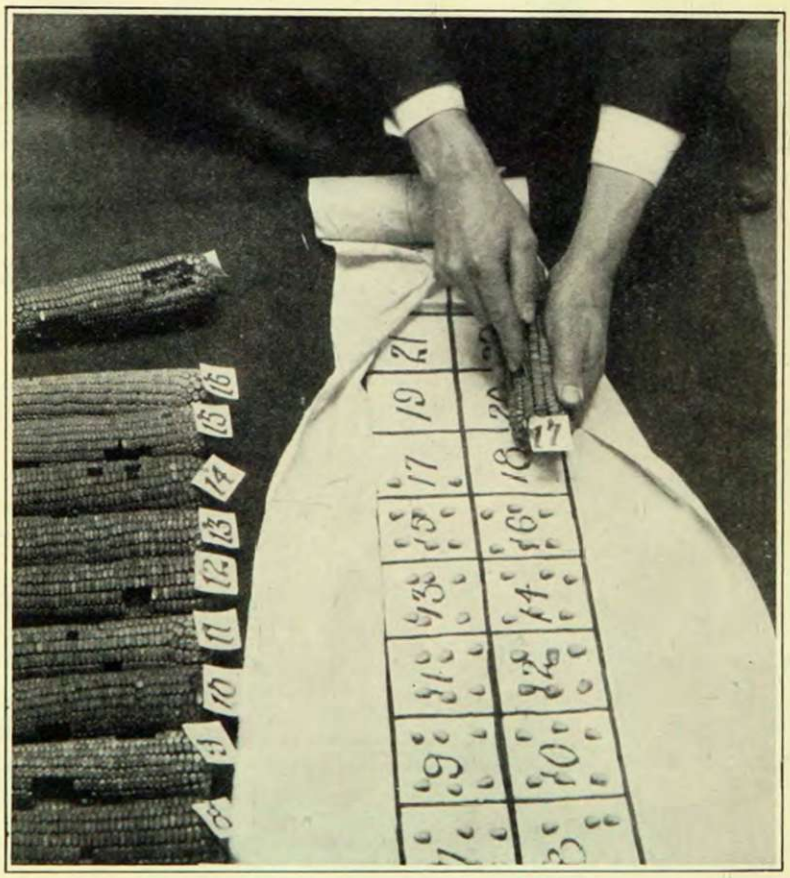
germination. In looking thru the corn in field or crib, it is rather difficult to be sure that you will pick out good ears. The medium-sized, firm, heavy ears are most apt to be matured and adapted to your conditions. After picking out a sufficient amount of seed corn, the next problem is to arrange the ears in order to be able to identify a particular ear with some of its kernels in the tester so that undesirable ears may be eliminated.

The "Binder Twine" method of hanging seed corn for drying.

Often ears under test may be put on a barn ledge or a shelf or they may be hung in groups of 10 or 20 with binder twine. A seed-corn rack is convenient, made of 2x4 uprights with 2 laths (one on each side) as cross pieces, then individual ears separated by wire stretched from the top cross piece to the bottom. See Farmers Bulletin 1175.

Probably the best known and most widely used method of making the germination test is the rag doll. The improved rag doll is considered the simplest; is effective, inexpensive and suited to average farm conditions.

To make this test, cut strips of muslin (old sheets, flour sacks or sugar sacks sewed together) 12 inches wide by 54 inches long. While still dry, number the cloth with a wax pencil or water-proof ink to correspond with the ear numbers. A corresponding strip of heavy wrapping paper is next cut to the same width but 6 inches longer. The thoroly wet cloth is next placed on the paper spread out flat, then 6 to 8 kernels from each ear are arranged in straight rows across the width of the cloth. These kernels for test should be removed from different parts of the ear so as to test each section.



The Rag Doll Seed Tester—Six kernels are taken from each ear for test. These are placed on the square corresponding to number on ear.

The kernels from 20 to 30 ears can be placed on a cloth 54 inches long. The grain should not be placed nearer than 4 inches to the end of the cloth, having the paper extension and after all space is filled the cloth and paper are rolled into a doll. The doll should be marked with a label giving the date and the number of the ears from which the kernels were taken.

The dolls may next be immersed in a pan of lukewarm water for 2 to 3 hours then drained and set upright in a pail, kettle or box. The container should be lined with burlap or gunny sacks which are kept moist thruout the test. It is essential that plenty of moisture be supplied to the dolls and that they be kept in a warm room for 7 to 10 days. In reading the test, one should be critical.

Any ears whose group of kernels show weak sprouts, slow germination or dead germs should be thrown out.

The yield of any crop depends to considerable extent upon the stand. In order to secure a 100 percent stand every kernel or seed should grow and it is for this reason that testing is done. However, there will be some kernels that are not dropped in favorable soil and moisture conditions and will not grow. Other kernels will be taken by field mice, gophers or insects and bird pests.

Work conducted at the Ohio Experiment Station has proved that time devoted to testing corn for seed was rewarded at the rate of $6.50 per hour in increased yields.

V. Preparation of the Seedbed

The essentials of a good seedbed for starting the growth of corn are (a) plenty of moisture, (b) sufficient depth to allow deep rooting, (c) free from weeds. Any method of preparation that will provide these three conditions should be considered, and of course will differ under dryland and irrigated conditions. The method of preparing the field for corn will also depend upon the previous crop grown. In general, club members **should follow the practice of seedbed preparation** used by the **best farmers in the community.**

Dryland preparation usually consists of listing with a 1, 2 or 3-row lister; 1 man with 6 horses or tractor can plant 12 to 16 acres daily. With the specialized listed-corn cultivating machinery that is now available, listed corn can be cultivated with less work and kept clean with fewer cultivations than surface-planted corn.

If the corn crop is following a crop of beans in the plains area, it may be well to list the land as soon as the bean crop is removed, this will prevent blowing during the winter or spring and in this roughened condition snow is more apt to be stopped for moisture storage in the soil. Regardless of what the previous crop may have been, fall or late-summer listing is considered preferable to listing in the spring. Sometimes it is desirable to disk small-grain stubble ground soon after the removal of the grain crop so that an excessive weed growth is prevented and straw or stubble is cut up sufficiently to avoid trouble when listing is done later in the summer or fall.

A method that has given excellent results in western Kansas with sorghums and should be equally satisfactory for corn, consists of listing in the fall, then disking or harrowing in the spring as weeds begin to grow. At planting time the lister is run in the old furrows which by that time are partly filled with dirt worked in from the ridges. This fine mellow earth is in excellent condition for the seed

and germination usually takes place immediately, because of the warmth that is gained by direct rays of the sun striking the sides of the lister ridges. This practice should be adapatable to the so-called "hard lands" as earlier germination and growth would be possible because of this warmed condition of the soil. The lister ridges will also act as a protection to young plants should there be late spring frosts or hard winds.

Listing early in the spring, then again at planting time, breaking the ridges, does not always give satisfactory results due to great loss of moisture from the exposed soil surface, especially if the weather is dry thruout the spring. In some sections where sufficient rainfall occurs, early listing is practiced, then later as the soil has become warmed up, planting is done in the open furrows and a quicker germination with rapid growth is secured; a condition not always possible when planting is done at the same time as listing. Seed dropped at the bottom of the lister furrow, if listing and planting is done in one operation, is put in cold soil and decay may occur before warmth for germination is available.

There may be some conditions where plowing, then surface planting will be practiced under plains conditions. Fall plowing is considered best, wintering in a roughened condition. A good harrowing or disking then puts the soil in excellent condition for planting in the spring. In some districts fall listing is practiced, then early in the spring the ridges are worked down with disk "middle busters" and the corn is surface planted. A well-prepared seedbed with a minimum loss of stored moisture practically assures victory in the raising of a corn crop on dryland. **The application of common sense is known as Scientific Farming.**

The adjustments of the lister and arrangement of the horses or hitches for the tractor should be discussed thoroly with dad before starting out to list the field. Straight rows indicate a careful farmer tho in some fields it may be advisable to run furrows on the same level around a hill to avoid washing from heavy rains. Straight rows indicate that the farmer is careful with his team and that he is careful with his machinery. Anybody can make a crooked row but it takes a good man to list out a field of straight rows.

Preparation for the irrigated corn crop usually consists of spring-disking the field where beets or potatoes were grown last year. The disking or spring-tooth harrow serves the purpose of loosening the top soil that may have become baked or run together and will kill the first crop of weeds before planting is done.

If the corn crop is to follow alfalfa or sweet clover, it is advisable to fall plow. Fall plowing turns under any plant or weed

Early fall plowing, turning under a good growth of sweet clover is excellent preparation for corn on irrigated farms.

growth which starts to decay during the winter and at the same time the freezing and thawing breaks up the clods and puts the soil in a good mellow condition for spring planting. Fall plowing of the field for corn has an advantage of relieving the farmer of a certain amount of spring work during a very busy time.

In plowing alfalfa in order to insure a good kill of the plants, two methods are practiced with satisfactory results. The alfalfa field may be "crowned" in the fall by plowing at a depth of 3 or 4 inches, then replowed to a depth of 8 or 10 inches in the early spring. Some farmers have very good results in killing the alfalfa plants by one plowing to a depth of 7 or 8 inches, either in fall or spring; however, the old alfalfa roots may cause some difficulty in cultivating the corn or any cultivated crop. In either method it is advisable to set the plow so that the share does not cut a full furrow slice. The overlapping will insure a complete cut of the alfalfa roots. A sharp share is essential to a good job of plowing alfalfa. The tractor has an advantage over horses in the alfalfa-plowing job because of the steady pull possible. Sweet clover does not present such a problem in killing as does alfalfa. Sweet clover is perhaps best handled by

pasturing the second year, followed by late summer or fall plowing to turn under any stems and crowns that may be left.

Under some conditions, spring plowing gives very satisfactory results. When soil is dry the land may be flooded in the spring; then plowing is done soon after flooding, and after harrowing, the field is ready to be planted. Some growers plow their land in the spring, then flood irrigate with a large head of water to settle down the field, giving a firm seedbed and at the same time supply moisture needed for germination. Harrowing or a light disking should follow such a practice to prevent crusting, and also to kill volunteer crops or weeds that may start up before planting.

Club members will need the best information obtainable for their district. The plans and advice of the best corngrowers in the district are perhaps the safest to follow. It is **always** safe to **estimate** that you will have a **difficult year** to grow corn and every precaution should be taken to insure a crop. Then if the season is more favorable for growing the crop you will be agreeably surprised at the yield obtained.

VI. Planting Corn

There is no definite time of planting corn that applies to all sections of Colorado. Neither is there a definite time of planting in a given district of the state because of the variation in seasons. Sometimes the weather is warm early in the spring and we say that we have an early spring and corn may be planted as early as the last week in April. Other years there may be a late spring and planting will need to be delayed perhaps until May 25. Again the experience of local growers is the best information that can be secured. Generally we say that it is better to have the young plants "nipped" by frost once or twice in the spring than to have the crop go into severe frost in September before it is mature.

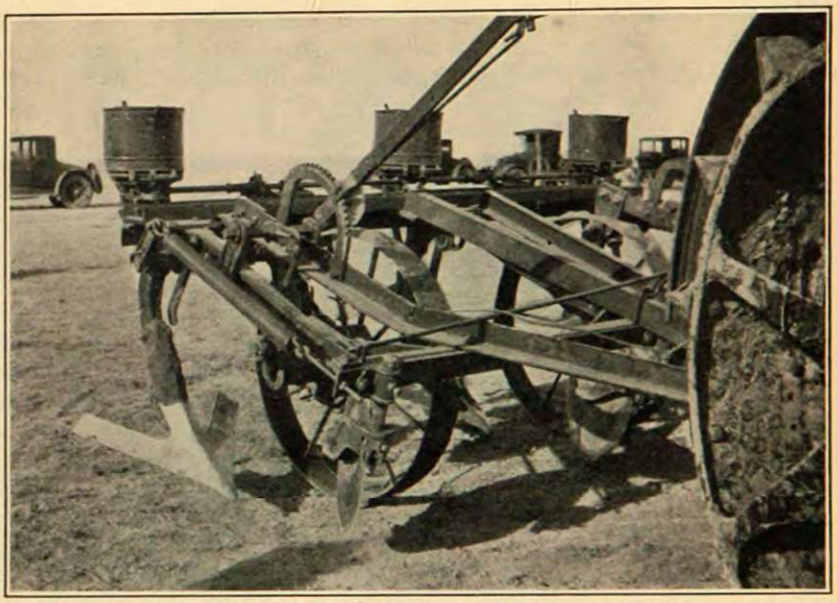
Date to Plant Irrigated Corn in Northeastern Colorado[1]

Date	Yield in bushels Shelled Corn 5-Year Average	Weight Per Measured Bushel	U. S. Grade
April 20	53.3 Bus.[2]	57.8 pounds	No. 1
May 1	51.3 Bus.	56.8 pounds	No. 1
May 10	49.2 Bus.	55.2 pounds	No. 1
May 20	45.7 Bus.	54.0 pounds	No. 2
May 30	41.2 Bus.	51.6 pounds	No. 3
June 10	30.9 Bus.	45.4 pounds	No. 6

1 Five-year average of experiments conducted at Colorado Agricultural College.

2 Only 4 years' data for April 20 date.

It will be noted in the above table that early planting favors both yield and quality of corn, the last week in April and the first week in May proving best under the soil (Fort Collins light loam) and altitude (5040 ft.) conditions at the Experiment Station.



Moldboard removed from lister—duckfoot shovel attached ready to plant corn in fall-listed furrows on "hard land."

Under dryland conditions moisture is the limiting factor of crop production; therefore the number of plants to be grown to maturity should be limited to correspond with the amount of water available in storage in the soil. This is a difficult determination to make. This is where the science of dryland farming is needed and again scientific dry farming is **uncommonly** good sense. **Remember** your **dryest** years, then proceed to plant corn. Growers may become enthused by apparently plenty of soil moisture at planting time, being encouraged to plant too much seed. The critical time in the development of the corn plant is when the ears are being formed, usually in August. Then a great amount of moisture is needed. It is this period for which the good grower always plans. It is during this period that the annual prayers for rain go unanswered. A stand of corn slightly less than the land will carry is better than even a slight excess. Many failures under dry farming are directly due to over seeding, the moisture sometimes being sufficient to carry plants half way to maturity and then burning occurs and the grower is discouraged.

Five pounds of Minnesota 13 seed are sufficient to drop a single kernel every 24 inches in rows that are 3 and one-half feet apart. There are enough kernels in 8 lbs. of seed to allow for spacing of

15 inches in the rows. Some varieties of corn have a smaller kernel, therefore, a greater number in a pound, requiring fewer pounds to secure a stand on an acre. In most plains sections corn can be planted in rows 3 and a half feet apart with the single stalks in the row 24 inches to 30 inches apart.

Some sections where corn may be produced are so dry that the rows may be 7 feet apart and the rate of planting in the row one stalk every 24 inches. This 7-foot system is used both in surface planting and in listing. If fall listing is practiced, the planting can be done in every other row, leaving the middle furrow in the 7-foot space to be worked down and clean cultivated. Very satisfactory yields have been secured by this practice and such a plan more nearly approaches regular summer fallowing than other systems of planting. Following proper cultivation, these wide spaces can be put into excellent condition for sowing winter wheat before the corn is harvested. The rows of corn stalks may stop snow or sand from blowing during the winter.

Regardless of whether surface planting or listing is practiced, the planter should be tested out to see if it is adjusted to give proper spacing between kernels. The simplest method is to drop in a few handfuls of corn when driving to the field, throw the planter in gear, but out of the ground and determine if the drop is satisfactory.

Two stakes at the ends of the field bearing colored rags which can be seen easily the entire length of the row are frequently used as a "sight" in getting the first row straight, the driver of the planter sighting down the tongue of his machine and driving toward the distant stake. In long fields a third stake set in the middle of the field is used.

Two to three inches is considered the proper depth to cover the kernels tho it is a good practice to drop the kernels deep enough to be in **moist soil.** It is important to use the sub-soiler in listing corn as otherwise the kernels are dropped on uncultivated, packed ground at the bottom of the furrow. This sub-soiler should be set usually to run 2 to 3 inches below the bottom of the lister point.

Planting Corn Under Irrigation.—Surface planting is usually practiced under irrigation and since moisture can be applied easily, a thicker stand of corn may be raised than under dry conditions. Corn rows are usually 3 and a half feet apart on the irrigated field with the individual plants spaced 12 to 15 inches in the row, requiring about 9 pounds of seed per acre. The depth to moist soil is frequently not so great as under dryland conditions, consequently the kernels are not planted as deep as under dryland conditions.

VII. Cutivation of Corn

The first cultivation of the cornfield, either dryland or irrigated, usually consists of a thoro harrowing. This harrowing kills young weeds as they are coming up—the easiest time to destroy them. Corn may be harrowed with safety until it is 4 or 5 inches in height. Following harrowing of dryland, listed corn, the disc type of cultivator is a good machine to use. The two-, three- or four-row type is more efficient than the single-row cultivator. In early cultivation the soil is usually thrown away from the plants, then later in the season the soil is pulled in from the ridges around the plants. Listed corn usually roots more deeply than surface-planted corn; therefore it will stand drouth better and also it will stand up during severe winds due to growth of brace roots as the soil is pulled in around the plants. The principal purpose of cultivation is to destroy weeds; therefore a six-shovel cultivator is considered more destructive to weeds because it more completely stirs the soil surface than the four-shovel machine. The shovel type of cultivator is considered good on dryland, especially if a third cultivation is necessary.

If a thoro job of harrowing has been done during the early stages of growth of the corn, three cultivations will usually be sufficient to mature the crop. There is no especial advantage in a great many cultivations, nor in cultivating to an excessive depth. Deep cultivation may actually be harmful by exposing moist soil, or al-

A good prospect—vigorous plants, well cultivated and free from weeds.

lowing too much air to circulate in the soil, causing excess evaporation, and roots may be broken off sufficiently to cause damage to the growing plant. Under irrigation, cultivation should usually follow every application of water especially before the plants are large enough to shade the ground. The six-shovel type of cultivator is very good to break this crust and at the same time larger shovels on the rear will act as ditchers for opening the furrow for irrigation. It is probable that one or two more cultivations may be needed under irrigated conditions than are required under dryland conditions.

VIII. Irrigation

Corn needs a maximum amount of water when it has developed its greatest amount of green leaf surface. There is no set schedule of the number of irrigations to apply nor when to apply them. The corn plant will attempt to ask for water by turning to a dark-green color with the leaves wilting and rolling during the hot portion of the day. By digging into the soil in the field to a depth of 4 or 5 inches and squeezing some of the soil from the bottom of the hole, another simple test is possible. If the soil clings together to form a ball, sufficient moisture is present in the soil. If the soil does not cling together it is time to give an irrigation. Water is best applied in furrows between rows without attempting to force too much water thru each furrow, thereby causing flooding of the row. Sometimes only every other furrow is watered; then later the missed furrows are watered. The secret of good irrigation is to get water thruout all of the furrows as quickly as possible, then cut it off at the headgate.

IX. Weeding

No matter how well cultivation is done there is apt to be some weeds in the field. To produce a pound of weeds requires the same amount of moisture as to produce a pound of corn. A weed is any plant out of place. A wheat plant growing in a corn row is considered a weed the same as a Russian thistle. Wild-oat plants, wild morning glory or Canada thistles are considered noxious weeds. A good farmer does not allow weeds to develop seeds on his farm, even if it is necessary to go thru the cornfield and pull out weeds by hand. A farmer who takes pride in having his fields and farm look well is usually successful.

X. Corn Diseases and Insect Pests

As the corn plant develops, large black boils frequently appear at the joints of the stalk or on the ear. These black smut boils will later become dry and burst, releasing a black powdery mass which is blown about by the wind. Smut is a disease which cannot be con-

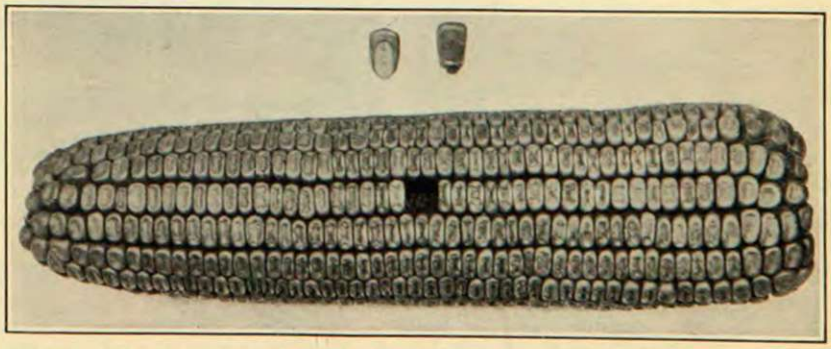
trolled by any treatment now known. These black "spores" or seeds, as the powdery material is called, will live over in the soil from year to year. Therefore, it is best not to plant corn on the same field but once in 4 or 5 years.

Corn earworm, cutworms and grasshoppers may cause damage during some years. There is no satisfactory method now known of controlling the earworm. A bran mash consisting of bran, paris green, molasses, salt and a little lemon juice may be used very effectively against both cutworms and grasshoppers. The county agent or club leader will give you definite instructions for mixing and distributing this poisoned bait. The practice of crop rotation is perhaps the most practical method to combat both insect pests and diseases of any control methods now known.

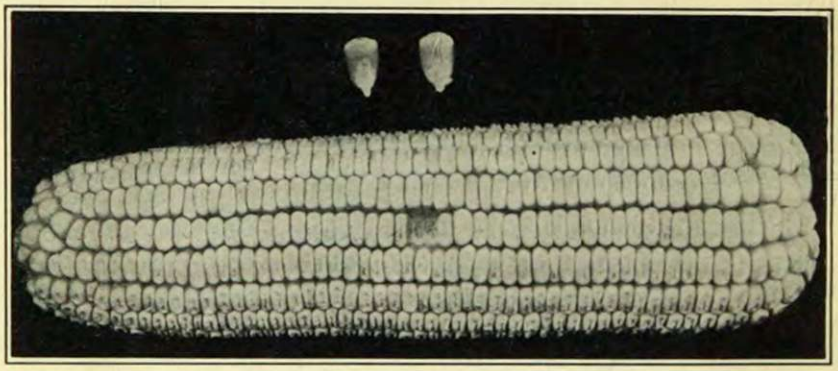
XI. Registered Corn

If the club member has secured and planted registered seed and there are indications that the field will mature well before frost, he may wish to have his crop registered so that some seed may be sold.

A field of corn for registration must be 40 rods from other fields unless they, too, are being grown from registered seed of the same variety. The pollen from the tassel of one variety of corn may blow across a distance of 40 rods and fertilize the ears of another variety, causing a mixture. An application for field inspection must be sent to the agricultural college on blanks provided by county agents. Inspectors examine the corn in the field in August; then after the seed corn has been gathered, stored and shelled, a bin sample is taken by the inspector for a germination test at the State Seed Laboratory. The bin sample which is representative of the entire lot of seed offered for sale must grade U. S. No. 1 corn, be true to type and at least 90 percent of the kernels must germinate. It may be that the club member does



A true type "Colorado 13" ear of corn, 16-kernel rows, 8 inches long. Grown by Raymond Condon, Platteville, former club member.



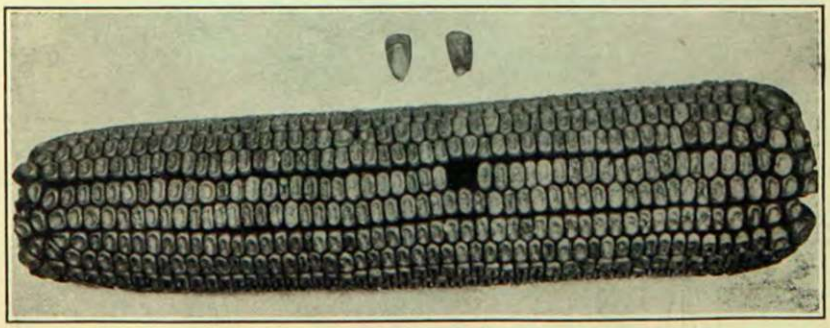
True type "Logan County White"—champion single ear, 1930 State Seed Show. Grown by Dan Hofmann, Iliff, club member.

not wish to secure registration and yet he may desire to sell some seed corn to neighbors in order to secure a cash income for some of his crop. There are two ways of selling seed corn: (1) The field run of seed after culling and (2) the plan of selling field-selected seed.

XII. Field Selection and Storage of Seed Corn

Poor stands and low yields in many cornfields each year are due to improper seed selection. A farmer can easily improve the yields and quality of his corn variety by careful field selection for his seed. The parent plant deserves consideration as much as the ear because some plants are more healthy, vigorous and productive than others grown under the same conditions. There is no chance to make a study of the plant or stalk when corn is selected in the crib or shock.

Every stalk should produce **one** good, sound, heavy ear of corn. The stalk should be strong, leafy and erect, with a normal stand of



Best single ear "Reids Yellow Dent"—Shown at 1930 State Seed Show. Grown by J. C. Fasnacht, Wiley, Colo.

corn on either side of it. Since maturity is so important in Colorado, field selection should be done before a killing frost in order that the individual plants may be carefully selected. In picking plants, consider only those that have yellow or ripened husks on the ears.

Examine the ear. If it is of medium size, solid, heavy and attached to the stalk by a shank of medium size and length, it will likely make a good seed ear. In this manner a club member can easily select his supply of seed corn in 1 day. As a rule there is such a demand for carefully field-selected seed corn that the club member can spend several days in selecting in order to secure a cash income.

Field selection is the only way to be sure of good seed corn adapted to Colorado conditions. Robert Moreland of Sligo, Weld County, selecting registered Minnesota 13 seed.

Ears that are selected as the club member goes down the row may be dropped into a sack which is hung over his shoulder. This sack may be emptied at either end of the field and later the corn collected in the wagon and hauled to storage. Most boys have a dog which is trained to pull a little cart made of an apple box and 2 or 4 wheels. This arrangement is interesting to both boy and dog and is a good way of collecting desirable ears of seed corn.

At the time of selection for seed it is always well to remember that a sample should be selected to be shown at fairs or seed shows. Excessively large ears never get the blue ribbons at Colorado shows, so pick the medium sized, mature ears that have straight rows and well-filled butts and tips. All 10 ears must be as nearly alike as possible in color, size, color of cob and size of kernels. (See Attached Standards).

In storing corn that has been selected for seed, the essential thing is air circulation around the ears so that the excessive dampness is removed before freezing. The garage, barn rafters, granary or other

dry, well-ventilated location may be satisfactory. The ears may be hung up with binder twine, electrically welded hog wire, slatted racks or other home-made apparatus which is not expensive.

XIII. Harvesting

The method of harvesting will be determined by the kind of livestock to be fed, by the method generally practiced in the community, and the equipment and storage available. The corn crop may be hogged-off if sufficient hog wire is available to fence the field. This method is the cheapest way of harvesting and has given very satisfactory results in fattening hogs.

A little figuring will be necessary to determine the number and size of pigs that can be fattened per acre. It requires 4 and a half to 5 lbs. of shelled corn to produce a pound of pork. A 40-bushel yield of corn means 2240 lbs. of shelled grain per acre or a sufficient amount to produce 90 lbs. of gain on 5 pigs, provided the weather is such that no waste occurs.

Other methods of harvesting corn are (1) husking from the standing stalk, either by hand or machine, leaving the stalks in the field to be winter pastured, (2) cutting and shocking, either by hand or binder, then husking from the shock or shredding whole plant, with considerable feed value for cattle or sheep, or (3) cutting the whole plant for silage.

If hogging-off is to be practiced, the club member will first need to provide proper fencing, then make sure that a water supply is available for the animals and determine what supplementary feeds should be used. The work connected with this method of harvesting can be done before and after school and on Saturdays.

Husking the corn from the standing stalks can be done any time on Saturdays or holidays after the corn has cured in the field. Some storage facilities will be needed for the ear corn as a steel bin, granary bin or outdoor crib of slats or wire netting.

Cutting and shocking corn by hand is a tedious job, but can be done if the club member has plenty of time. The hand-made sled cutter (write Extension Agronomist for plans) or corn binder is the best method of cutting corn, followed by immediate shocking in large shocks in the field. The club member can then shuck out the corn as needed for livestock feed. There will always be the decision to make as to how best to feed the corn crop. Shall it be fed on the ear, ground into corn-and-cob meal, fed shelled or fed as corn chop?

The harvesting and cutting for silage requires expensive equipment Corn for silage should be cut while the stalks and leaves are green and as the corn begins to glaze or get hard. The most efficient machine for harvesting the corn crop for silage is a combination cutter-harvester which harvests the corn stalks and cuts them into silage lengths, delivering the silage into beet racks or header barges as it moves down the rows. These wagon loads of silage may be dumped into a trench silo, which is simply a hole in the ground for storage. When the trench becomes filled, a 2-foot layer of straw is used on top, together with 4 inches of dirt and the silo becomes sealed for later use. Complete plans for trench silos may be had by writing the Colorado Agricultural College.

XIV. What Kind of a Plant is Corn?

Get acquainted with a corn stalk. Corn belongs to the large grass family. It is strictly of American origin. The first lessons in corn growing were given to the Pilgrim Fathers by Redskin teachers. It would be very interesting to make a comparison of yields of corn now possible with the yield obtained when fish were used as fertilizer in each hill during the time of Pocahantas and Capt. John Smith.

Pull up a stalk of corn and you will see a mass of crooked, small roots at the bottom. If all of the roots of one plant could have been pulled up and stretched out end to end they would perhaps be 1800 feet long. Corn roots from a single plant sometimes go into the ground to a depth of 6 feet in their search for plant food and water. Before it can enter into the root system, all plant food taken from the soil must be dissolved in water, then it moves on up thru the stems into the leaves like the blood circulating in your veins. The principal duty of the root system is to gather food material and water for the plant. Another duty is to hold the plant up.

Examine the stalk and you will see joints called nodes and the long tube-like stems between the joints, called internodes. Cut across one of these internodes and you will find that there is an outside shell of rather hard material, then pith inside.

Examine closely the pith and you will find tough threads or strings called vascular bundles. These strings are the plant's arteries or veins, as they are filled with little tubes that carry water and dissolved food material from the roots to the leaves and bring back manufactured food material from the leaves to various parts of the plant. The leaves act as the plant's stomach. Very small openings called stomata in the leaves allow pure water to escape but there is left the mineral food substances taken from the soil. This soil material is com-

bined in the leaves with carbon dioxide, a gas from the air, and a food substance is formed. This food substance then moves from the leaves back down into the stalk or ears where it is deposited, causing growth or the formation of corn.

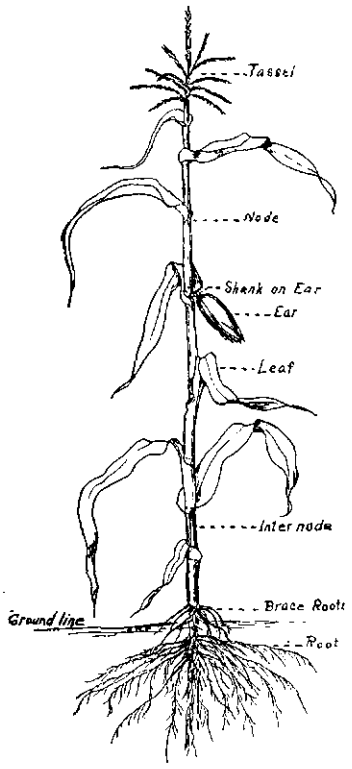


Diagram of a corn plant.

The tassel is the male part of the corn plant's flower and the ear is the female part. In order to have kernels develop on the cob of the ear, some of the powdery dust called pollen from the tassel must come in contact with the ends of the "silks" which are sticking out of the shuck. Each tassel will produce about 20 million pollen grains and it is easy to see that when the wind is blowing this pollen dust may be blown for considerable distance and come in contact with silks on other plants. Then we have cross-pollination. If yellow corn is planted close to a field of white corn there will be quite a number of yellow kernels mixed with the white on ears due to this blowing of pollen.

The study of the growth and development of a corn plant is certainly interesting. No one has yet determined just why and how a corn stalk grows. Such a study offers a challenge to any boy to solve this complex mystery of nature.

XV. Opportunities in Growing Corn

It is more important to be able to raise a good crop of corn than to be able to make a touchdown on the football field. It is more important for a boy to be a champion corngrower than for him to become a champion boxer. The growing of a good crop of corn challenges the best efforts of any American boy. Good corn crops have paid expenses of many club members at college. It takes a good farmer to raise a big yield of corn and as a rule the bigger the yield the lower is the cost per bushel. After the club member has harvested his corn crop and found out what yield was secured, it is time to complete the records and see how much it cost per bushel.

Suppose your yield was one-third more, what would have been the cost per bushel?

If you have produced your corn at a cost of 50 cents per bushel you are prepared to put some very cheap gains on your pigs, lambs or baby beef calf. You can easily see that there will be no overproduction of corn as far as you are concerned, if you continue to produce at low cost and have enough livestock to eat all that you do not sell or use for seed.

Corn is a good crop to grow as a seed crop to sell to farmers who do not take time to save their own seed. Ears not suitable for seed can be fed to your livestock so that you really have a cash crop and feed crop in one.

Note.—Valuable suggestions in the preparation of this manual have been received from Prof. Alvin Kezer, Prof. G. A. Schmidt, and Prof. Warren Leonard of the Colorado Agricultural College. Any suggestions as to accuracy of material or improvement are solicited from club members, county agents, Smith-Hughes teachers, club leaders or any one using the manual.

4-H Corn Club leaders may find that the chapters contained in this manual can be studied in seasonal order rather than in the logical order presented in the bulletin. Club members may read and report on chapters at club meetings. This reading or report, together with a general discussion and project-progress report from each member, should complete the study period allowed at each meeting.

4-H Club 10-ear exhibits in a down-town show window make a good exhibit to acquaint farmers and merchants with the club work. The club member's name, yield record and cost per bushel might be a part of the exhibit.

Demonstrations that may be developed among club members are:

1. Seed-corn testing
2. Field selection of seed corn.
3. Time to plant corn.
4. How a corn plant gets its food.
5. Different grades of corn.
6. Selecting a show sample.
7. Storage of seed corn.

Type of Club Member's Contract

MEMORANDUM OF AGREEMENT made and entered into by and between;—J. M. Jones (father) herein called party of the first part and Lyle Jones (club member) party of the second part, Witnesseth, that the said party of the first part has this day leased unto said party of the second part for a period of 9 months, the following described premises, situated in the County of Weld, State of Colorado, to-wit:—

Five acres of land along the West side of the farm, a part of the field which was in potatoes in 1929 extending in an easterly direction 10 rods from the fence and in a north and south direction for 80 rods, together with privilege of using a proportionate amount of irrigation water as the season demands to properly grow a crop of corn.

BE IT FURTHER AGREED and understood that party of the first part will receive one-third of the corn grown on the 5 acres indicated in this lease, said one-third of the crop to be shucked and delivered to the crib by the second party by December 14, 1931.

It is further agreed that the party of the first part will provide storage, power and machinery for the growing, harvesting and proper care of all corn produced under the terms of this contract for the following considerations:—

1. All corn stover (stalks after the ears are removed) will be accepted by party of the first part in full payment for the use of machinery except tractor used in preparing soil, growing and harvesting the crop of corn, and in full payment for storage of the share of corn belonging to the second party.

2. Power furnished by the first party for preparation of soil, cultivation and harvesting will be paid for by exchange labor. Horse labor calculated at the rate of 10 cents per hour, tractor power calculated at the going rate per hour or per-acre rate in the community. A rate of 20 cents per hour for second party's labor will be used in calculating the exchange.

(Note:—Club members can frequently field select and sell seed corn to dad in partial payment for expenses incurred.)

AND FINALLY it is agreed that the spirit of fairness should prevail in settlement of points not covered in this contract.

Signed, J. M. JONES, (party of first part)
LYLE JONES, (party of second part)

Date—March 14, 1931

STANDARDS FOR LEADING VARIETIES OF COLORADO CORN

		Reid's Yellow Dent	Iowa Silver Mine	Colorado* 13	Swadley Dent	White Australian
Ear	Shape	Cylindrical	Cylindrical	Slightly tapering	Cylindrical	Cylindrical
	Length	8 inch to 9½ inch	8 inch to 9½ inch	7 inch to 8½ inch	7 inch to 8½ inch	8 inch to 9 inch
	Circumference	6¾ inch to 7½ inch	6¾ inch to 7½ inch	6 inch to 7 inch	5 inch to 6½ inch	5 inch to 6 inch
Kernel	Color	Yellow	Clear White	Clear Yellow	Yellow Body Whitecap	White
	Shape	Rectangular	Deep	Medium	Square to round	Round and Flinty
	Indentation	Deep	Rectangular	Rectangular	Smooth dent	None
		Fairly smooth	Fairly smooth	Fairly smooth		
Rows	Number	18 to 20	18-	16-	12 to 14	10 to 12
	Space between rows	Fairly close	Fairly close	Fairly close	Fairly close	Open at top
Butt	Shape	Rounded	Slightly rounded	Slightly rounded	Rounded	Moderately rounded
	Rows	Straight	Straight	Straight	Straight	Straight
	Kernels	Uniform	Uniform	Uniform	Uniform	Nearly as uniform as in middle of ear
Tip	Rows	Straight	Straight	Straight	Straight	Straight
	Kernels	Even and large	Uniform with rest of ear	Even and fairly large	Even and fairly large	Even and fairly large
Shank	Diameter	¾ inch	⅞ inch	½ inch to ¾ inch	¾ inch	¾ inch to 1 inch
Cob	Color	Dark Red	White	Dark Red	White	White
	Diameter	1¼ inch to 1½ inch	1¼ inch to 1½ inch	⅞ inch to 1¼ inch	¾ inch to 1¼ inch	¾ inch to 1¼ inch

*These are also the standards for Minnesota 13 in Colorado.