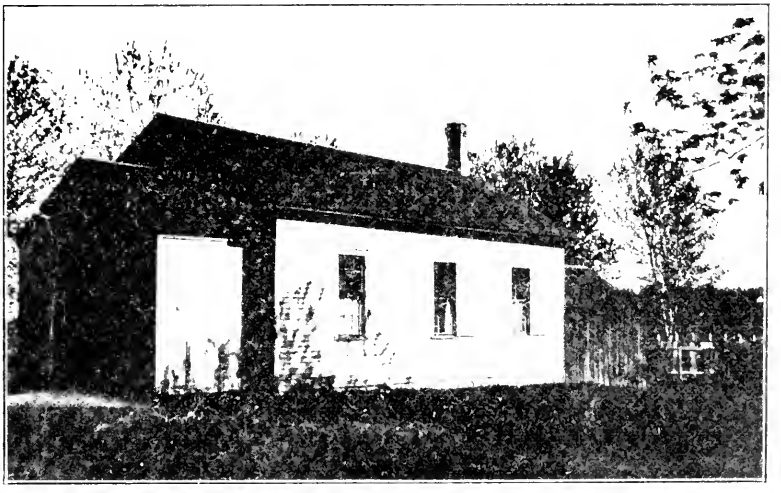
THE UNIVERSITY OF MINNESOTA

DEPARTMENT OF AGRICULTURE

RURAL SCHOOL AGRICULTURE

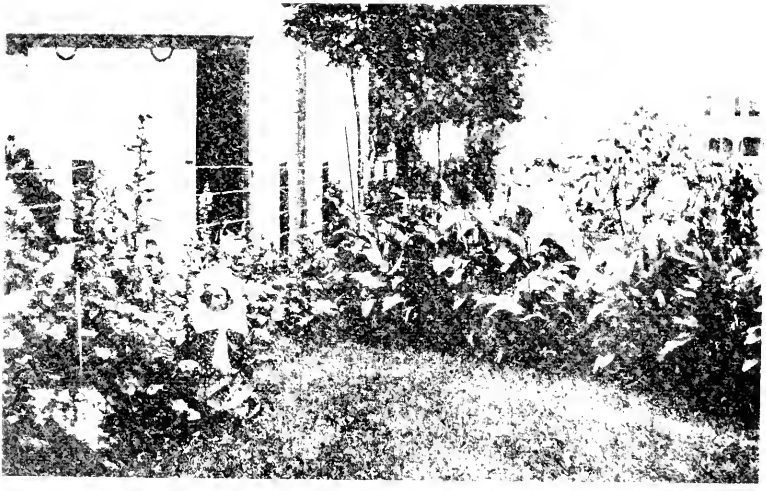
BULLETIN NO. 2. REVISED



THE DISTRICT SCHOOL.

Seeds and Seed Selection.
Suggestions for Industrial Contest.
Types of Wheat, Oats, Barley and Corn.
Rules for Judging.
Suggestions for Rotating Crops.
Cooking Contest and Suggestions.
Sewing Contest and Suggestions.
Fruit Growing Contest and Suggestions.
Vegetable Growing Contest and Suggestions.

God's gift to the New World's great need
That helped to build the Nation's Strength,
Up thro beginnings rode to lead
A higher race of men at length.—Thaxter.



School Gardens near villages or in cities may properly consist largely of shrubs and flowers.

"An unlessoned girl
Unskilled, unpracticed,
Happy in this, she is not yet so old
But she may learn."

—Shakespeare.

BULLETIN No. 2. REVISED

RURAL SCHOOL AGRICULTURE

PREPARED BY C. P. BULL

DEPARTMENT OF AGRICULTURE

THE UNIVERSITY OF MINNESOTA

1907
ST. ANTHONY PARK
MINN.

FOREWORD

"Here let us breathe, and happily institute
A course of learning and ingenious studies."
Taming of the Shrew.

The successful introduction of the study of the elements of agriculture into the rural schools of Minnesota depends upon placing comprehensive studies before the superintendents, teachers and pupils of these institutions, and upon the intelligence with which they execute the plan of introduction. Rural School Bulletin No. 1 supplied the teachers with simple outlines of experiments that could be carried out in any rural school by the youngest pupils, thus introducing the elementary studies in such a way as to make them both interesting and instructive. In accord with the movement to introduce agriculture in our public schools, Rural School Bulletin No. 2 is offered as a text for teachers and pupils who are interested in the improvement of seed and crop conditions in Minnesota. It is thought best to include in the work only the common grains: wheat, oats, barley and corn, with an introductory chapter on seeds, their parts, germination, selection, weight, classes, etc. Definite rules for score cards and judging are also included for the benefit of the teachers and judges of the contest.

At the back of the outlines for the grains and corn is an appendix upon the subject of Field Management and Crop Rotation This is offered to the teachers as a guide to a general understanding of the subject of farming and handling of crops. Following this are suggestions for practical exercises, which if followed out will greatly increase the pupil's interest in his work and in the value of good seed.

Upon the basis of these rules it is planned to have a contest in each county in the state. A plan for the 1907 state contest is herewith included.

The contestants are to be pupils of the schools, both boys and girls or any other boy or girl in the state under 18 years of age.

County contests may be planned as best suits the local conditions or the desires of those in charge. In connection with the state contest a "good seed" meeting will be held, at which time the prizes will be awarded and methods of growing the crops and caring for the seeds will be discussed. Other matters of interest in relation to rural school affairs may also be brought up in these meetings.

The original Rural School Bulletin No. 2 was published in connection with the seed contest for rural school pupils for 1906. This revised edition is more complete and includes barley as well as wheat, corn and oats, also a brief discussion of sewing, cooking, vegetable and fruit growing. It is published by the Minnesota Experiment Station. The Minnesota Field Crop Breeders, as before, will provide judges for making the awards.

All inquiries in regard to the contest should be addressed to The Farmers' Club, St. Anthony Park, St. Paul., Minn.

For valuable suggestions and assistance in preparing this Bulletin the writer is deepy indebted to Prof D. D. Mayne, Principal of the School of Agriculture; Andrew Boss, Professor of Agriculture and Animal Husbandry, and others of the Department of Agriculture.

Miss Mary L. Bull, Assistant Instructor in Domestic Science, Mrs. Margaret J. Blair, Instructor in Domestic Art, and Le Roy Cady, Assistant in Horticulture, prepared the copy in cooking, sewing, and fruit and vegetable growing respectively.

INTRODUCTION.

Minnesota is an agricultural state. About one-half of the people are living in country districts, and of the total population 40.1 per cent are engaged in agricultural pursuits. At the last census there were 154,659 farms. The average size of each farm is about 169 acres. Of all the farm crops grown in Minnesota, wheat, oats, barley and corn are the most important. Wheat is grown on 35

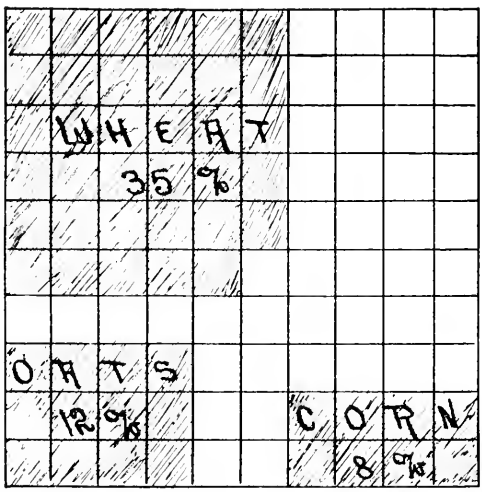
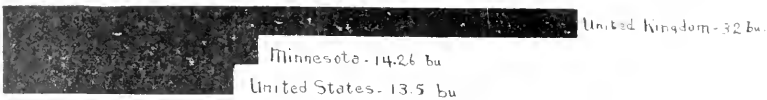


Fig. 1. The chart contains 100 little squares. Each square represents one per cent. Therefore, the number of squares darkened in each corner shows the percentage or proportion of etch crop, as compared with the entire cultivated area in the state.

per cent (more than one-third) of the improved land; oats on 12 per cent (about one-eighth); barley on .048 per cent, (less than one one-hundredth part), and corn on 8 per cent (about one-twelfth). These four crops form more than one-half of the total acreage of the improved farm lands of the state. The total amount of wheat, oats, barley and corn grown in Minnesota is small compared with the acreage. The average yields per acre

for the state are: Wheat, 14.26 bushels, oats 33.5 bushels, barley 27.3 bushels and corn 29.00 bushels per acre. These low yields are largely due to improper care in selecting the grain used for seed. By the use of well-selected seed the yields can be very much increasd. The Minnesota Experiment Station has shown that by selecting the largest, plumpest, and heaviest seeds the yields can



Note. Comparative yields per acre of wheat in Minnesota, the United States and the United Kingdom.

be increased so that on good land, wheat will yield 25 bushels, oats 70 bushels, and corn 75 bushels. If this were done by every farmer in the state the yearly income from wheat, oats, barley and corn in the state would be greatly increased with but very little extra expense.

THE SEED

WHAT IS A SEED? A seed is a little storehouse in which a tiny plant has a separate room and gets its nourishment or food from the material stored up in the other room when the conditions for germination* are right. Usually the little plant lies along one side at the end of the seed. The stored-up material fills all the rest of the space and is separated from the plantlet by a very thin wall.

THE PARTS OF THE SEED. A seed has three distinct parts: (1) The little plant or germ (this germ in corn is often called the heart); (2) the stored-up food for the little plant; and (3) the seed coat which covers all

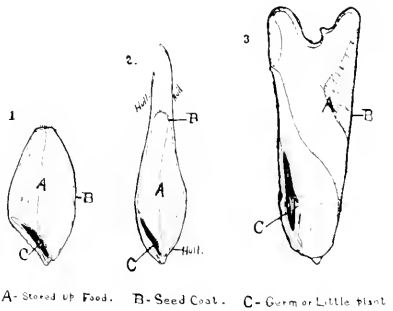


Fig. 2. Kernels of 1 wheat, 2 oats, and 3corn, cut through lengthwise to show the three parts of the seed: viz., A, the stored-up food; B, the seed coat; and C the germ.

and protects the inner parts. All true seeds, whether large or small have these three parts, which may be seen with the naked eye if a grain of corn be cut lengthwise in two parts. Some seeds, such as oats, appear to have an extra covering, but these extra parts are only the parts of the flower or blossom which stay with the seed when it is ripe.

*Germination is the "sprouting" or "growing" of a seed.

CLASSES OF SEEDS. Nature has divided seeds into two classes: viz., those where the stored-up food is in one part, like corn, and those where it is in two parts, like the bean. When the one-part seed, like corn, is planted the seed remains in the ground, while leaves are sent up through the soil to get air and sunlight. But when the two-part seeds are planted the seed coat is broken and the two parts are pushed to the surface taking the place of leaves until regular leaves are formed. In both cases, however, the little plant gets its food largely from the stored-up material until the roots and leaves are well developed.*

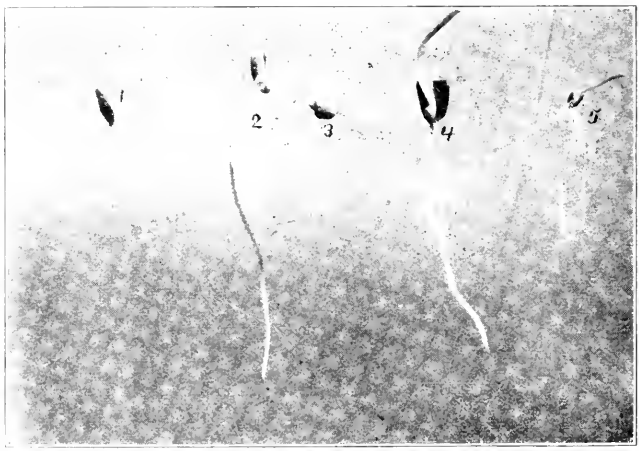


Fig. 3. Shows seeds of 1 oats, 2 bean, 3 pea, 4 corn, and 5 wheat. After three days in a germinator, note that the bean is being pushed up at the end of the sprout while the other seeds are sending the sprouts up.

WHAT IS GERMINATION? Germination—sometimes called sprouting—is the growing of the little plant in the seed when it is placed under certain conditions. These conditions are heat, air and moisture. The heat is necessary to make the stored-up food useful and to cause growth in the plantlet in the seed. Air, together with moisture and heat, causes a change in the stored-up food. Air also permits the little

*Teacher– Germinate some corn and some beans to illustrate the above.

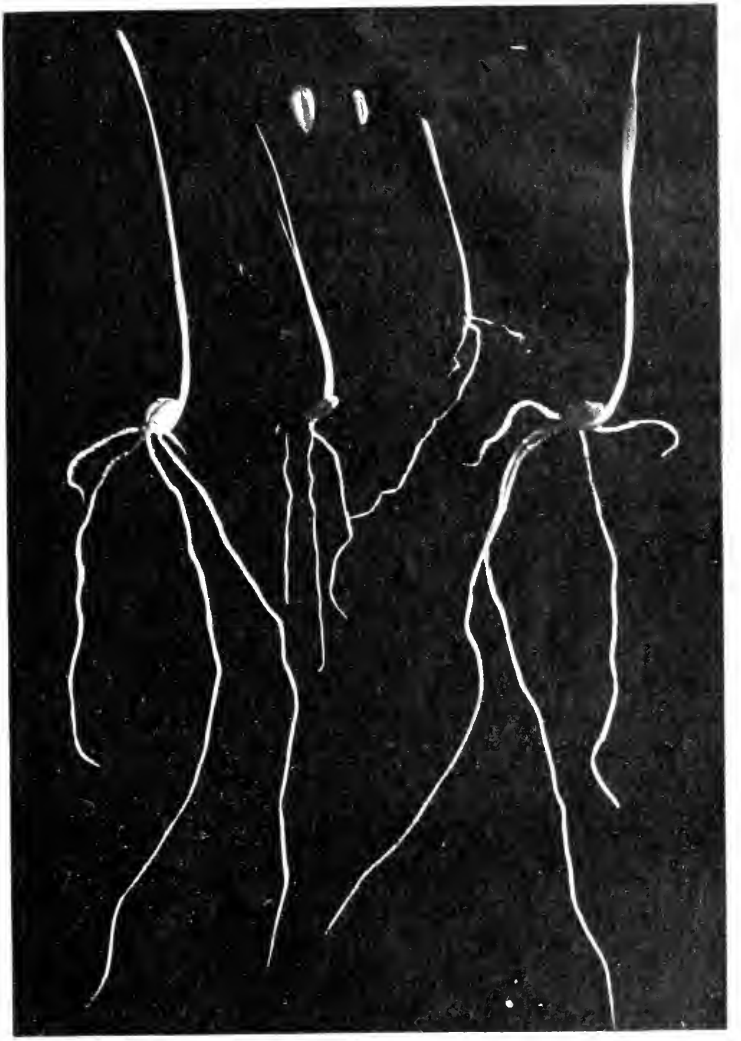


Fig. 4. Shows two plants resulting from good seed (outside) and two plants from poor seed (inside); also a plump and shrunken kernel of wheat. Note the relative extent of the root systems and the size of the little plants.

plant to breathe. Moisture is needed to carry food substances and to give the plant what it needs. If any one or all of these three things are lacking, germination or growth will not take place.

In a thoroughly ripe seed, stored away for the winter, the plantlet is dormant or asleep, and awakens into activity and growth when planted in the warm soil. When in spring germination or sprouting takes place the food stored up in the seed is used by the plantlet to feed the first leaves and the roots. By the time the roots and leaves are well formed the stored-up food is all gone. The plantlet then draws its food from the soil and the air through the roots and leaves. Nearly all of the plant's food comes from the air. The ashes left after burning the straw or the wood are the only parts of the plant taken from the soil.

GERMINATING POWER OF SEEDS. The germinating power is the strength and rapidity with which a seed sprouts and grows. A great deal depends upon the germinating power of a seed. Some seeds of the same kind may be slow to start and weak in growing while others may be quick and strong, or others may fail to germinate at all. Some kinds of seeds are much stronger and quicker than others; for example wheat is quick to start and grows strong and steady while sorghum starts slowly and is weak when young. Therefore, more care must be used in plowing and harrowing and rolling the field in seeding, when the weaker seeds are to be used. There is also a great difference in seeds, of the same kind as between the large and small kernels of corn. The largest and plumpest seeds with a large germ always give the strongest and best plants. Upon the same ear of corn, for example, the germinating power of the middle kernels is much stronger than the tip and butt kernels. (See figure on subsequent page illustrating.)

The age of the seed has much to do with the relative vitality or germinating power. Some seeds do not germinate after the first year, while others will keep their power of growth for several years. Wild mustard will live in the soil for twenty years and then grow under favorable conditions. On the other hand wild oats will live only a year or two.

EVIDENCES OF GERMINATING POWER

There are certain outside appearances which more or less determine the vitality of the seeds:

(1) Age, as is seen by the dull condition of the seed coat and by the hardness of seed. Hard seeds are mostly well stored and ripe. Young, bright, shiny seeds are best;

(2) Shrunkenness, as is shown by the wrinkled seed coat, gives evidence that there is not enough plant food stored up and that the little plant is stunted. Its room is too small for it;

(3) Lack of luster and color indicate alternate wetting and drying and such seeds should never be used;

(4) Frozen condition, shown by a blistered, watery appearance of the seed coat, is often fatal to the germ;

(5) Bin-burned is shown by the dull, dark appearance of the entire seed. This is caused by too much moisture in the bin where the wheat is stored. Bin-burning kills the germ;

(6) Sprouted grain is shown by the presence of dried roots at the germ end of the seed. These will sometimes sprout again, but they cannot be relied upon. There are cases where seed bears every appearance of life and vigor but will not germinate. The only way to prove the power of growth of any grain is to test it.

TESTING SEEDS FOR GERMINATING POWER.

Every farmer should test all classes of seed that he intends to plant. Why? Because he expects the seed to grow when planted and he expects that the amount of seed grown will make the proper stand. If only part of the seed planted will grow, the yield of the crop will not be as large as it should be, and the work of planting the poor seed will be useless.

HOW TO TEST.

Take two common plates and get two pieces of cotton cloth a little larger than the plates. Dip the cloths in warm water and spread one of them out on one of the plates. From the seed that is to be tested, take a handful and place on the table. Count out one hundred seeds just as they come from the edge of the pile. Do not try to make

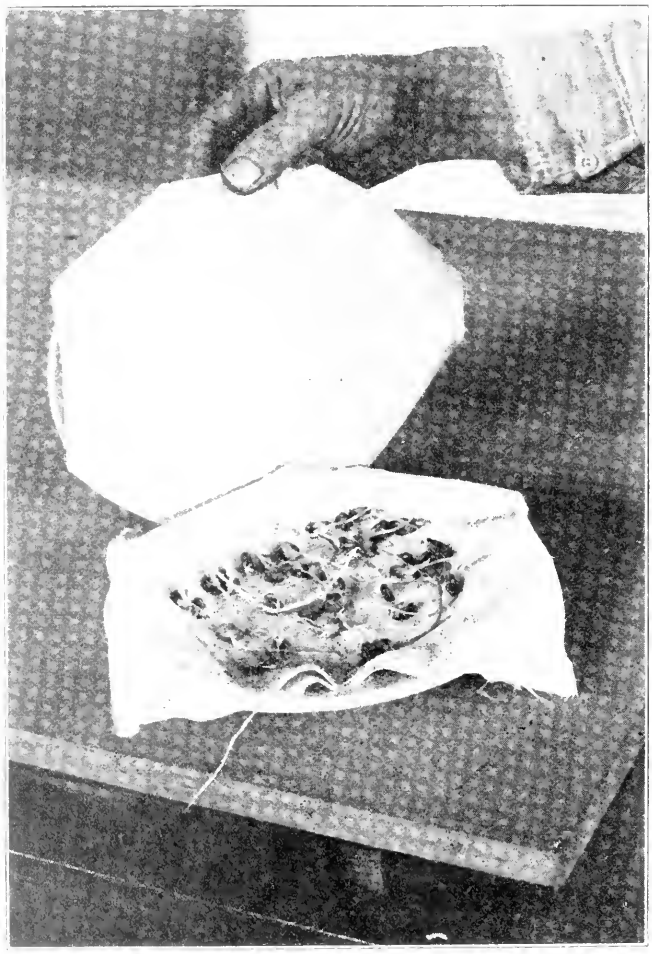


Fig. 5. A Seed tester consisting of two plates and two pieces of cloth. The seeds are placed between the cloths. The cloths are kept wet.

a selection. Scatter these 100 seeds upon the wet cloth on the plate. Spread the other cloth over the seed and press it down closely. Then turn the other plate upside down on the plate with the seeds, leaving the corners of the cloths sticking out between the plates. This makes a complete little tester and is sufficient for all kinds of seeds. Place it where it will keep reasonably warm and keep the cloths moist by sprinkling with water two or three times a day if necessary.

TABLE FOR SHOWING THE METHOD OF RECORDING THE TEST OF SEED FOR GERMINATION.

Name—Paul Jones.

Date—March 10, 1906.

Record test of Seeds.

Number of seeds used 100.

Wheat	Number Germinated
March 3	27
March 4	37
March 5	16
March 6	5
March 7	1
Total	86
Seeds not germinating	14

Such a test is too slow. The grain should be better selected; or, if it has been selected, more seed must be used to make up for the 14% that did not grow. In this way a good stand may be obtained.

COUNTING. About the third day, the counting may begin. Count carefully and keep a record of the number of seeds that have sprouted each day until the test is complete, or until no more seeds shows signs of life. A week is as long as this should take.

FIGURING THE GERMINATING POWER. Add the counts of the different days together and the total number will be the per cent of the seed germinating. If 90 to 95 seeds grow the germination is pretty good, but below 90 the value of the grain for seed begins to be doubtful and another test should be made a little later to see if the grain is losing its power. A little more seed may then be added in sowing, to make up for the dead ones. If the germination is too low, new seed should be secured. If the seeds all sprout about the same time, it is a sign of uniform strength, but if a few sprout each day it shows that the vitality is injured in some way.

SELECTING SEEDS FOR PLANTING. The quality of seed as indicated by the color, the size, the plumpness, etc., is a great help in selecting seed to improve our field crops. It has been shown that by running grain through a fanning mill a good selection can be made. In this way the heaviest seeds are obtained, and these always give better results than light seeds.

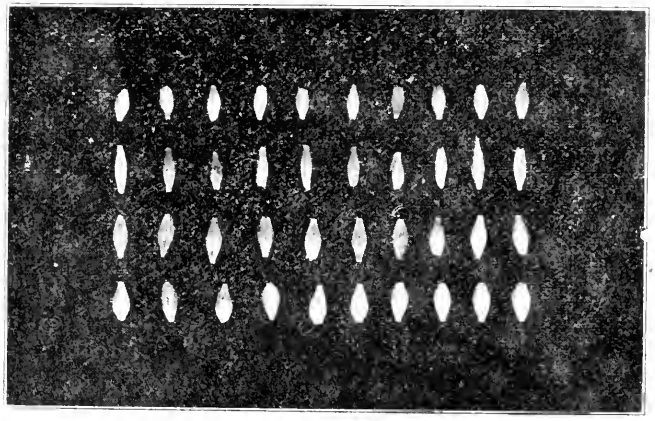


Fig. 6. Showing the different degrees of plumpness of barley seeds.

In other words, the weight per bushel is a fairly correct index of the value of grain for seed purposes. Too much care cannot be taken in getting the best possible seed for planting. So much depends upon the quality of the seed that a farmer should always get the best.

WEIGHT PER BUSHEL.

All seeds have a definite weight per bushel. Some are very heavy while others are very light. For example, a bushel of wheat weighs 60 pounds, while a bushel of oats weighs only 32 pounds, and a

The weighing kettle (chrondrometer) is used to determine the weight per bushel. The sacks indicate how the "seed grain" may be selected from the whole harvest.

bushel of Kentuckey Blue Grass seed weighs 14 pounds. In order that the weights for the different seeds may be the same in all parts of the state, the weight per bushel of all classes of seeds has been fixed by law. When a farmer sells his grain at the mill or elevator the number of bushels he has on his load is determined by the weight. For example: The farmer takes a load of wheat to the mill. The miller weighs the load and finds that it weighs 5,400 pounds. The farmer unloads the wheat and the miller weighs the wagon. It weighs 1,200 pounds.

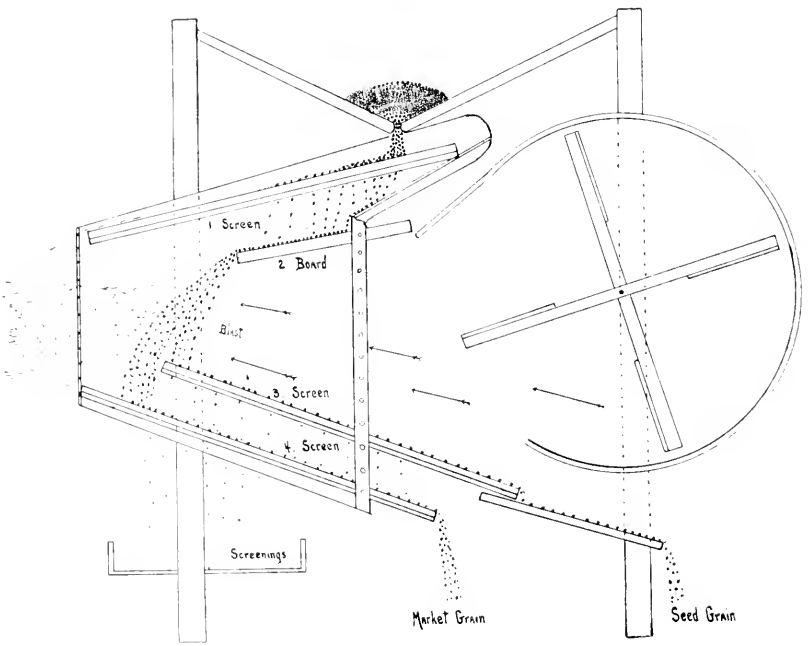
5,400 pounds equals weight of load.
1,200 pounds equals weight of wagon.
4,200 pounds equals weight of wheat.

Wheat weighs 60 pounds per bushel. 4,200 divided by 60 gives 70, or the number of bushels of wheat.

Thus it is easy to tell how many bushels he had on the load.

FANNING MILL SELECTION:

A SECTION OF A FANNING MILL SHOWING ARRANGEMENTS OF SIEVES AND DIVIDING BOARDS.



"SIDE-SHAKE" MILL FOR SEPARATING SEED GRAIN.

Screen No. 1 should be just coarse enough to let the grain through. It is used simply to run off sticks and straw. Board No. 2 carries the grain backward in the mill, so as to let it drop through the blast at one place. The light kernels are blown past the end of screen No. 3 the heavier kernels fall on screen No. 3. Board No. 2 may be moved forward or back ward to throw a large or small per cent of grain on screen No. 3, as desired. Screen No. 3 should be coarse enough to let the small kernels through onto screen No. 4. It is adjustable as to slant and may be moved forward or backward to regulate the amount of grain it will catch. Screen No. 4 is fine enough to carry nearly all of the grain over into market grain. Any side shake mill may be fixed up in this way. Separation by weight cannot be made with the end shake mills, but the large kernels can be separated from the small ones in any proportion desired simply by using coarse or fine screen in lower part of mill.

WEIGHT PER BUSHEL OF SOME COMMON SEEDS AND AMOUNT TO SOW PER ACRE

	Pounds Per Bu.	Pounds of seed Per Acre
Alfalfa	60	15—25
Barley	48	96—120
Beans	60	30—60
Buckwheat	48	36—48
Canada Field Peas	60	120—180
Clover—red	60	4—12
Clover—alsike	60	3—6
Corn, shelled	56	8
Corn, on the ear	72	10—15
Emmer (Speltz)	40	100
Flax	56	30—60
Kentucky Blue Grass	14	42
Oats	32	64—100
Red Top (in chaff)	14	30—42
Red Top (solid seed)	42	4—10
Timothy	45	8—12
Wheat	60	60—90
Millet	48	24-36
Hemp	50	
Potatoes	60	480
Rye	56	70—84

(Teacher: Have pupils figure the number of pecks or bushels to seed per acre.)

GRADES OF GRAIN. The laws of Minnesota have provided different grades for the grains. Samples of these car loads are taken to the men who are hired to grade them The grade these men give represent different qualities and are based upon the comparative quality of the grains, and the weight per bushel. The price paid depends upon the grade.

TABLE OF SOME MARKET GRADES OF GRAIN AND WEIGHTS PER BUSHEL.

No. 1 Hard spring wheat must weigh at least 58 pounds.
No. 1 Northern spring wheat must weigh at least 57 pounds.
No. 2 Northern spring wheat must weigh at least 56 pounds.
No. 3 spring wheat must weigh at least 54 pounds.
No. 4 spring wheat must weigh at least 40 pounds.
No. 1 white oats must weigh not less than 32 pounds
No. 2 white oats must weigh not less than 31 pounds.
No. 3 white oats must weigh not less than 29 pounds.
No. 4 white oats must weigh not less than 25 pounds.

The grades of grain used for seed are not regulated by law. The seedsmen and others selling seed offer certain brands of seed which are graded generally according to the germination of the seed. Each year may bring forth a somewhat different grade of seed, according to the crop. It may be very poor one year and the next year it may be the very best. Thus it is not possible to make standard grades of seed grain and keep them in use, but 100 is taken as perfect and the seed graded accordingly. In buying seeds it is always advisable to buy the best grade, even though it costs more.

JUDGING SEEDS. In order to tell if seed is good, a person must be accustomed, when looking at grain, to pick out the particular points which go to make up good seed, and to tell how nearly they compare with what he considers perfect for these points. He must also be able to give the most consideration to those points or characters which are of most importance. For example: Plumpness is of more importance than mere color. Plumpness, therefore, should have more influence than color in judging. A grain having the best of color and yet not plump would not be worth one-third as much as one that was plump and well filled but having a bad color. In order to have the important points always in mind, they are made into a score card and given a certain comparative value.

WHAT THE SCORE CARD IS.

To aid in judging the different kinds of seed grain a set of points (called a score card) is arranged to show the relative value of each point. One hundred (100) is taken as perfect for the sum of all points. It is noticed that each one has a cer-

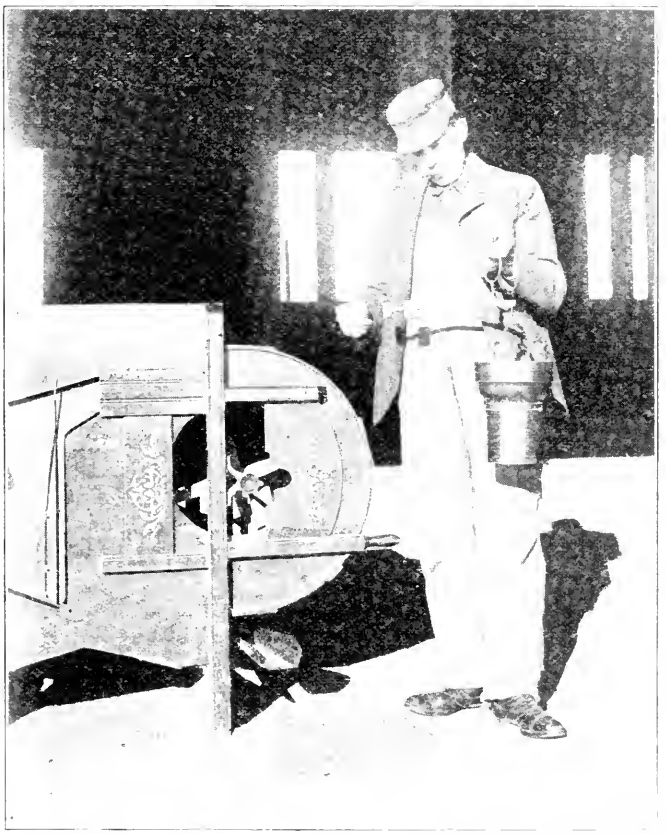


Fig. 9. Getting the weight per bushel with the testing kettle. When grading grain for seed the weight per bushel should be taken. The heaviest is the best.

tain number or part of the 100. This number represents the relative value of the point. Men who judge chickens often pay

too much attention to the feathers. They give more attention in some cases to a certain mark of a feather than they do to the amount of meat there is or the number of eggs laid. But this is a mistake. The score cards should be arranged so as to give greatest value to the points that show the true value of the grain, or chicken, or horse, as the case may be.

SCORE CARD FOR SEED WHEAT

1. Weight per bushel	25
2. Uniform and purity	10
3. Color	15
4. Plumpness	25
5. Condition of bran (seed coat)	5
6. Diseased or injured kernels	10
(Market Condition)	
	100

RULES FOR JUDGING. In order to make the score card useful it is necessary to have a rigid set of rules to follow in giving the proper credit to the samples being judged. The score card is divided into several heads or points to be considered. These headings will differ somewhat according to the kind of crop to be judged. Wheat, for example, is quite different from corn and cannot be governed by the same rules. Each heading in the score card will have a separate rule, which should be followed very closely when judging a sample. In looking at the sample and passing upon any one point in the score card, all other points should be forgotten for the time. In other words, judge only the one point regardless of the others.

See bulletins listed in back on this subject.

WHEAT

HISTORY OF WHEAT. Wheat is one of the oldest crops grown. The people who lived in Egypt along the valley of the Nile River, more than five thousand years ago, grew wheat, and it was used for food by the richer classes. The tombs in which many of these people were buried have been found to contain grains of wheat. From Egypt wheat was carried across the Mediterranean Sea to Greece, and from there to Rome. In the hands of the Romans wheat spread all over Europe, and was taken into England about two thousand years ago.

Finally wheat was introduced into America. It has spread into every state and country of both North and South America. It is used so much for human food that it is often called "the staff of life." Wheat is nearly always the first crop to be grown in a new country, especially on our western prairies and in west central Canada.

In the United States, Minnesota stands third in the list as a wheat state. It produces more wheat annually than any other state except Kansas and North Dakota, and the largest flour mills in the world are located at Minneapolis on the Falls of St Anthony. One of these mills alone makes over 16,800 barrels of flour in a day's work of twenty-four hours.

DESCRIPTION. Wheat belongs to the great family of grasses. It grows like most grasses, sending up several stalks from the planting of one seed. It requires planting every year if a crop is to be harvested. Plants which ripen their seed the same year they are planted are called annuals.

The stems of a wheat plant often grow to be five feet high. They are hollow except at the joints. This gives lightness and elasticity to them so they will not break in the wind and storm. The number of joints in each stalk above ground is usually five—one just at the surface and four above. The space between the joints is greater near the top than at the bottom.

The seed-bearing part of the plant is called a spike. It is made

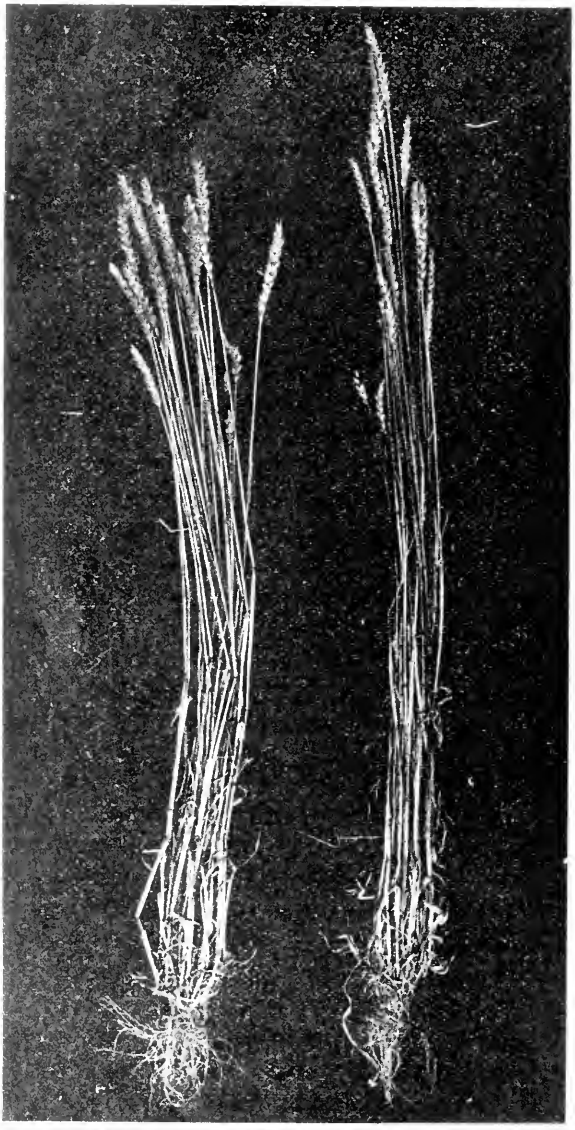


Fig. 10. Two wheat plants. Each from a single seed. Note the stems.

up of a zig-zag stem upon which are grown small bunches of flowers. These are called spikelets. There are usually about nineteen of these spikelets on each stem, and they have from two to four seeds each.

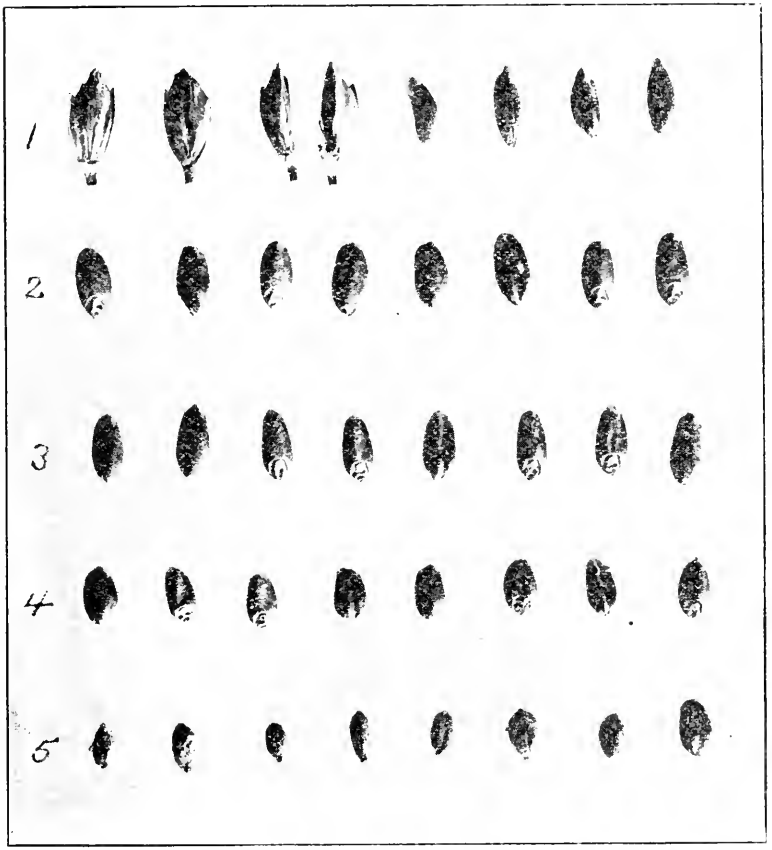


Fig. 11. Type kernels of wheat, also stinking smut-balls. 1, Emmer (Speltz) in the hulls and the berries alone. 2, Macaroni wheat. 3, Blue stem wheat. 4, Fife. 5, Smut-balls.

The grain is usually held fast in the chaff when it is ripe, but it should be cut before it is too ripe and dry, as the grain shells easily afterward. The grains are a little longer than broad and

have a crease on one side running the entire length. They also have fine hairs at the top or end opposite the germ. The color of the grain is sometimes white and sometimes red, depending upon the variety grown.

TYPES OF DIFFERENT WHEAT. There are several different types or kinds of wheat grown in the world. Not all of these types are grown in Minnesota. The types of wheat are divided according to the looks of the spikes and the seeds. Those most common in Minnesota are as follows:

THE COMMON BREAD WHEATS, mostly grown in North America.—In Minnesota the Fife and Blue-stem wheats are the com-

Fig. 12. Types of wheat. 1. Emmer (speltz). 2. Blue-stem. 3. Macaroni. 4. Fife. 5. Bearded common.

mon varieties of this class. Blue-stem yields better, but the quality of the grain is not so good as that of the Fife. Blue-stem is more successful in southern Minnesota than Fife. Fife is mostly used in the north.

THE MACARONI OR DURUM WHEAT, mostly grown in the countries bordering on the Mediterranean Sea.—It was recently

brought into this country, and is rapidly spreading through the Northwest. It is not liked by the millers. It does best upon the poor, sandy soils, where there is not much rainfall. It yields more per acre than the Fifes and Blue-stems, but is more difficult to make into flour.

EMMER*—This is a kind of wheat that looks like barley and is often called "Speltz." Speltz is still another class or type of wheat, and is not grown in this country. The chaff of Emmer holds the seed like oats and barley when threshed.

In the United States Emmer is used only for food for live stock.

Polish Wheat is popular in some parts of the world, but is not much grown in this country. When grown it is useful only in gruels or as stock food.

There are still other types of wheat, but they are so little grown that their importance is slight.

There are also two classes of wheat—the winter wheat and the spring wheat. These look just alike, but the winter varieties must be planted in the fall and remain over winter before they will produce seed, while the spring varieties are planted in the spring and produce seed the same year. These two classes—winter and spring wheat—are found in nearly all of the types.

HOW TO GROW WHEAT.

PLOWING. Plowing for wheat should be done in the fall. Fall plowing opens the soil so that air and water can pass through it. The frost then breaks it up and makes it fine and more productive. If the plowing is left until spring the soil does not go through this treatment and is not so productive Spring plowing should be shallow, as it is likely to make the soil too loose.

HARROWING THE SOIL. Harrowing should be done at just the proper time. If a wet soil is not harrowed it will form a hard crust on top or be lumpy. If left too long after plowing the soil dries out and the seeds do not get

*It is not intended to have Emmer as one of the varieties in the grain growing contest.

the moisture needed for germination. The seeds do not sprout evenly and the crop looks poor. Harrowing is not intended for making the soil loose, but for compacting it, and making a fine, firm seed bed. Fall plowed land should not be harrowed until spring. Spring plowed land should be harrowed the same day as plowed and again before or just after planting.

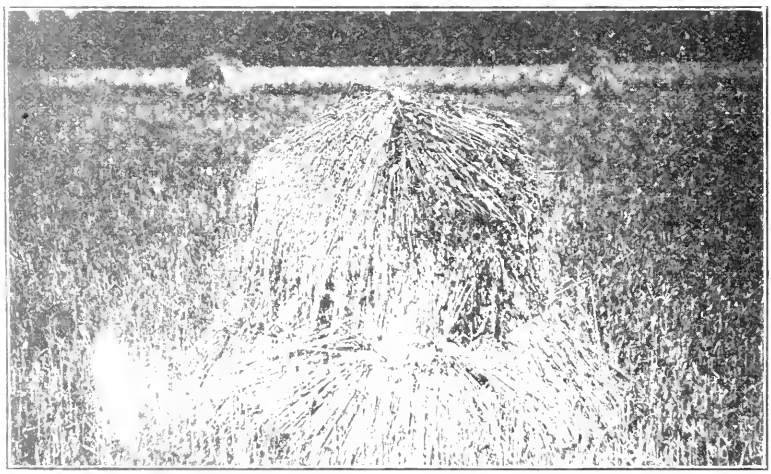


Fig. 13. A well made shock will shed rain.

PLANTING THE SEED. The best way to plant wheat is with a drill. This gets the seed buried at an even depth and places it in contact with moist soil. Farmers use from 1-¼ to 1-½ bushels of seed per acre. The seed should be drilled as early in the spring as the ground can be worked. Many farmers who have many acres of grain to put in, begin before the soil is in the best condition. After the seed is all planted it is a good plan to harrow or roll the field just as the wheat is coming up. This presses the soil about the roots of the little plants so they can get moisture easily. It also helps to keep the

moisture in the soil. If the ground is wet it should not be rolled as it makes the surface too hard and dry.

HARVESTING WHEAT. Wheat is usually cut just before the last of the green color is gone from the top of the stems and spikes. The grain should not be allowed to get dead ripe

Fig. 14. A poorly made shock permits the rain to soak into the heads of the bundles and spoil the grain. A shock contains about one bushel of grain. Cant you afford to spend a little more time on the shocks and make them good? or will you let them go like this one and lose from five to ten cents per bushel on the crop?

and dry. It is well to have the binder in good order before harvest time, so that no time will be lost in saving the crop. The bundles should not be allowed to lie on the ground, but should be shocked up at once. The shocking should be well done. Poorly shocked wheat is worse than no shocking at all. Shocks should have one or two bundles on top for caps to shed the rain. The bundles must be firmly set on the ground or the shock will fall over to one side, which lets many of the heads of the wheat touch the damp ground and damage the grain.

THRESHING. After wheat has been in the shock long enough to get thoroughly dry it should be either threshed or stacked. When once dry in the shock it must be kept dry. If the grain is damp it will heat in the bin or stack and be injured. As far as the cost is concerned, there is not much difference between threshing from the stack or the shock.

Fig. 15. Well made stacks keep grain in a good condition and improve the color of grain by "sweating."

MARKETING GRAIN. Before a farmer begins to market his wheat, he should save the seed for the next year's planting. Many farmers forget this and market all their wheat except enough in the bottom of the bin to use for seeding. This is a mistake, for many small, poor seeds are then used. He should first see that the best wheat he raised is saved for seed, then sell the rest.

SAVING SEED. In saving grain for seed purposes, every farmer should strive to get the largest, plumpest and heaviest seeds. Run some of the grain threshed through a fanning mill and save the best half of what is run through for seed. If the fanning mill is run very fast the heavy seeds will be the ones to come out beneath or in front. All the light, small

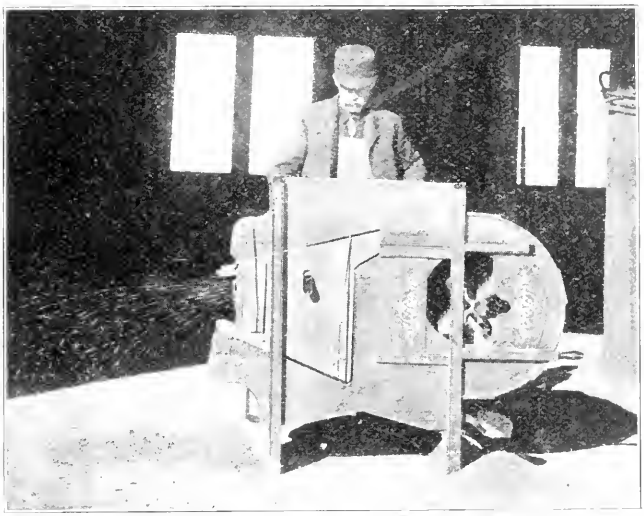


Fig. 16. Selecting seed wheat with a fanning mill. Note the heavy seed coming out at the right and the light seed and chaff at the left. In getting the best seed in this way, the mill should be run rapidly.

or shrunken kernels will be blown over the end of the sieve at the back. (See Fig. on page 16.). No better selection than this can be made except by hand.

USES OF WHEAT. Nearly all the wheat grown is used by the millers to make flour for bread. A very small part of each year's crop is fed to live stock. In making flour, however, there are a good many by-products, such as bran, shorts, middlings, etc. These the millers sell to the farmers for feed for stock. The screenings from wheat, that is, the very small and cracked kernels together with the weed seeds, are fed to poultry and to sheep and cows.

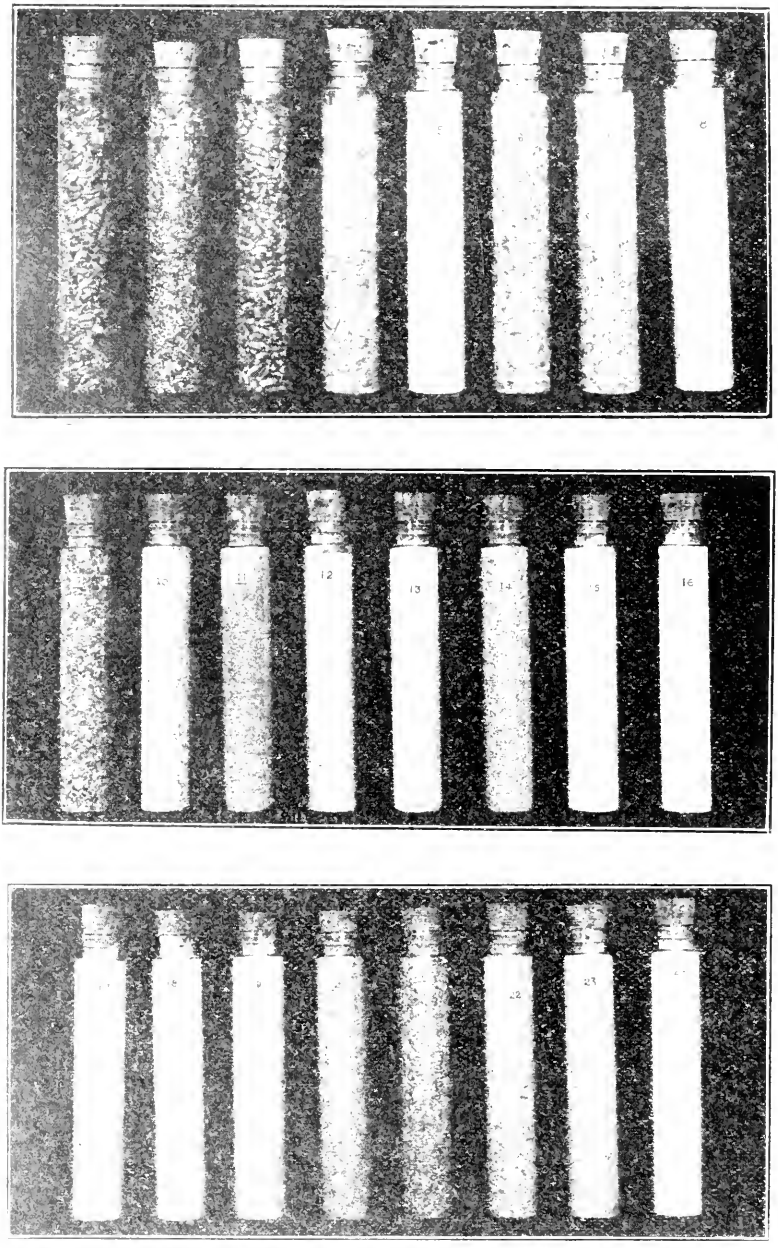


Fig. 17. Samples of Milled products illustrating the various operations in Milling wheat

KEY TO FIG. 17

1. Wheat as it is received at the mill.
2. Screenings taken out of wheat.
3. Clean wheat ready to grind.
4. After 1st grinding or break.
5. Middlings sifted out of No. 4.
6. Ready for 2d grinding.
7. After second grinding.
8. Middlings sifted out of No. 7.
9. Ready for 3d grinding.
10. No. 1 coarse Middlings before purifying.
11. Fine bran taken out of No. 10.
12. No. 1 or coarse Middlings after purifying.
13. No. 2 Middlings before purifying.
14. Fine bran and dust taken out of No. 13.
15. No. 2 Middlings after purifying.
16. Best grade flour.
17. 1st Clears (2d Grade of flour).
18. 2d Clears (3d Grade of flour).
19. Red dog (1st Grade of feed).
20. Shorts or standard Middlings.
21. Bran.
22. Pure wheat germ.
23. Flour Middlings.
24. Entire Wheat Flour.

OUTLINE OF THE PROCESS OF MILLING.

"Sample No. 1 shows the wheat as it comes to the mill in the cars from the country. Here it is shoveled by means of power shovels into large Hopper Scales which weigh it accurately. From the Hopper Scales by means of Conveyors and Elevators, it is carried into the storage bins.

From the storage bins the wheat goes to the first cleaning process, which is known as a Milling Separator. It is a series of metal sieves. Perforations of the first two are just large enough for a kernel of wheat to pass through and therefore oats, straw, and other impurities larger than a kernel of wheat are separated from the wheat on these sieves. The lowest sieve of the series has perforations considerably smaller than a kernel of wheat, through which the small mustard seeds and other impurities which are smaller than a wheat kernel pass. Some of these impurities are shown in sample No. 2.

From the Milling Separator the wheat is passed through what is called the wheat scourer, which is in the form of an upright perforated cylinder, in the center of which, revolving about the shaft, are large beaters. The wheat falls down in the center, is struck by the beaters, and is thrown against the outer wall, and after revolving a number of times against the casting it passes out

through the bottom of the cylinder. While it is falling through the cylinder there is a strong current of air passing upward which carries off the dust.

After the wheat passes through these cleaning systems it is all ready to go on to the rolls and is shown in No 3. After being thoroughly cleaned, it passes to the first set of corrugated rolls,—that is, rolls having ridges cut lengthwise, about 10 to 14 of these ridges to every inch of circumference. This is called the first reduction as shown in No. 4.

After passing through these rolls it goes into one end of a long reel covered with coarse bolting cloth. The Middlings shown in No. 5 pass through this cloth and what remains of the wheat passes over the end of the reel and from there goes to the second reduction rolls, which are similar to the first.

This process is repeated five times and after the Middlings are taken out after the fifth reduction, all that is left of the wheat is the Bran, which is shown in sample No. 21.

Before the Middlings can be reduced into flour, the fine Bran and dust must be taken out of them, or, in other words, they must be purified. Before the purification can be accomplished thoroughly the Middlings must be divided into various grades with respect to size. This is accomplished by running all the Middlings into the end of a long reel, which is covered with various sizes of bolting cloth. On the head of the reel is a very fine cloth through which the flour passes; the next section is covered with a cloth a little coarser, through which the finest grade of Middlings pass; the next section still coarser, and so on up to the end of the reel. What is too coarse to go through the last section of the reel passes over the end.

After the Middlings are graded they pass over the end known as the Middlings Purifier. This is a long narrow sieve with a strong current of air passing upwards through the cloth. The Middlings travel from one end of the sieve very gradually to the other end. The strong current of air carries off the fine dust to the Dust Collector and the fine Bran being much lighter than the Middlings, is suspended by the air current from the cloth, while the Middlings go through the cloth, the Bran being carried by the current of air to the tail of the machine and is thus separated from the Middlings. This fine Bran is shown in No. 11, and the Middlings after the Bran is taken out in No. 12.

This process is the same for the various grades of Middlings. After the Middlings are thoroughly purified they are reduced similar to the gradual reduction of the wheat except that instead of having the rolls corrugated, they are smooth; that is, the coarsest grade of Middlings is ground, then passed on to a reel clothed with a very fine cloth through which the fine dust passes and goes to the flour bin. Particles of the Middlings that are too coarse to pass through the cloth go over the end of the reel and on to another set of rolls, being ground again, and pass through another reel, the flour being taken out.

This process is repeated for all grades of Middlings until all have been reduced to flour. The Clears and lower grades of flour are made from the fine Bran and dust that is taken out of the Middlings during the process of purification. This is done by grinding on smooth rolls this fine Bran and dust. The Bran will not break up, but will flatten out and when the product is passed on to a reel clothed with a fine cloth, the Bran will not go through the cloth but will go over the end of the reel, and the flour passes through the cloth.

This flour, of course, contains very fine particles of Bran which it is impossible to separate from it and, therefore, cannot be run into the highest grades of flour and is sold for either 1st. Clears, 2d Clears, or Red Dog, according to the amount of Bran it contains.

Entire Wheat Flour (shown in sample No. 24) is made by simply grinding the entire wheat on a corrugated roll, removing only the coarse fibrous part of the Bran.

From Washburn Crosby Co. Sample Case.

Breakfast foods and macaroni are also made from wheat. It is supposed that macaroni is all made from the Macaroni or Durum wheat, but whether this be true or not, macaroni can be made from the fife and blue-stem wheats.

MAKING FLOUR. The process of milling wheat is very interesting. The intricate methods and machinery used in separating the various parts of the kernels into so many "milled" products is little less than wonderful. The wheat received from the elevators is first thoroly cleaned of dirt and weed seed. If it is infested with smut it is passed thru a scouring device, which removes the smut particles from the wheat. The next process is tempering. This is usually done by steam. By passing the grain thru steam it takes on a little moisture. This is for the purpose of softening the kernels so that in grinding the bran does not break up into small particles and mix with the flour. After tempering, the grain is passed thro the break or rollers. The breaking is not all done at once, but in five processes. It is commonly supposed that in passing between these rolls the wheat is crushed, but such is not the case. The rolls are so geared that one revolves slowly while the other revolves very rapidly. The rollers are corrugated,—thus the wheat, in passing between them is cut or broken rather than pressed or crushed. On this account the grain coming thro the first pair of rolls is called "1st Break."

After the first break the wheat goes into one end of a large reel covered with coarse bolting cloth. The fine "middlings" pass thro the cloth while the coarse parts pass over the end of the reel into a second pair of rolls similar to the first. This process is repeated five times. Each time the separation is more and more complete until at last only the bran is left.

Before the separation is complete and the pure flour obtained, the fine bran and dust must be purified. Before this process is complete the middlings are passed thro a long reel covered with different sizes of bolting cloth—thus the various grades are divided.

After being graded the middlings pass thro a "purifier."—This

is a long, narrow, cloth sieve, with a strong air blast passing upwards thro it. The dust is, in this way, blown out while the bran particles are held in suspension in the air and the fine middlings pass thro the cloth.

After this process the middlings again go thro a reduction process similar to that of the wheat except that the rolls are smooth. This goes on until all the flour has been worked out. Some of the flour of the last reduction process will have many particles of fine bran in it. It cannot be run in with the highest grades of flour, but is left unmixed and sold as 1st Clear, 2d Clear or Red Dog—according to the amount of bran it contains. (See Fig.)

JUDGING WHEAT. The judging of wheat is based upon points or characters. These characters have some relation to the amount and kind of flour the wheat will make. The wheat score card is made up so as to give most emphasis to the points that are of most importance. For example: Shrunken grain does not make good flour. Therefore, plump grain is desirable and is given 25 points out of the total 100 for a perfect lot. On the other hand, uniform size and shape are an advantage to the miller, but these are given only 10 points.

SEED FOR CONTEST

An exhibit shall consist of one peck of selected grain and ten selected seed heads with stalks at least six inches long.

To select the twelve heads watch the field from the time the wheat begins to head until it is ripe. When an extra good head is found mark the place with a stake and tie a small white rag on the stalk of the selected head. In this way mark fifty or more heads that come out first and grow tallest and have the largest, best-filled heads. Harvest all of these and then select the ten best from them. Make a small bundle of the selected heads and tie the bundle loosely just below the heads and tightly at the base of the stem.

SCORE CARD FOR SEED WHEAT

MINNESOTA JUDGING SCHOOL

Division of Agriculture. St. Anthony Park, Minn.

POINTS NOTED	Standard Score	S'mple No. Score	S'mple No. Score	S'mple No. Score	S'mple No. Score	S'mple No. Score
1. Weight per bushel	25					
2 Uniformity and Purity	10					
3. Color	15					
4. Plumpness	25					
5. Condition of Bran	5					
6. Market Condition	20					
Total Points	100					

EXPLANATION AND RULES OF SCORE CARD

Weight per Bushel.

The standard weight is 60 pounds per bushel. Any sample weighing less should be given a lower score than the standard.

Rule.—By means of a testing kettle get the weight per bushel. This may also be determined by weighing very carefully an even peck of the grain, then multiplying by 4, the number of pecks in a bushel. If the sample has a weight less than 60 pounds per bushel, *cut one point off the score card for each pound less than the standard.* Thus, if the sample weighed 55 pounds per bushel it would score only 20 points.

Uniformity and Purity.

This is an important point in all grain intended for seed purposes, and should be closely observed. The size and shape of the kernels will often help in judging the purity of the seed. For example: Fife and blue-stem wheat kernels are different. The one short and thick and the other long. All the kernels should closely resemble each other.

Rule.—To judge the score of uniformity of a sample examine it closely and estimate the relative amount of difference in size and in shape. Then judge about how near it comes to being pure. *Cut the score according to how near the sample comes to being perfect.*

Color.

The color of wheat has much to do with the quality. For example: If it has been frequently wet with rains, or has been heated in the bin, or has been frosted, the natural color is changed and the seed has been somewhat injured. Good seed wheat has a hard, flinty clear color and good luster.

Rule.—Keep in mind what perfect wheat should look like. Then see how near the sample comes to your idea and mark accordingly. *It is very seldom that a sample is marked perfect.*

Plumpness.

The plumpness of wheat is important to millers in making flour. The plumpest kernels have the most flour. For

seed purposes plump grain is the best and gives larger yields.

Rule.—The rule for judging this point is the same as for judging color. See about how near the sample comes to being perfectly plump, and *cut the score card in proportion to what it lacks in being plump.*

Condition of Bran.

If the bran or seed coat is wrinkled the milling qualities are reduced. The cause for the wrinkled condition may have been such as to injure the value of the grain for seed purposes.

Rule.—Cut the score card according to the extent of the wrinkled or otherwise injured condition of the bran.

Market Condition.

Under this head are considered the amount of diseased or injured kernels and the dirt. All injured seeds are detrimental to the grain for seed purposes, therefore no such seeds should be found in samples of seed grain. Smutted or moldy kernels, cracked kernels, and dust or dirt should not be tolerated in seed grain.

Rule.—Cut the score card according to the amount of dirt and dust, and the number of diseased or otherwise injured kernels.

Adding the Score.

Add all the scores given under the six heads. The sum of these will be the standing or score of the sample. After all the samples have been judged, the scores can be compared and the best ones picked out of those with highest score.

See appendix for bulletins on this subject.

OATS

HISTORY. Cultivated oats are supposed to have been originated from wild oats. There is very little difference between the cultivated and the wild oats. The earliest mention of oats is found in the history of Roman Agriculture about four

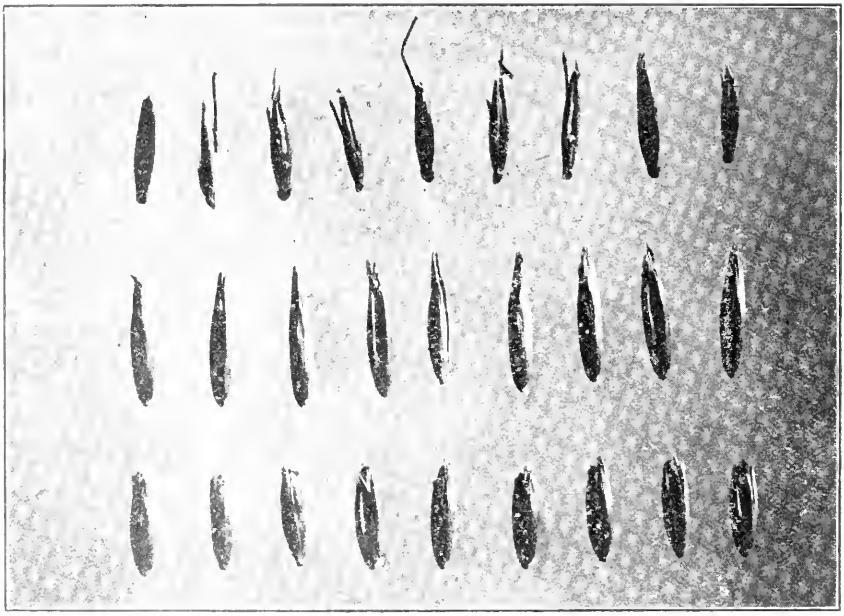


Fig. 18. Types of Oat kernels; Top row, Wild oats; Middle row, slender type; Bottom row, potato type. Note the beard, the basal hairs and oval base of the wild oat. The slender oats commonly have a thinner hull than the potato type.

hundred years before Christ. The oat is a native of the country north of the Mediterranean Sea, probably Central Europe, and has been introduced into the newer countries early in their development.

DESCRIPTION. The oat plant is very much like wheat when it is young. When fully developed the stems also resemble wheat, but are generally coarser. The seed heads of

oats are very different from wheat. The flowers are borne at the top of the straw in clusters called panicles. The kernels are borne in twos at the ends of very small slender branches.

WHERE OATS ARE GROWN. Oats are grown in nearly every country in the temperate zone. They do best in fairly cool climates. In the United States oats are not much grown south of the old Mason and Dixon line, except in Texas. The

Fig. 19. Two types of oat panicles. 1. The side or horse mane; and, 2. the open or spreading.

states growing the largest amounts are Illinois, Iowa, Nebraska, Minnesota and Wisconsin. There is hardly a farmer who does

not grow some oats. In Scotland, oats are given the first place on the farms and are more extensively grown than any other crop.

USES OF OATS. Most of the oats grown are used for feed for horses. They make an excellent food for all kinds of stock, especially the young animals. The greatest good can be obtained when the oats are ground before feeding, but this is not essential. Oats are extensively used as a food for man. The Scotch have always been noted as oatmeal eaters. In recent years the English and American people have used oats, in various forms, as a breakfast food. The straw, though not so good as hay, is used by the farmers for feeding horses and other stock during the winter months. It is also used for bedding animals.

TYPES OF OATS. Oats are divided into two classes, according to the shape of the panicles, viz., the spreading and the side oats. The side oat is so called because the seeds appear mostly on one side of the panicle, whereas in the spreading type the panicle is open and branching in all directions. Oats are also divided into classes according to color, as white, black, yellow, red and gray. The white oats are the most common and are generally preferred.

PREPARING LAND FOR OATS. Whatever is true in regard to getting land ready for wheat is also true for oats. Fall plowed land should be disced or harrowed early to cause weeds to germinate. A harrowing later, just before planting, will then kill them. The ground should be free from weeds (especially wild oats) and should be made smooth and fine before seeding. Manure should not be applied to land the same year that oats are to be sown. It makes too heavy a growth of straw, which causes the oats to lodge.

PLANTING. Oats should not be planted as early in the spring as wheat, for the plants are not so hardy in the soil and weather. Sow oats when the weather and soil are fairly

warm. In Minnesota this is about May first. In nearly every case it is preferable to sow with a drill. The broadcast seeder requires more seed and does not get the seed in evenly. Farmers use about two to two and one-half bushels of seed to sow an acre. On heavy, rich soils it is generally thought best to use more seed than on light soils. Plant deeper on light than on heavy soils. Two and one-half inches is about an average depth for planting.

HARVESTING. To get the best results oats should be harvested before they become dead ripe. Even if low places are quite green, more will be gained by cutting early than by waiting until these places are ripe, for when they are ripe the rest of the field is over-ripe. Oats that are over-ripe scatter and lose many seeds during harvest. Better color in the grain is also obtained by cutting early. The bundles should be shocked the same day as cut and the shocks must be well capped and covered with two bundles or the color of the oats will be damaged. The color has much to do with the price paid on the market, therefore it should be protected wherever possible. Dew and rain make the hulls yellow or dirty brown.

MARKETING. Before taking oats to the market the grain should be clean of dust, dirt and foul seed. Oats are usually a more or less dusty grain, and if the crop is very bad the buyer either pays less than market price or deducts one or more pounds per bushel for dirt and weed seeds. The farmers often put the best grain in the top of the sack or the load and a poor lot in the middle or bottom, thinking that it will sell better. But this is a mistake. When the grader or buyer finds the grain like that, the whole lot is graded according to the poorest grain in the sack. Therefore the farmer really cheats himself, for he is sure to be found out.

SAVING SEED. It is much harder to tell the value of oats by looking at them than it is with any other grain. The largest kernels may not be found the heaviest kernels for they may be simply hulls without a seed. Sometimes

the largest kernels are simply two oat kernels held within one glume. The best way to get good seed is to run the oats through a good fanning mill and save only the heaviest seed. A great difference in weight can thus be obtained. For example, the Minnesota Experiment Station did this with a variety of common oats and got a difference in weight of 16 pounds per bushel. The heaviest weighed 37 pounds and the lightest 21 pounds per bushel.

The yields from these two classes of seed were 64.09 bushels for the heaviest and 54.59 for the lightest seed.

JUDGING OATS. The judging of a sample of oats is not an easy matter, for the real value of the oat is hidden by the hulls. Yet there are certain characters which show themselves when a study of the oats is made.

SCORE CARD FOR SEED OATS.

MINNESOTA JUDGING SCHOOL,

Division of Agriculture. St. Anthony Park, Minn.

POINTS NOTED	Standard Score	S'mple No. Score	S'mple No. Score	S'mple No. Score	S'mple No. Score	S'mple No. Score
1. Weight per Bushel	25					
2. Plumpness and Quality	20					
3. Uniformity and Purity	20					
4. Color	10					
5. Market Condition	25					
Total Points	100					

Remarks

OATS—RULE AND EXPLANATION OF POINTS

An exhibit must consist of at least one peck and 12 selected seed heads according to the method described for wheat.

Weight per Bushel.

The standard weight in Minnesota is 32 pounds per bushel. By means of a patent weighing kettle or by taking a 4-quart measure of the grain and getting its weight on grocery scales then multiplying by 8, the weight per bushel can be obtained.

Rule.—Cut two points from the score card for each pound less than the standard weight per bushel (32 pounds). Thus, if the sample weighs 30 pounds per bushel it would score only 21 points.

Plumpness.

This character must be observed very closely, as the eye is easily deceived by the hull being well rounded out. It frequently happens that two kernels are enclosed within one hull. This makes the hull appear very plump, but in reality it is the opposite. One good way to judge plumpness is to squeeze a handful of the oats. If they do not spring much they are well filled. Look closely at the tip of the hulls. If they are short and broad they indicate plumpness, but if they are rather slender and pointed, the seed is either wanting or it is very small and poorly filled.

Rule.—There is no set rule by which the plumpness may be scored. The judge should look carefully for poorly filled hulls, double seeds, etc. *Then cut the score card about what he thinks the sample lacks of being perfect in plumpness.*

Uniformity and Purity.

The uniformity of the kernels is very important in oats for seeding, and in determining the purity of the breed represented. All the seeds should be of the same general size and of an even color and should all be of the shape that represents the variety.

Rule.—As in the case of plumpness, there is no definite rule by which to score. The judges must estimate the relative number that are not like the majority and *cut the score card accordingly.*

Color.

No matter what the color of the sample is, every seed should be of the color that represents the variety. A white variety should not be mixed with yellow or black or gray kernels, nor should a black variety have any but black kernels. The color should also be bright and clear.

Rule.—For every 5 kernels of another color or variety cut one point on the score card. Also cut some for discolored or bleached kernels.

Market Condition.

Under this head are considered bad kernels, dirt, foul weed seed, maturity, etc. There is no excuse for oats being dirty or foul, therefore the market condition should be thoroughly examined and scored severely.

Rule.—The judging of this point is very similar to that of plumpness. After inspecting the sample carefully, *cut the score in proportion to the relative amount of dirt, poor or defective kernels, etc.* If, for example, the sample has some dirt and weed seeds in it, and shows signs of having been wet or has a good many bad kernels, *it could be cut to 20 points or more*, depending upon the amount of the dirt, etc.

If it is difficult to tell how much dirt, etc., there is in the sample, get a sieve and sift out the dirt. *Then weight it and cut the score accordingly.*

BARLEY

HISTORY. Barley has been grown for its grain for many hundred years. The ancient Egyptians, Assyrians and other people about the Mediterranean sea grew barley more than a thousand years before the birth of Christ. It was grown extensively in England and was introduced into America (probably first in Nova Scotia) about 1600 A.D. It was growing in Virginia in 1611, at Lynn, Mass. in 1629, and formed the chief agricultural product in Rhode Island in 1796. Since that time it has spread over the entire North American continent.

DESCRIPTION. Barley belongs to the great family of grasses and is known on the market as one of the coarse grains. When the plants are young it is easy to tell them from oats or wheat, for they are of a lighter green color and have broader leaves. The mature plants are not unlike oats and wheat in general appearance except the spike or head. The flowers of the spike are arranged very much as the flowers of the wheat plant, but their individual make-up is enough different to make it easy to tell the two apart. (See Fig. 21. Page 47. Typical Barley Spikes.)

When threshed the hulls remain around the seed, except in the so-called hulless barley.

WHERE BARLEY IS GROWN. Nearly every state in the union is a producer of barley. Minnesota and California produce more than the other states. Minnesota produces more than 29 million bushels. The northern states as a rule grow more than the southern states. Upon Minnesota farms barley is not one of the chief crops raised until the land has become badly infested with wild oats and other weeds. Barley matures early and on that account is cut before the wild oat seeds are ripe. After it has once been grown on a farm, the farmer usually plants a small area annually.

USES OF BARLEY. Ancient Egyptian history states that barley was one of the first grains to be used as food for man. We are also told that it was one of the principal foods of the poor classes of people until late in the history (1600 A.D.) of the Christian era. Since that time it has been used more for a stock food and less by man.

Barley has long been known as the "Brewer's Grain." It is called this because the breweries use it extensively for the manu-

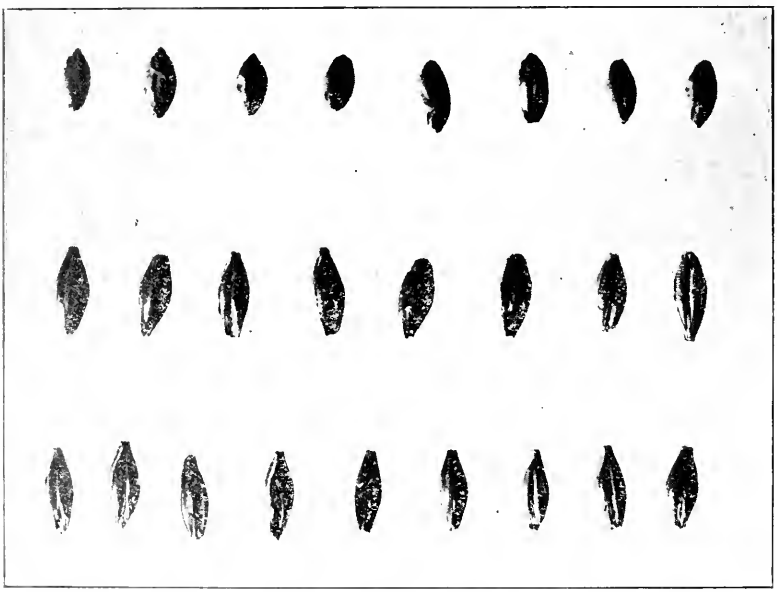


Fig. 20. Types of Barley kernels: Six-row barley in the bottom row, Two row barley in middle row, Hulless barley in top row.

facture of beer. In this process the barley is sprouted, then dried. From this dried grain the essence essential for beer is extracted.

Barley, if ground into a meal, is especially good for young stock. It also furnishes the elements necessary for fattening animals. When corn is not extensively grown, barley may form the principal grain ration to fatten all classes of stock.

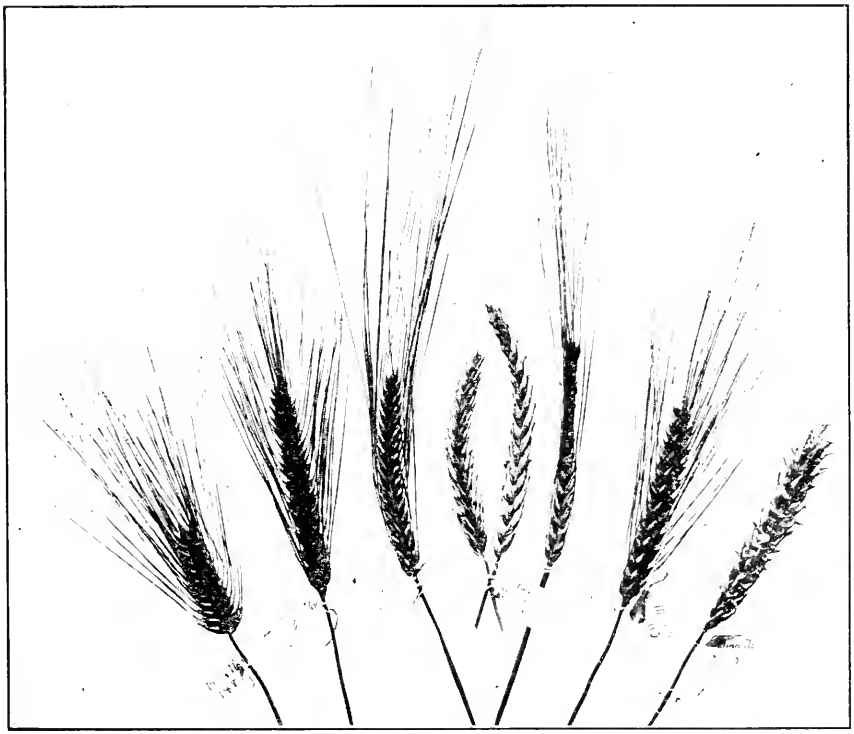


Fig. 21 Types of Barley—Beginning on the left they are Hexagon 6 row—Manshury, 6 row—Duckbill 2 row—Beardless two row—Long Two row—Mandschvri 6 row and Beardless 6 row.

KINDS OF BARLEY. There are two distinct groups into which all barleys grown may be classified. These are the Six Rowed and the Two Rowed groups. They are called Two Rowed and Six Rowed because of the way the kernels are arranged upon the spike; the Two Rowed with a row of kernels on either side of the stem and the Six Rowed having two rows of three kernels each. In the Six Rowed class we have the common Six Rowed, the Beardless, the Hulless and the Hexagon six-rowed types. In the Two Rowed group we have the Long Two Rowed, the Duck Bill and the Beardless Two Rowed types.

The types most found in Minnesota are as follows:

1. The Common Six-rowed barley is the one that gives the largest yields and best satisfaction. The varieties of this type that have proved best are the Mandscheuri, the Manshury and the Oderbrocker.

2. The Beardless Barley has never succeeded in Minnesota.

3. The Hulless Six-rowed barley is grown only for stock. All other types of barley hold the hull when threshed. This one threshes out free from the hulls like wheat and rye.

4. The Hexagon type is grown only in an experimental way. It is not a tall growing variety, but stands straight and bears a very regular, short, compact spike.

5. The Long Two-rowed barley is a very good kind, but does not yield as much as the six-row type. It is especially desired by brewers in the East and in Europe. The Chevalier variety is the most common of this type.

6. The Duck Bill two-row barley has a shorter spike than the Long Two-row varieties, but the spike is much broader and is narrower at the top than at the base, thus giving it the shape of a duck's bill. Hence its name.

7. A Beardless Two-rowed type of barley is sometimes seen, but, like the six-rowed beardless, it is of no economic value.

PREPARING LAND FOR BARLEY. The suggestions for preparing land for wheat and oats will also apply for barley. Barley, however, is not a gross feeder: that is, its root system is not as large as the root system of wheat, oats and corn, and it must therefore have a richer soil than oats.

The heavy soils should be plowed in the spring, disked and harrowed fine. The harrowing must be done the same day that the plowing is done; otherwise the soil dries out too much. This extra work will pay well, because of larger yields that will be obtained. It will also be possible because the wheat and oat seeding will be finished and it is not necessary to get barley seeded extremely early.

SEEDING BARLEY. When the danger from frost and cold weather is past it is safe to plant barley. The actual calender date will, of course, vary with the season. At the Minnesota Experiment Station the barley has been sown from April first to May fifteenth.

The amount of seed barley usually sown by the farmers is eight pecks per acre. The Experiment Station finds that seven pecks give best results. This amount should be ample if the seed has been properly tested and graded. The seed should be sown about two and one-half inches deep in ordinary soil; deeper in sandy soil and shallower in heavy wet soils.

HARVESTING BARLEY. The greatest of care should be exercised in harvesting the barley crop at the proper time, and in properly shocking the bundles after the crop is cut. The color of the grain is a very important item in the grading and it should be kept white and bright. Discolored, yellow or brown grain will not bring the high price that is desirable when selling the crop. Aside from bringing a lower price, discolored barley is not as good feed.

To prevent barley from losing its bright, white color, the bundles should be shocked and carefully capped as soon as cut (See Fig 13.). This prevents the sun, dew and rain from doing the damage.

The time to cut barley is just before it is dead ripe. It has, at that time, a creamy white appearance. Perhaps, also, a slight tinge of green may be occasionally seen.

MARKETING. Barley is so commonly used as a "cleaning" crop that it is seldom that a carload of clean barley reaches the market. When marketing the crop farmers

pay very little attention to cleaning. It is for this reason that Wisconsin barley brings a higher price than Minnesota barley. The same statements made for marketing oats will apply to barley. But above all, barley must be free from all other grains—as wheat and oats, and must be all of the same variety. A noticeable per cent of either will injure the malting qualities, hence reducing the price. The reason for this is obvious. The malt houses demand a barley that is not discolored and is free from all foreign seeds. In the process of malting it is necessary that all seeds germinate at the same time. If, however, other grains are mixed with the barley or the barley is of mixed types, (two and six row) the germination will be uneven and the malt ruined. Malt houses require from 1000 to 1500 bushels of barley to make a run profitable. The loss, therefore, is great if the germination is imperfect.

SAVING SEED. It is not difficult to tell the plump, well filled barley grains from those that are shrunken and light in weight. Any grains that show a tendency toward slenderness are to be avoided. They are not well filled and are therefore weak. (Note in figure* the bottom row of kernels as compared with the two top rows). The fanning mill is the best "all around" machine to grade the seed. The largest and heaviest should be saved for seeding. By grading and saving the biggest and plumpest grain for seed each year the average yield can be increased five or more bushels per acre. The Minnesota Experiment Station has in this way secured the variety called Minnesota No. 105 barley, which has yielded 52.9 bushels for an average of eight years.

No barley should be used for seed if it weighs less than the standard, 48 pounds per bushel.

JUDGING BARLEY. To judge barley a person must be informed as to the points of value. If the barley is for brewing, the color and the purity is of great importance. For seeding the color does not have as great a value, but should be taken into account, as it is an indication of damage to the seed. The purity and freedom from foul seeds is important. No dirty

Fig. 6, page 14.

impure or poor germinating barley should be used. A farmer can do more harm in one year by using foul and impure seed grain than two or three years work will set right The best is none too good when it comes to the seed question. The net returns are more or less dependent upon and in proportion to the quality of the seed used. If a farmer is to get the largest possible returns from a crop, he must make every effort to create conditions that will warrant such results.

SCORE CARD FOR SEED BARLEY

MINNESOTA JUDGING SCHOOL

Division of Agriculture. St. Anthony Park, Minn.

POINTS NOTED	Standard Score	S'mple No. Score	S'mple No. Score	S'mple No. Score	S'mple No. Score	S'mple No. Score
1. Weight per bushel	25					
2. Plumpness	15					
3. Uniformity and Purity	15					
4. Color	20					
5. Market Conditions	25					
Total Points	100					

DESCRIPTION AND RULES

Weight per Bushel.

The standard weight per bushel of barley is fixed by law at 48 pounds. The barley may possibly weigh more, but should never weigh less. The weighing kettle may be used to determine the weight or a given measure may be accurately weighed.

Rule.—Cut one and one-half (1½) points off the score for each pound found less than the standard. Thus if a sample weighed 46 pounds it would score only 22 points.

Plumpness.

The plump barley kernels should be rounded and full; the crease well closed in; the ends of the kernels blunt, not long and tapering.

Rule.—Cut the score according to the relative amount of poorly filled and shrunken kernels. Good judgment is a virtue in ascertaining plumpness.

Uniformity and Purity.

Grain that is uniform in size, in quality and in purity will give the best possible returns. The seeds will germinate evenly, grow evenly and mature evenly if the grain has been graded to a uniform standard. Purity should be given special consideration. No mixtures of other grains or varieties should be tolerated in seed barley.

Rule.—Cut the score according to the lack of uniformity and purity.

Color.

It is important that barley be of the proper color. A creamy white is generally considered best, but the color varies more or less with the variety. The so-called Blue barley, for instance, has a slight tinge of dark blue. Whatever the color is it should be true to the variety represented. Any discoloring of barley is an indication of a certain degree of injury to the seed. Tests show plainly that the greater the discoloring the poorer the seed.

Rule.—Cut the score in accordance with the lack of true color

Market Condition.

The market condition of seed barley includes maturity, freedom from mustiness, smut, bin burned and frosted kernels, or otherwise damaged kernels and weed seeds. A careful examination will be necessary to detect these conditions.

Rule.—Cut the score in proportion to the degree in which these conditions are present.

The Final Score.

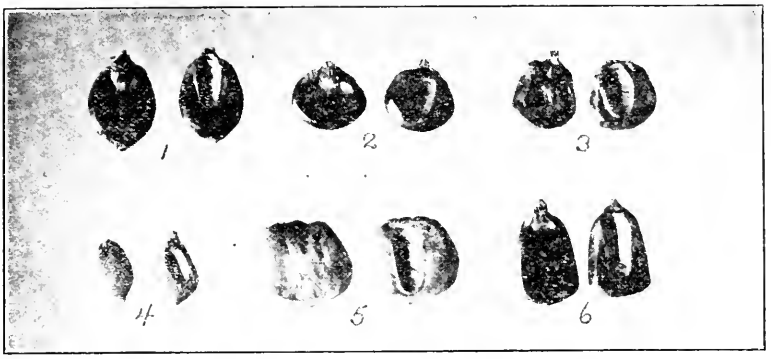
Add the scores given to each of the points and the sum will be the total score of the sample judged. In other words it represents the percentage value of the grain for seed purposes.

CORN

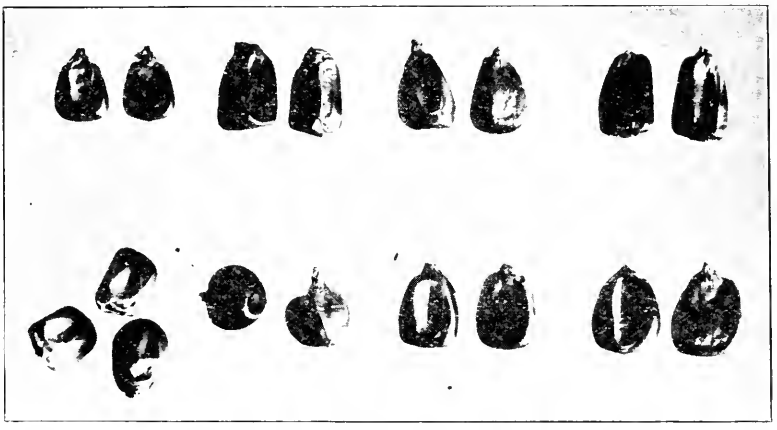
HISTORY. Corn, as we speak of it, was not known in the old world until after Columbus discovered America in 1492. The people in Europe mean wheat or rye or oats when they speak of corn. When they wish to speak of our corn they say maize—which is the botanical, or scientific name.

The growing of corn originated among the Indian tribes along the Atlantic coast. The Indians knew nothing of the old world ways of farming, but every year they planted small patches of corn in the small open places in the forests. In the fall they husked the corn and piled it in a sheltered place. They covered the piles as we cover potatoes nowadays to keep off the frost and snow. Corn is a native of Mexico and Central America. From Central America it was carried both north and south.

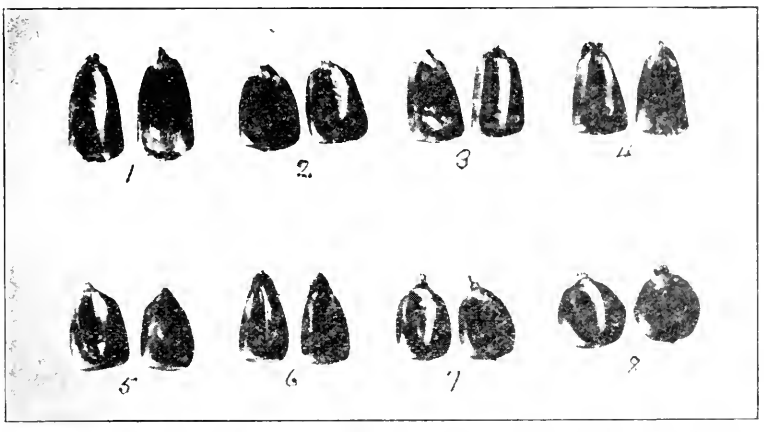
DESCRIPTION. Although corn is very large and coarse and different from most of our grasses, it belongs to the grass family. Its habits of growth are the same as the habits of grass. It is an annual, That is, it ripens its seed the same year as planted, and lives only one season. Most kinds of corn do not send up more than one stalk from each seed but there are short branches (called suckers) that come from the stalk near the ground. These do not often have ears, but do sometimes bear tassels. The main stalk is the only one that produces seed. The stalks are not hollow like most grasses, but are filled with pith. There are several joints in the stalk above ground and as many below ground, but those below are very much closer together than those above. At every joint above ground a small branch is started. These branches are immature ears, but only one or two ever grow into mature ears of corn. The stalks grow to a height of from 18 inches to 30 or more feet. The difference depends upon the type and the locality.



I. Types of corn kernels common in Minnesota. 1, Rough Dent; 2, Flint; 3, Farly Crosby Sweet; 4, Pop; 5, Minn. King; 6, No. 13, (smooth Dent).



II. Various types of Corn kernels which are a menace to the crop. They break the uniformity of the seed and bother in planting, besides being of weak vitality.



III. Types of Corn kernels (some good some bad) commonly selected by farmers. From No. 1 the kernels grow gradually poorer to No. 8.

FIGURE 22.

TYPES OF CORN.

There are six different types of corn grown. The names of these types are Dent, Flint, Sweet, Pop, Soft and Pod corn. Minnesota soil and climate are not suited to all types, but the first four types are common in the state. There are many colors of corn: white, yellow and red are most common, but there are varieties of black, blue and of calico colors. These colors are not distinct for any one type, but all colors may be found in most types.

DENT TYPE. This type is the most common and best corn raised. It gets its name from the fact that it has a dent in the top of each kernel. Dent corn can be grown in all parts of Minnesota, but it does not do well in northern Minnesota, as the season is too short and cold for corn. The principal varieties of dent corn suited to Minnesota soil and climate are Minnesota No. 13, Minnesota King, Rustler White Dent, Minnesota Leaming, Dakota County White, Northwestern Dent, and Pride of the North. There are also many common varieties grown by farmers in the different parts of the state, but they are not recognized as true varieties. Many of them, however, are profitable to raise.

FLINT TYPE. Flint corn is mostly grown in the northern climates, where the season is short. It is called flint because the kernel has no dent and is very hard and smooth when ripe. The most important varieties in Minnesota are Triumph Flint, Mercer Flint, Smutnose Flint, King Philip, Longfellow and White Flint. Like the dent corn, the colors vary from red to yellow and white, but yellow is the most common. Flint corn generally matures earlier than dent corn. On this account it is more common in northern Minnesota.

SWEET CORN. This type of corn is common to the gardens of nearly the whole of the United States. On account of its sweetness this type is often called Sugar corn. It is a very common crop in the northern states. There are many

factories where sweet corn is canned in these states. There are several of these factories in Minnesota. The color of sweet corn is nearly always white. The best known varieties are the Early Crosby, Early Minnesota, Stowell's Evergreen, Country Gentleman, Early Corey and Black Mexican. For canning, the Early Crosby, Country Gentleman, and Stowell's Evergreen are preferred. For eating green from the cob, all the varieties may be used.

POP CORN. Pop corn is another type that is grown chiefly in gardens. When heated gently over a fire this corn explodes or pops open; thus it gets its name, pop corn. The best varieties of pop corn are White Rice, Pearl and Red Rice. These may all be grown in Minnesota.

SOFT CORN. This type is grown only in the southern countries and is called soft because it is not hard like dent or flint corn, but is mealy like wheat or rye.

POD CORN. Sometimes this type is called Primitive Corn. Each kernel of this corn is held in a little husk by itself similar to oats. Thus it gets its name. This type also is grown only in the southern countries.

USES OF CORN.

A larger variety of useful articles is made from corn than from any other plant grown. It is used extensively for feeding all classes of stock and for making glucose and oil. The oil is often flavored and sold as olive oil for table use. In the making of glucose and oil there are about forty other products also obtained. The grain is also made into a meal for use in baking. In the South corn-meal is used a great deal. Alcohol is one of the products made from corn. The stalks of corn are used for feeding stock. The pith is made into bales and used in the sides of ships to prevent leakage. One pound of pith will absorb twenty pounds of water.

GROWING A CORN CROP.

More care is necessary in growing corn than in growing any grain crop. And no farm crop will pay better than corn, for extra work in preparing the land or cultivating the crop and selecting good seed. Corn will do better on a rich, loam soil than on a heavy clay or a loose sandy soil. Corn loves a warm soil that is well manured.

PLOWING FOR THE CROP. For corn the ground should be plowed in the fall, if possible after it has been manured. This will turn the manure under and leave the ground loose so that the air and water can break it into small particles before planting time in the spring. If the land is a heavy clay it should be plowed six inches or more deep. If it is more or less sandy and loose, plowing about five inches deep will give better results. If sod is to be plowed for corn it should be plowed as early in the fall as possible. If the land cannot be plowed in the fall and must be plowed in the spring, it should be plowed as soon as the frost is out and the ground dry enough to plow well. Harrow the land the same day it is plowed. This will hold the moisture, and not leave the ground lumpy.

HARROWING. Fall plowed land should not be harrowed in the fall. It should be left as rough as when plowed. In the spring harrow as soon as the top soil is dry enough to break up easily. If a disc harrow is to be had, it is a good implement to use on fall plowed land. Just before planting harrow again with a light slant-tooth harrow. Always be sure that the top of the soil is as fine and smooth as a harrow can make it before the planting begins. The seed will then have the best chance to grow.

PLANTING. Corn is usually planted in hills about three feet eight inches apart each way, but where land is free from weeds it is sometimes planted in drills or rows three feet eight inches apart with the kernels twelve inches apart in the row. This way of planting gives somewhat larger yields

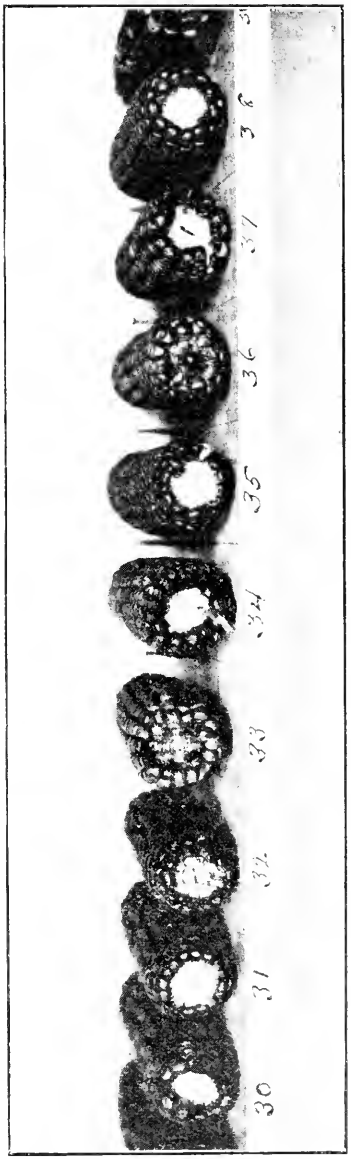


Fig. 23. A few of the ears from which kernels have been taken for germination test.

but requires some hoeing unless the land is very clean. One bushel of seed will plant seven or eight acres of corn for ears, or about one acre for fodder. The time to plant in Minnesota is from May 5th to May 20th. Nothing is gained by planting earlier if the ground is cold, for the tender plants are either stunted or the kernels rot in the ground. The best depth to plant the kernels is about two and one-half inches. Plant a little deeper if the soil is dry and light; plant shallower if the soil is heavy and wet.

GETTING A PERFECT STAND. It very seldom happens that a perfect stand of corn is secured. The intention is to plant three or four or five kernels per hill, but if the number of stalks per hill be counted and averaged for the whole field only two or three stalks per hill on the average would be found. The reasons for this imperfect stand may be summed up under three heads, viz; 1. Lack of germination tests. 2. Using tip and butt kernels. 3. Using seed that is not uniform in size. Since the stand is the basis of yield per acre, it is essential that a full stand be obtained. Therefore, the value of the above three points cannot be overestimated.

Results of Seed Strength With Corn.

100 Kernels Planted.	Butt Kernels.	Middle Kernels.	Tip Kernels
Per cent Germinated	88	80	68
Total growth in 20 days	177 inches.	196.6 inches...	151 inches.
Average growth per plant	2.0 inches	2.2+ inches.	2.2+inches.

This table plainly shows that the kernels from the middle of the ear are the best. The kernels were planted in sterile sand at the same time and same depth. Measurements were made each day until the plants died. What ever growth is recorded must have resulted from the stored up food in the seed and the strength of the germ or in other words the inheritance and stamina.

CULTIVATING. By cultivating is meant the treatment of the field while the corn is growing. Shallow cultivation (two to three inches deep) gives best results. Deep cultivation (four or more inches) cuts the roots of the corn

Deep cultivating also dries out the soil so the corn cannot get what moisture it needs. Cultivation should begin when the corn is just coming through the ground. At this stage a light slant-tooth harrow should be used. The harrow may again be used if the presence of weeds warrants it. The corn will not be hurt, even if it is four inches high. After this treatment the regular

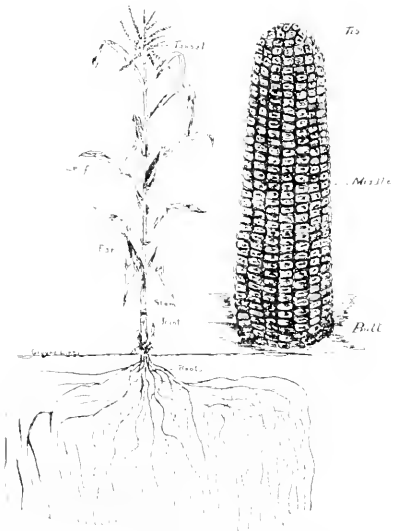


Fig. 24. A corn plant, showing all the parts of the stem and the roots. Also an ear showing the relative parts.

cultivator may be used as often as needed until the corn begins to tassel out. All cultivation should stop after the first tassels come out. Cultivators with several small teeth are better than those with two or three large ones. It is not necessary to hill the corn by shoveling the dirt up around the stalks, except in soil that is very heavy and wet. Corn should be cultivated at least three times during the season. The cultivating should be done when the weeds are small or when the ground gets dry.

HARVESTING CORN. There is some difference of opinion as to the best method of harvesting the corn crop. Some prefer to let it stand until dead ripe and then

husk, thus leaving the stalk to be plowed under or removed afterward. Others prefer to cut the corn by hand or with a corn binder while the stalks are somewhat green, thus letting the corn finish maturing while in the shock. Husking in this

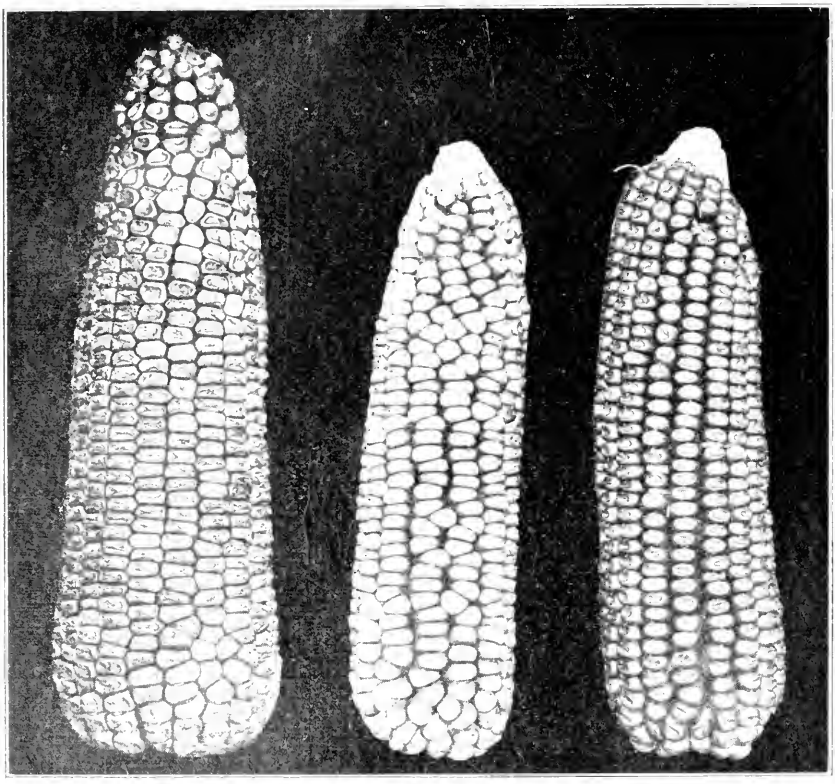


Fig. 25.—Shows three types of poor ears. Seed should not be saved from ears like these.

case is done from the shock by hand or with the shredding and husking machine. This is a better way for the average farmer to harvest his corn, for he gets more or less coarse fodder for his stock during the winter and has no trouble with the stalks on the field. Corn should always be harvested before any severe frost, especially if the frost comes early in the season. If

an early frost is likely to kill the corn before the ear is well matured the crop should be cut. After husking the ears should be taken at once to the crib. The seed ears must be dried carefully and kept in a dry place.

MARKETING. Corn is generally marketed on the ear, 72 pounds being taken as a bushel in the fall and 70 pounds after January first. The cobs, however, are very useful on the farm and may be saved if the corn is shelled before hauling to the market. The cobs, to the buyer, are clear gain,

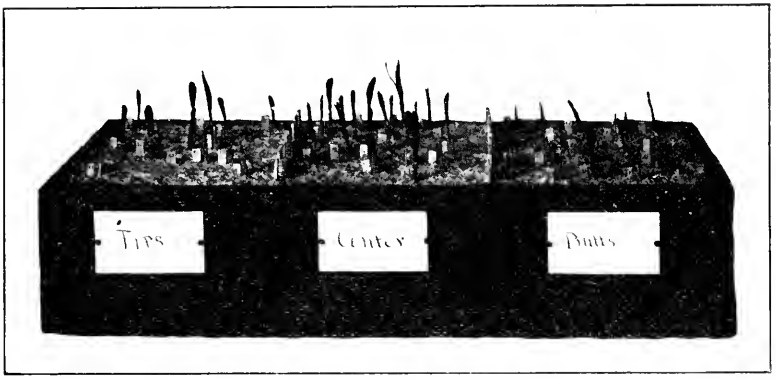


Fig. 26. A box of corn planted in sterile sand. The tip, center and butt kernels, respectively, from 25 ears were shelled together. After thoroly mixing these, 25 seeds from each lot were planted at the same time and same depth. Thus equal conditions were obtained. Note the difference in germination and growth.

for he pays only for the number of bushels, by weight, of corn and deducts the weight of cobs. Example: A man's load of corn weighs 4,200 pounds. He unloads and his wagon weighs 1,200 pounds. The corn alone weighs 3,000 pounds. Seventy pounds is taken as the weight per bushel of corn on the cob. Therefore he has 3,000 divided by 70 or 42.85 bushels. But 56 pounds is taken as the weight of shelled corn, so there is a loss of 14 pounds for each bushel or 599.9 pounds. This is the weight of the cobs.

For seed it is better to buy corn on the cob. It is then possible to detect poor quality in the corn.

SAVING SEED. The best way to save seed corn is at husking time. The largest, best formed and most mature ears can then be secured. The stalks from which the ears are taken can also be examined and ears from weak or otherwise poor stalks can be avoided. The ears saved for seed must be dried in a room that is well ventilated and free from dampness. Poor ventilation kills the germ. The room for keeping seed corn should not be over a stable nor over a bin of wheat or oats for moisture is given off from these and injures the seed. The best place to dry seed corn is in a room above the kitchen, where the windows can be left open in good weather. Seed corn should

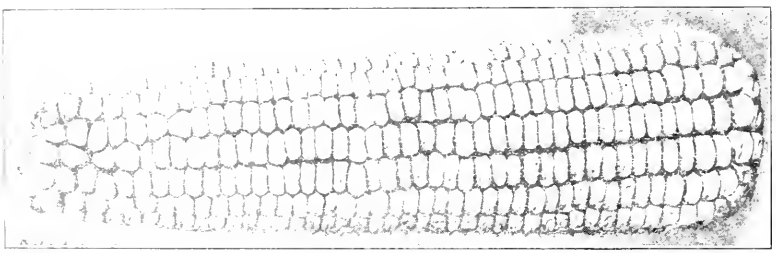


Fig. 27. A good ear of corn. Note the even shape of kernels. Seed should be saved from such ears.

remain on the cob until spring. It keeps much better in this way. In buying seed corn—get it as near home as possible. Do not save the kernels from the tip or from the butt of the ear Use only the kernels from the middle of the ear for seed. The others are of poor quality and make a poor crop.

JUDGING CORN. On the city markets corn is always shelled, and judged in that condition, but corn for seed should always be judged in the ear. The size and form of the ear have much to do with the value of the seed. The position of the kernels on the cob also has an influence upon the value of the seed. Therefore these and other points must be considered before the ears are shelled.

SCORE CARD FOR SEED CORN EARS.

MINNESOTA JUDGING SCHOOL,

Division of Agriculture. St. Anthony Park, Minn.

POINTS NOTED	Standard Score	S'mple No. Score	S'mple No. Score	S'mple No. Score	S'mple No. Score	S'mple No. Score
1. Market Condition	10					
2. Form of Ear	15					
3. Size of Ear	5					
4. Uniformity and Variety Characters	10					
5. Tips of Ears	10					
6. Butts of Ears	10					
7. Kernel Uniformity	5					
Shape	5					
8. Color Grain	10					
Color Cob	5					
9. Space between rows and	3					
Kernels at Cob	2					
10. Per cent Grain to Ear	10					
Total Points	100					

STANDARD POINTS FOR CORN. There are a number of varieties of corn in Minnesota. Each of these varieties has a certain set of characters that are different from the characters of other varieties. Therefore there

must be a set of standard points for each variety. For example: The form of the ear of flint corn is different from the form of the ear of dent corn. These different characters are recognized by a corn judge as quickly as a cattle judge sees the difference between a Jersey and a Holstein.

RULES AND EXPLANATIONS OF POINTS

Each entry or exhibit shall consist of ten selected ears.

Market Condition.

The ears should be thoroughly mature, dry and sound, and should feel firm when taken in the hand. The kernels must not be injured by mice or worms or by mold; neither should they show any rotten or cracked places. They should have a good, bright appearance, and have a large germ.

Rule.—If the ears have any of these faults they should not be given the full ten points but be scored according to the extent of the defects. For example: If the defects, such as cracked kernels, mold and decay or rottenness amount to about as much as one whole ear, and the rest of the corn on the ears is good, the mark should be 9. If it amounts to more than one whole ear and not enough for two ears, mark the exhibit 8½ or 8¾ upon market condition, etc.

Form or Shape of Ear.

The best formed ears are nearly the same size at the tip as at the butt. The rows of kernels should run straight from butt to tip. Twisted rows show bad form. The ears can be as long or big around as they can be found, but the length and the circumference must be proportional, that is, an ear must not be too big for its length. The tips and butts of the ears should be blunt and well filled with kernels.

Rule.—There is no definite rule for judging the shape of the ear. Always have a perfect shaped ear in mind and mark the sample according to how near the ten ears come to being perfect. Make due allowance for variety characters.

Size of Ear.

The size of the ear depends upon the standard for the variety being judged. For example, Minnesota No. 13 should be 8 inches long and 6 inches in circumference. No smaller dimensions will be accepted.

Rule.—Measure the length of each ear. If an ear is less than standard put down the amount it is less than standard. When all ten ears are measured, add the amounts that are lacking. Then take one point off the standard for each 2 inches thus obtained. For example: The standard is 8 inches.

Ear No. 1 is 7.5 inches long, therefore .5 inch short....	.5
Ear No. 2 is 8.5 inches long, therefore nothing short	.0
Ear No. 3 is 8 inches long, therefore nothing short	.0
Ear No. 4 is 7 inches long, therefore 1 inch short.... .	1.0
Ear No. 5 is 7.75 inches long, therefore .25 inch short	.25
Ear No. 6 is 8.25 inches long, therefore nothing short	.0
Ear No. 7 is 7.25 inches long, therefore .75 inch short	.75
Ear No. 8 is 7.5 inches long, therefore .5 inch short	.5
Ear No. 9 is 9 inches long, therefore nothing short	.0
Ear No. 10 is 8 inches long, therefore nothing short...	.0
Total short	3.0

Therefore 1.5 points should be taken from standard. This makes the score 3.5 points for the exhibit.

In the same way the circumference may be measured with a tape line and the shortage figured and cut accordingly. The measurement should be made a little below the middle of the ear.

Variety Characters.

The color of the grain and of the cob, the shape of the kernels and of the dent in one variety are different from others. Therefore these are called variety characters. The ears in the exhibit should be true to the breed represented.

Rule.—Any characters that do not represent the breed must be counted as against the exhibit and some must be counted off for the lack of exact breed characters.

Tips of Ears.

The tips of the ears must be well filled with kernels and well rounded like a fork handle, not tapering like a horn. The end of the cob must be entirely covered.

Rule.—If the entire end of the cob is exposed, *cut off one full point for each ear thus found.* If a little of the cob is seen or

the kernels are not of good size and shape, *cut off as much as is thought proper.*

Butts of Ears.

These should be even and smooth. The rows of kernels must extend over the edge of the butt. The hollow, left after breaking off the shank, should be saucer shaped, and of medium size The butt must not be large and open nor small and shrunken.

Rule.—According to how much the judge thinks that the butts of the ten ears lack of being perfect formed butts, *he cuts little or much from the score card.*

Kernels.

Uniformity and Shape.—All the kernels should be alike in size, color and other characters. The best shape is what is known as the wedge shape, with nearly square corners at the top and sides. This shape fills the cob best and gives the most shelled corn per ear. Round top kernels or round kernels like those found at the tips of the ears are objectionable. The germ should be large.

Rule.—With a blade of a jack-knife pry out two kernels from each ear and lay them in a line, points down, in front of the ears from which they were taken. Look them over and push out of line those kernels that are different from the majority. Since there are five points for uniformity, each four kernels make one point. *Therefore take off one point for each four kernels that do not remain in the line, or if there are three or four types cut accordingly more.*

Do the same way to get the score on shape of kernels. Leave only the good, wedge-shaped ones in the line, and mark off one point for each four kernels not left in the line.

Color.

Grain and cob.—Whatever the color of the variety is, it must be bright and clear. This indicates freshness and good quality Sometimes a yellow ear of corn will have white or red kernels and white corn will have yellow kernels. Also yellow corn may have a white cob or a white corn a red cob, but this is not a true variety character. They should be all of one color.

Rule.—Cut one point for every four kernels of different color from that of the variety. Cut one-half of all the points if a red cob is found in white corn or a white cob in yellow corn, unless the cobs are all of the same color and it is common to the variety.

Space.

The space between the kernels is caused by the shape of the kernels. The rounded corners and sides make spaces between the kernels which should be filled up. When there is a good deal of space the per cent of grain to ear is not as large as it should be.

Rule.—Examine each ear and keep in mind the relative amount of space found in each. When all the ears are examined make an estimate of about how much lost space there is altogether, and cut the score accordingly.

Per Cent of Grain to Ear.

The amount of shelled corn is an important point in an ear of corn. In most varieties of corn there are from 80 to 85 per cent of shelled corn to the ear. That is, in one hundred pounds of corn 80 to 85 per cent is shelled corn and from 20 to 15 per cent is cobs. It is important to have a high percentage of shelled corn, for a high percentage of corn per ear means a big yield per acre.

Rule.—Take five of the ears from the exhibit and weigh them carefully on a grocery scale. Then shell them, being careful not to lose any of the kernels. Weigh the cobs and subtract this from the weight of the five ears. The difference is the weight of the shelled corn. By dividing the total weight of the shelled corn by the weight of the five ears, the per cent of grain to ear is obtained. For example: The five ears weigh $6\frac{1}{4}$ pounds, or 100 ounces; the five cobs weigh 1 pound, or 16 ounce; the shelled corn is $5\frac{1}{4}$ pounds, or 84 ounces. 84 divided by 100 equals per cent of grain to ear.

With the standard as 85, *cut one point for each per cent less than standard.* Thus the above example of 84 per cent would be marked 6 on the score card.

Getting Total Score.

Add the scores of the different characters and the number thus obtained will be the score of the exhibit. Compare the scores of all the samples and those with the highest scores are sure to be the best ones for seed.

See appendix for list of bulletins on Corn.

MINNESOTA EAR CORN SCORE CARD

UNIVERSITY OF MINNESOTA, DIVISION OF AGRICULTURE

ST. ANTHONY PARK

Date, JANUARY 15, 1905. Score of JOHN KNOX.

STANDARD POINTS		1	2	3	4	5	6	7	8	9	10	REMARKS
Market Condition	10	9.5										A little mould on butt
Form of Ear	15	12.0										Crooked kernels
Size	5	4.0										
Variety Characteristics	10	8.5										
Tips	10	7.2										Not filled.
Butts	10	8.3										
Kernels Uniformity	5	3.0										Uneven
Shape.	5	3.5										
Color Grain	10	10.0										
Cob.	5	5.0										
Space Between Rows	3	2.5										
Between Kernels at Cob	2	2.0										
Per cent Grain to Ear	10	8.5										
Total	100	84.0										
Net Wt. of Shelled Grain...		80										

STANDARD OF VARIETY Form of Ear, Cylindrical, slightly tapering at the tip.
Length, 8½ inches.
Circumference, 6 inches.
Color, Yellow grain red cob.
Per cent grain, 85.

CROP ROTATION AND FIELD MANAGEMENT

GENERAL STATEMENT. All field crops are divided into three classes according to the relation they bear to the condition and the fertility of the soil. These classes are: 1st *grain crops* such as wheat, oats, flax, etc.; 2d, *grass crops* such as Timothy, blue grass, clover, etc.; 3d, *cultivated crops* such as corn, potatoes and beets. This arrangement is made because it is known that some crops do better following certain crops than they do following others. For instance—wheat, oats and barley do not do as well after grass and clover as they do after corn. The grasses on the other hand follow the grain crops best because the seed-bed is fine and the grain offers protection to the young grass plants. Corn does better after grass or clover than it does after a series of grain crops because there is a large supply of plant food in the soil. The grass offers a good opportunity for manuring and corn is the very best crop for which to manure. Thus the grains, grasses and cultivated crop may be grown on fields so that each crop will prepare the land for the next crop.

By rotating the crops on the fields the land is made richer, larger yields of all crops are obtained, the weeds are kept down, a better quality of grain is obtained, and a better farm business is established than where one class of crops is grown continually on the same field. Before it is possible to plant crops in rotation, it is necessary to divide the farm into a number of fields of the same size. The number of fields must be the same as the number of years through which the rotation is to continue. For example: A rotation for four years must have four fields for the rotation. In this way a certain crop, as corn, is planted on one field one year and on a different field the next year, and so on until four years have passed, when corn is again planted on the first field.

For convenience in arranging a rotation a list of the classes of common crops is here given.

Grain Crops	Cultivated Crops.	Grass Crops & Clover
Wheat	Corn	Timothy
Oats	Potatoes	Bromus
Barley	Beets	Red top
Speltz	Sorghum	Medium Red Clover
Rye	Peas	Mammoth Clover
	Beans	Alsika Clover
		White Clover
		Alfalfa

A class called Catch crops or Soiling crops is used extensively in Minor rotations. The most important of these are the Root crops, Rape, Rye, Corn fodder, Soy-beans, Millet and the cereal crops used for annual pasturage.

TWO KINDS OF ROTATIONS. A farm should be thought of as having three parts. These parts are (1.) the *farmstead*, which includes the buildings, the orchard, and the yards; (2). The *inner fields*, which are small and are used for young stock and for temporary pastures. A rotation on the inner fields is called a *minor* (small) rotation; (3.) The *outer fields*, which are large and are used for growing the market crops and for rotation pastures. The rotation on the outer fields is called *major* (large) rotation. The minor rotations in Figure 28 are lettered A, B, C, etc., while the major rotation fields are numbered I, II, III.

ROTATION OF CROPS. Rotation of crops means the arrangement of the grass crops, the cultivated crops and the grain crops in order, in such a way that one class does not occupy the same field more than two years in succession. But it does arrange to have one class follow another class. For example: A field grows corn in 1905. In 1906 instead of planting corn again the field is seeded to wheat and the next year hay is grown.

In arranging a rotation of any kind it is always a good plan to follow as closely as possible the rule that a grass crop should follow a grain crop and a cultivated crop may follow a grass or grain crop. A rule for applying manure to the fields in the ro-

tation is as follows: Plan to keep enough stock to furnish enough manure to cover one of the fields each year, and plan if possible to apply the manure on the field where corn is to be planted.

In planning for a rotation on any farm, first make a statement of the exact amount of each crop grown, the number of acres devoted to each crop, the amount of live stock kept, and the total acreage of the farm. Any other notes, as the amount of each crop used on the farm or sold, will also be useful. For example: In Fig. 18 (a typical 160-acre western farm) the statement should be as follows:

wheat,	108 acres,	1080 bushels,	150 bushels used,	930 bushels sold
oats,	10 acres,	500 bushels,	410 bushels used,	90 bushels sold
corn,	12 acres,	360 bushels,	200 bushels used,	160 bushels sold
stover,	12 acres,	15 tons,	15 tons used	
millet,	8 acres,	16 tons,	16 tons used	
hay,	4 acres,	6 tons,	6 tons used	
pasture,	13 acres,		13 acres used	
Potatoes,	1 acre,	138 bushels,	75 bushels used,	63 bushels sold
6 horses				
9 head cattle				3 sold
14 hogs				11 sold
87 chickens,			50 used.	12 sold

From such a statement and an outline map of the farm, work out the number of fields of equal size according to the number of acres wanted for the crops. Keep in mind that best planned rotations have about one-third of the farm in cultivated crops, one-third in grain crops, and one-third in hay and pasture crops. It is not necessary that the crops be divided exactly on this basis, but these proportions should be kept in mind and form the basis upon which to figure the averages of the revised plan.

It may be found that there is not stock enough to furnish manure for an entire field each year. This is easily remedied, for more stock would be profitable and at the same time supply the required amount of manure to keep up the soil fertility. In the absence of the stock, clover and other legumes* must be used to keep up the fertility. In general, when planning for a rotation

*Legumes—Such plants as have flowers like the Clover, Bean, etc., and store nitrogen in the soil.

of crops, endeavor to make a balanced system. One that will use the labor and horses to best advantage the year around, provide the needs for the stock and the family, and make a good net income.

SUGGESTED ROTATIONS. The following rotations and arrangements of fields illustrate the general plan both where the farm is large or small and the rotation long or short. These plans are not suited to *all* farm conditions, but the general plan is such that other crops could take the place of some of those suggested and still be in rotation and keep up the fertility of the soil. These offer a basis upon which to work in planning any rotation.

Figure 28 represents a farm of forty acres with a three-year major and a five-year minor rotation, besides a few acres in permanent pasture along the creek bottom. The major rotation consists of corn one year, oats one year, and clover one year. This simple rotation furnishes hay and grain sufficient to keep the stock during the winter. The permanent pasture, together with the annual pasture furnished by the clover field after the hay is cut, gives the stock nearly enough feed for the summer. What other feed is needed may be furnished by the soiling crops grown in the minor rotation. Rye or rape may be sown with the corn at the last cultivation to furnish late fall and early spring pasture. The field is then sown to oats, with which clover seed is mixed. The clover lives over winter and furnishes hay the next year. In the fall or early next spring the clover is plowed and the corn planted. Manure, as indicated by (m) on the chart, is applied to the field and plowed under for the corn. A lane leads out to the field to allow the stock to reach any or all fields when desired.

The *minor rotation* is made up of (1) potatoes, (2) speltz or other grain, (3) clover pasture, (4) fodder corn, (5) garden. The potatoes prepare the soil for the speltz or other grain. The grain serves as a nurse crop for the clover. The clover is used for pasture the next year. The spring of the next year the clover is plowed under and the field is sown to fodder corn. In the fifth

field the garden is planted. These five crops change places on the five fields each year, while the orchard remains permanently on the sixth. This rotation is intended to furnish the pasture for young stock and green cut crops for the stock when the pastures are short.

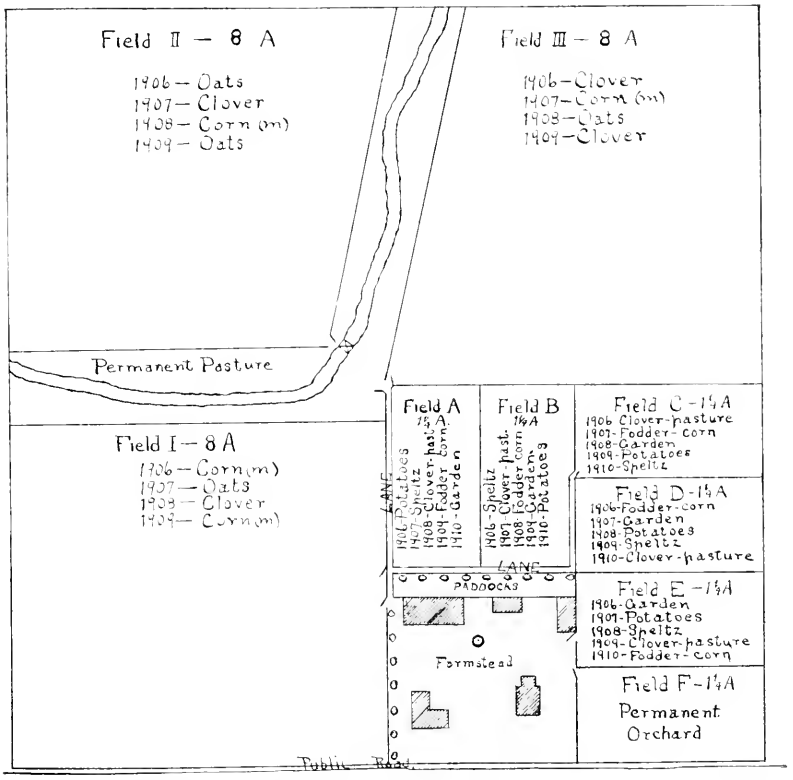


Fig. 28. Shows plan of a farm of 40 acres with major and a minor rotation suited to small farms.

A MEDIUM SIZED FARM.

Figure 29 represents a farm of 120 acres, arranged for a five year major rotation, a four year minor rotation, and a farmstead of about eight acres. The major rotation is made longer in this

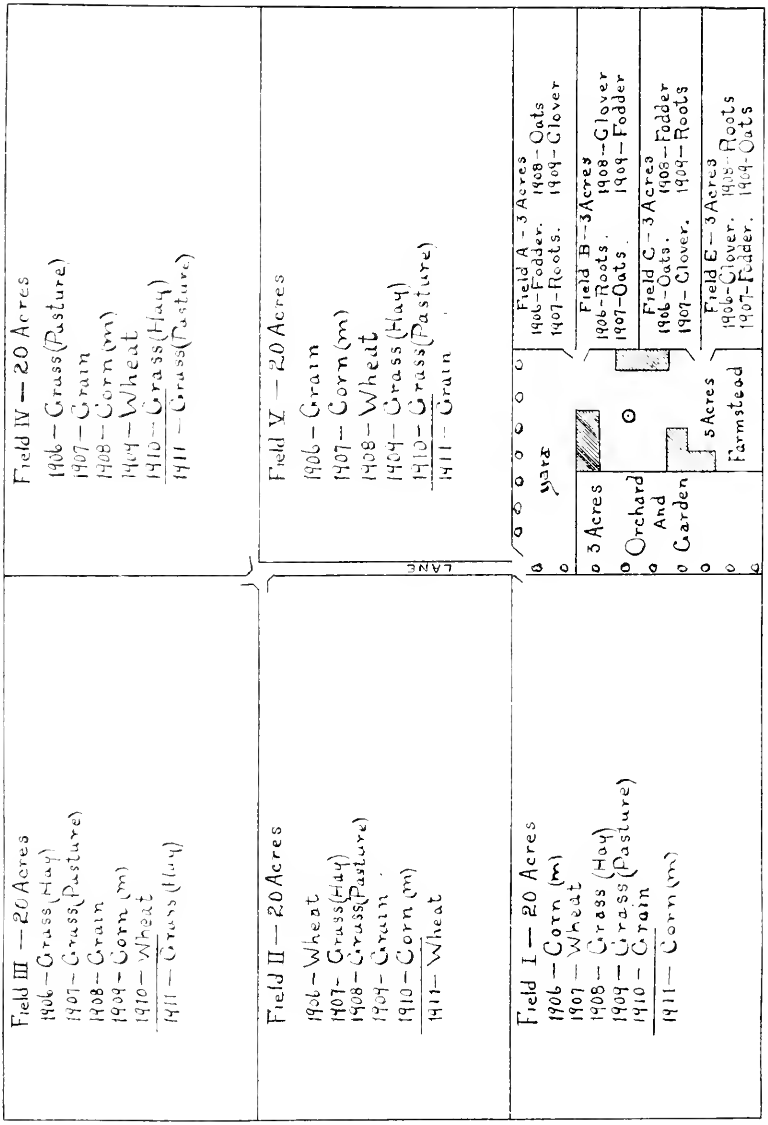


Fig. 29. Represents a 120 acre farm with a seven year major and a four year minor rotation.

case because the farm is larger. The farm will carry more stock than the 40-acre farm, and more stock requires more pasture in summer and more forage in winter. It is also supposed that grain raising is still profitable, and for this reason two fields are provided for grain. If two grain fields were not wanted the fields could be made larger and a four-year rotation made by dropping out one field of grain.

The five-year rotation provided in the figure, consists of corn, wheat, hay, pasture and oats or barley or other grain. These crops are all grown every year, but not upon the same fields. In this case the corn prepares the soil for wheat. Wheat is a good nurse crop for the hay. The grass seed should in this case be clover, six pounds, and timothy, eight pounds, mixed and planted with the wheat. The first year after the wheat the hay would be mostly clover, but the next year the pasture would be largely timothy. Clover usually dies out after the second year unless it is allowed to seed itself. After the hay is cut on field III, the stock could be turned into that field and the pasture in field IV plowed up for the grain which is to follow the next year. Field V could also be pastured after the grain had been removed. It should then be manured and plowed for the corn to be planted the next year. Plowing with this rotation would be required on but two fields each year. This would greatly lessen the work and be sufficient to keep most soils in a good, mellow condition.

The minor rotation calls for four fields and consists of fodder corn, roots, oats and clover. In this case the clover field is the only one plowed each year. The corn land is disced preparatory to planting the roots. The digging of the root crops prepares the land for the oats. Manure in this rotation is applied to the clover sod and plowed under for the corn.

AN OLD FARM REVISED.

Figure 30 represents two plans of the same farm, one (A) before any rotation was planned and (B) after a rotation has been planned and the fields arranged accordingly. The farm plan was revised by a student in the School of Agriculture, St.

Anthony Park, Minn. A comparison is not necessary, except to call attention to the great difference in the arrangement of fields, the irregularity in the size of the fields, and how in (A) wheat must follow on some parts of the farm year after year.

In planning this farm and working out a rotation, it is supposed that grain raising is to form a good share of the farm business for some years to come, but that the stock is to be increased so as to use on the farm a large part of the other crops grown.

The major rotation, Figure 30, begins with corn on field I, wheat on II, hay on III, pasture on VI, corn on VII, wheat on V, and any kind of grain, as flax, barley, oats or wheat on IV.* The following year the crops would be sown on the next fields in their respective order, e.g., wheat on I, hay on II, etc. It should be understood that arranging for grain in a rotation does not mean that any one grain must be planted, for all grains are sown in the same manner and have about the same general effect on the soil. Therefore, wheat could be sown on one-half of the field and barley on the other half without interfering with the rotation. With this rotation plowing is necessary only on three fields each year. This greatly reduces the labor and cost of production. Fields VI and II are plowed for the corn and field V is plowed for wheat. The other fields are disced and harrowed as occasion demands. Weeds will be very thoroughly cleared out with this rotation. What weed seeds develop in the grain fields will be eradicated when the corn, which follows, is cultivated, and what weeds gain headway in the hay and pasture fields will be killed in the corn fields that follow.

The minor rotation is planned for four fields and consists of fodder corn, grain, clover and roots. This rotation requires that two fields be plowed each year. The clover is pastured in the early spring and plowed for the potatoes and roots just before planting time, or it may be late fall plowed. Before planting fodder corn, the field is manured and plowed. This places the manure for the crop that uses it best and does not make the soil so rich as to cause the grain to lodge.

*This irregularity between the field numbers and the system followed in the rotation was necessary in order to put the rotation into practice as soon as possible.

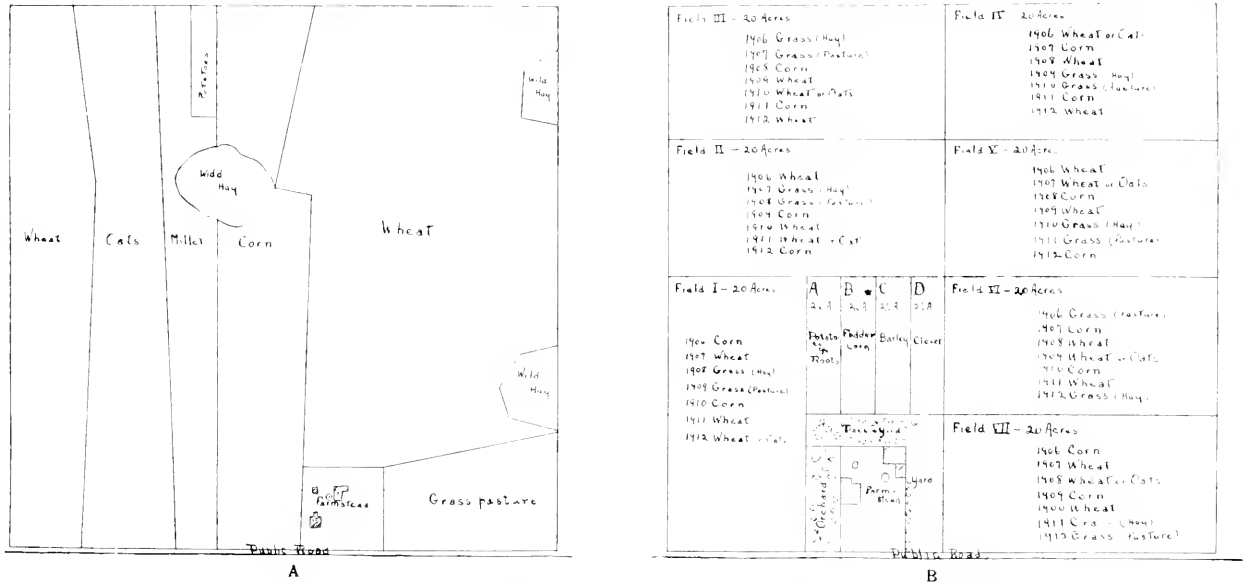


Fig. 30. Shows two plans of the same farm. The plan on the left, A, representing the average farm in western Minnesota. Note the irregularity and unevenness of the fields. The one on the right (B), shows how the fields are equally divided and a seven-year rotation planned. Note that the same crops grown on the seven fields in 1906 are grown on each field during the succeeding seven years. Compare Field I with the first crop in each field. Note also that as much wheat can be raised on the new plan as was grown on the old one.

SUGGESTIONS FOR PRACTICAL EXERCISES

TO THE TEACHER. To bring the subject before the pupils in a practical way and in such manner that a lasting impression will be given, the following exercises are suggested.

I. TO BE GIVEN IN CONNECTION WITH THE TEXT OF THE INTRODUCTION

1. Illustrate by means of 100 seeds what the difference is between the yields of the crops as indicated in the foreword. Thus: Give each pupil 100 kernels of wheat. Have them count out 32 and place them in a row. Then count out 13 more and place in a row just beneath the 32. Then count out 14 more and place beneath the second row. Now explain that each kernel stands for a bushel of wheat and the number in each row stands for the yields per acre of Great Britain, the United States, and Minnesota. When this is done, have the pupils count out 5 more and add to the Minnesota line, and explain that by saving the best seed each year 5 bushels per acre may be added, in from three to five years, to the yields of wheat in Minnesota on every farm.

2. Have pupils bring a few beans and a few kernels each of corn, wheat and oats. Let them hold one bean in the mouth for a few moments until the seed coat wrinkles. Then explain that the seed coat is a protection for the seed and holds the parts together. Now separate the halves of this same bean, thus showing the two cotyledons or primary leaves that are pushed to the surface when planted, also point out the minute plantlet at the end where the two halves are joined. With all this in mind, explain that the seed takes in water and the little plant uses the stored-up food while it is making roots and leaves

Cut lengthwise through kernels of corn, wheat and oats so as to show the germ in each. Also explain that the hull of the oat kernel is not a part of the seed but is the blossom of the oat

flower, which holds the seed and forms an extra protection. Have pupils separate the two hulls and take out the seed

3. Germinate a few seeds of wheat, peas, beans and corn in a box of moist sand. When up about two inches take a few plants of each kind and point out the difference between the seeds that have only one part and those that have two parts, also the way the little plants from these seeds send roots into the soil and leaves into the air.

4. Provide two boxes of sand and allow them to become thoroughly dry. In each box plant 10 seeds each of wheat and of corn that are taken from the same bin or ear. Water one box regularly but allow the other to remain dry. When the seeds have germinated in the moist box take some seeds from each box and point out that moisture is necessary for germination, as illustrated by the failure of the seeds in the dry box to germinate.

Illustrate by examining the seeds that have germinated, that the stored-up food is nearly all gone, that the little plantlet has grown and only the seed coat is left. Thus the stored-up food has been used to make the new growth.

5. To show that freezing, when there is much moisture in the seed, will kill it, allow some wheat, oats and corn to soak in a glass of water for about half a day. Then take the seeds out of the water and put them out of doors where they will freeze. After freezing place the seeds between two pieces of blotter or in sand for germination. Keep them moist and notice any failure to germinate.

6. Select from wheat 25 of the largest, heaviest, plumpest kernels, also 25 of the smallest, lightest, most shrunken kernels. Plant these in sand at opposite ends of a box and note the difference in vigor of growth and size of plants. Explain the difference on the basis of the amount of food material and the original stunted condition of the little plant in the seed. The plants from the good seed will sprout first and best, will be stronger, larger and a darker green.

7. Procure a quart measure and a small grocery scales or balance and have some of the pupils bring a quart or more of wheat,

oats and corn, also other grains if possible. Pour one of the grains into the quart measure until it is heaping full, then with a ruler resting firmly on the rim push off the grain, leaving the measure level full. Weigh the measure and grain, then deduct the weight of the measure. Multiply the net weight of the grain by 32, the number of quarts in a bushel. The result will be the weight per bushel of the grain. Do this several times, and if it weighs the same every time the test is accurate. If not, average the tests.

8. As far as practicable show the pupils the different grades of grain, not necessarily, the commercial grades, but grains of different quality, good and poor. Also in these samples point out the characters of the score cards, giving an idea of the relative score of each sample.

II. TO BE GIVEN IN CONNECTION WITH THE WHEAT TEST.

1. Procure mature wheat plants if possible. If not possible, pull up stubble and get straw. With these, show the pupils the different parts of the plant, as the joints or nodes, the internode, the leaves and sheath, the roots and the method of branching or stooling just below the ground.

2. Procure from the fields, the farmer or by mail, heads and grains of the different types of wheat and pin them on a pasteboard with their names. Call the attention of the pupils to the difference as shown by the samples and explained in the text.

3. Illustrate on the blackboard how the broadcast seeder scatters the grain at all depths while the drill puts it all in at an even depth. This can be done by drawing a line on the blackboard for the surface of the ground and making small dots with colored chalk at various depth to illustrate a broadcast seeder and at an even depth (about two inches below the ground line) to illustrate the drill. A sketch of the spouts and shoes of the drill would also help.

4. Have each pupil pick out by hand the largest, plumpest and best shaped kernels from a handful each of wheat, oats and corn. Then explain the value of the selected seed, upon the

bases of more stored-up food, a stronger germ, a larger germ, and a better chance for such seeds to withstand unfavorable conditions, according to lessons in the Introduction.

5. Get samples of high grade and low grade flour, bran and shorts, and display in bottles in similar fashion to the types of wheat. Explain that these are obtained by the miller and that the best flour is exclusively the white stored-up food; the bran is the seed coat; the low grade flour has some particles of very fine bran in it, and the shorts are largely the stored-up food of the seed near the seed coat together with some of the bran. To get these and other products from the wheat the miller grinds and regrinds, and sifts and bolts the wheat with a little better care each time.

III. TO BE GIVEN IN CONNECTION WITH THE OATS TEXT.

1. As in the case of wheat, procure mature plants of oats, point out the parts and compare the wheat, making an especial point of the method of tillering or branching to show that more than one stalk may come from one seed. Show the joints below the ground.

2. Secure the products of oats, as oatmeal, rolled oats, etc., also ground oats for stock food. Display these in bottles as indicated for wheat.

3. Procure as many types of oats as is possible and exhibit them on a board similar to the method described for wheat.

4. Have each pupil select the best seeds from a handful of the grain brought in by themselves. Call attention to the fact that tame oats have a beard similar to wild oats, that two seeds are sometimes found held together in one hull, but that one of the supposed seeds is generally only an empty hull. Point out the difference between the selection. Also point out the characters of the points brought out in the score card and give each pupil an idea of the relative score of his or her sample as selected. Pick out a handful of the very best oats you can find and use them to illustrate what *good* oats are like.

IV. TO BE GIVEN IN CONNECTION WITH THE CORN TEXT.

1 Get a corn plant and point out to the pupils the joints and space between the joints, the leaf and sheath, the tassels and the flowers in the tassel, the ear and shank, the roots and where they come from (the joints), the butt, tip and middle of the ear, and the rudimentary branches at each joint above ground, also at which joint the ear is produced.

2. Get as many types of ears representing the types of corn as possible and display them as suggested for the types of wheat and oats. Also call attention to the varieties or the types that are suited to Minnesota and to the locality.

3. Secure as many products (meal, hominy, corn and cob meal, etc.) of the corn as possible and explain from what parts of the seed they are made, and the uses of each.

4. Secure from the farmers several ears of corn which show points of the score card, and explain the good and bad points of each ear. For example: Mixed seed on an ear, bad tips and butts, large space between rows, large cobs and short, small kernels, a very tapering ear, etc.

5. Have the pupils shell at home five ears of good corn and bring a pint to school. From this have each one separate the longest, largest, best wedge-shaped kernels from the shortest, roundest and poorest kernels. Then call attention to the proportion of good kernels as compared with the poor, and explain that the rounded, poorly-shaped ones can not be planted by machines with the evenness that those of uniform wedge-shape can be planted.

6. Get a well shaped ear of corn and illustrate to the pupils by shelling off the tip and butt kernels that that is the way to save seed corn. Experiments have proved that the crop from the tip and butt seed is not so good as from the middle kernels of the ear. Plants from tip and butt kernels usually produce small, poorly filled ears.

V. TO ILLUSTRATE THE WAY CROPS ARE CHANGED FROM ONE FIELD TO ANOTHER IN CROP ROTATION

Sketch Fig. 31 on the blackboard and explain that each rectangle represents the same three fields on a certain farm. The rotation begins with corn in the top row. Oats and clover are

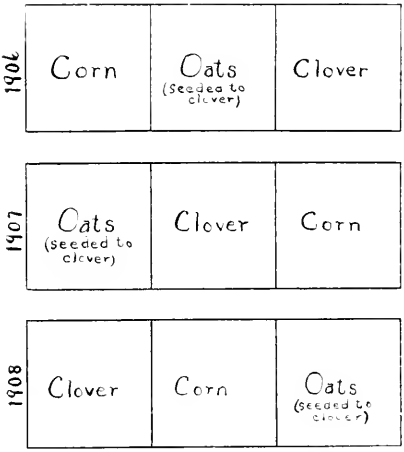


Fig. 31. Shows three plans of the same fields illustrating the method of changing the crops on the fields in rotating.

grown on the other two fields. Now drop to the middle rectangle, which represents the next year, (1907). Point out the fact that corn is replaced by oats, that the clover seeded in 1906 occupies the oats field of the year before and that the 1906 clover field is plowed up and corn planted. In a similar way explain the lower rectangle as representing the same fields the next year 1908. Make other illustrations and have the pupils try to work out a similar plan.

COOKING CONTEST

All exhibits must be made by contestant and after her own recipe. Winners of the first three prizes in each class in the county contest will be permitted to rebake to exhibit in state contest in same classes in which prizes were won in county contest.

Fig. 32. Cooking Class Minnesota School of Agriculture.

Prizes will be offered for best exhibits in the following classes: See appendix.

Class I White Bread.
Class II Graham Bread.
Class III Steamed Corn Bread.
Class IV Sponge cake.
Class V Chocolate cake.
Class VI Cocoanut cake.
Class VII Fruit cake.

COOKING

Each person entering the contest may use her or his own recipes.

Each exhibit must be accompanied by the recipe used, written in full, with directions showing how it was used.

WHITE AND GRAHAM BREAD.

Outline for making written report on bread:

1. Recipe.
2. Manner of making.
   a. Kind of yeast used.
   b. Was a sponge used in making?
   c. How long was dough risen before molding into loaves? How long risen the second time?
   d. What was temperature of dough when set to rise?
3. Was oven very hot when bread was put in to bake?
4. How long baked?
5. How cooled?
   a. Was it so placed that air might pass all about it, as when laid across the top of a pan, or was it placed directly on a flat surface, covered with a cloth or not covered?

CORN BREAD.

Outline for making written report on corn bread:

1. Recipe.
2. Manner of putting materials together.
3. How full were tins filled when put to steam?
4. Was water boiling when bread was put to cook?
5. How long steamed?

BUTTER CAKES.

Outline for making report:

1. Recipe.
2. Manner of making.
   a. Were the butter and sugar creamed?

b. How were the eggs added—were they beaten separately and folded in after liquid and flour were mixed, or were they added unbeaten, one at a time, to batter and thoroughly beaten with the dough after each portion of flour and liquid was incorporated?

Fig. 33. A Handy Kitchen table.

c. How were liquid and flour mixed?

d. When was baking powder added?

3. Tell whether heat of oven was medium or hot.

4. How long baked?

SPONGE CAKE.

Outline for making report:

1. Recipe.

2. Tell how eggs were used—whether beaten separately or together.
3. Tell when liquid was added.
4. Tell when and how flour was added.
5. If eggs were separated, when and how were whites added?
6. Heat of oven.
7. Length of time baked.

FRUIT CAKE.

Outline for making report:

1. Recipe.
2. Manner of making.
   a. How to cream butter and sugar.
   b. When and how were eggs added.
   c. When and how add flour and liquid.
   d. How prepare fruit, citron, etc., and when add.
   e. When add baking powder.
3. Tell whether steamed or baked.
4. If baked, heat of oven.
5. Times of baking or steaming.

SCORE CARD FOR WHITE BREAD.

1.	General appearance	5
2.	Proper baking (color and thickness of crust)	10
3.	Odor	10
4.	Flavor	30
5.	Grain and Texture	20
6.	Lightness	10
7.	Crumb	10
8.	Color	5
	TOTAL	100

GENERAL APPEARANCE.

The loaf should be well rounded over the top, not extending over the sides of the pan or flattened on top, evenly baked on all sides.

PROPER BAKING.

Proper baking is indicated by the color and thickness of the crust. The crust should be of a chestnut brown all over the loaf and about one-eighth of an inch in thickness. The center of the loaf must also be well done, not soggy.

ODOR.

A sweet and nutty odor indicates the highest degree of excellence in bread. Bread which has no perceptible odor or an unapetizing odor shows a stage progressing toward sourness, putyric and ropy fermentation, any one of which, when reached, gives unmistakable evidence of an inferior loaf.

FLAVOR.

The flavor or taste of bread depends upon the quality of the flour and yeast, as well as the temperature at which dough, or sponge and dough, is set and kept while rising, and length of time allowed to rise. The flavor should be sweet and nutty.

GRAIN AND TEXTURE.

Grain and texture depends largely upon the temperature and time of rising. The cut surface of the loaf should be evenly honey-combed, the holes should be small, the bread when pressed with the finger should seem elastic, there being no impression left when the finger is removed.

LIGHTNESS.

A light, well-risen loaf is, when baked, about twice the size of the dough when put in the pan to rise. An over-risen loaf is likely to be very porous and rather crumbly and dry.

CRUMB.

The crumb of bread should present a glossy, silky mass of unbroken cells. Dry and crumbly, or a dark and damp crumb indicates bread of inferior quality.

COLOR.

Color refers to the inside of the loaf, and may be of a creamy whiteness or a snowy white, depending on whether unbleached or bleached flour was used in making the bread.

SUGGESTIONS.

The size and kind of pan best suited to bread baking is four inches across the bottom, three and one-half inches high, and nine or more inches long. A loaf in a pan of this size and in an oven of proper temperature will bake in from fifty to sixty minutes. Single pans of this size are considered best because the loaf is thoroughly baked in the center as well as on the outside, and consequently keeps better and is more wholesome.

To attain best results in bread making, these points must be kept in mind: (1) Good yeast and plenty of it, good strong flour, and proper and even temperature through the entire time of rising. (2) Compressed yeast is considered best because of its strength, that is, it contains a large quantity of vigorous yeast plants which if given the right temperature, seventy-five degrees F.* with moisture and flour, grow rapidly and aid in the production of perfect bread. (3) It is a known fact that bread made by the quick process (that made and baked in five or six hours) has a greater food value and, to an educated taste, a better flavor, than that which is made by a long process. (4) If, for any reason, the compressed yeast is not used, the next best method is to use a home made yeast and a sponge, for example:

1 quart liquid (half water, half milk)
1 cup of fresh liquid yeast
4 level teaspoonfuls of salt and flour enough to make a stiff batter. (5) When set to rise the batter should be seventy-five degrees F.*

Place the vessel containing the sponge, where this temperature will be maintained, and at the end of three hours the sponge should be light; add flour enough to make a stiff dough, so that when kneaded into a loaf it will not stick to either the hands or the board. Let rise until double in size, which usually requires 1½ hours. Knead into loaves, let rise again one hour, or until double in size, and bake. Great care must be exercised not to allow the dough to become cooler than seventy-five degrees F.* and it is

*Fahrenheit.

of equal importance that it is not over heated as this injures the flavor as well as the appearance of the bread.

For baking bread the oven should be hot enough so there will be small specks of brown on the bread in ten minutes after placing it in the oven.

GRAHAM BREAD: Score card same as for white bread.

STEAMED CORN BREAD: Score card:

Lightness	35
Flavor	30
Texture	25
Moisture	10
TOTAL	100

Lightness—not heavy:—Should have risen to a little less than double original amount of batter.

Flavor: Should be that of well-cooked corn-meal—sweet and rich.

Texture: The pores or holes should be rather small and the bread should be elastic to the touch.

Moisture: The loaf should be moist but not doughy or soggy when crushed in the fingers; also, neither dry or crumbly.

Corn bread must be thoroughly cooked to bring out the best flavor of the corn and to render it wholesome. If steamed in cans or moulds five inches in diameter, 3½ hours should be allowed. The water should be boiling when the bread is put to cook, and not allowed to stop boiling until the 3½ hours have passed. A dry, tasteless steamed corn loaf is usually due to an excess of flour. The batter should be very thin as a given amount of corn meal will absorb an equal amount of water. A sticky, doughy steamed corn loaf is usually due to too little cooking.

Corn is an American grain, wholesome and appetizing when properly cooked, and should be more generally used than it now is.

SPONGE CAKE: Score card:

Lightness	30
Texture	25
Tenderness	15
Baking	20
General appearance	10
TOTAL	100

Lightness: Indicated by pressing the cake with the finger. If light the compression will disappear as soon as pressure is removed.

Texture: Texture is indicated by the holes in the cake; these should be rather small and of uniform size.

Tenderness: The cake, when broken, should be tender and should break short rather than pull apart.

Baking: Proper baking is indicated by a uniformity of color not burned or too light in color and not doughy or sticky. The crust should be rather thin.

General appearance: Evenly risen, not conical in shape on top. A cake should never burst open on side or top and should not be shrunken from pan.

Suggestions: In making sponge cake it is essential that the eggs be fresh, and be beaten until very light as it is upon the eggs that the lightness of the cake depends. Mix the flour with as little stirring as possible, and bake in a slow oven. If baked with too great heat the cake does not rise as it should and is likely to be tough. A sponge cake measuring nine or ten inches across the top and two and one-half to three inches thick should not bake less than thirty minutes and is better baked forty minutes.

CHOCOLATE CAKE: Score card:

Lightness	30
Texture	25
Moisture	5
Tenderness	10
Baking	20
General appearance	10
TOTAL	100

This cake should be a loaf cake and not frosted.

COCOANUT CAKE: Score card:

Same as for chocolate except that in place of general appearance in score card would be cocoanut filling.

FRUIT CAKE: Score card:

Lightness	35
Texture	10
Moisture	10
Baking	25
Flavor	10
General appearance	10
TOTAL	100

The Fruit cake should not be frosted.

In making cakes containing much butter, stir the butter with a fork or spoon until of a creamy consistency before adding any of the sugar; then add it a little at a time, stirring constantly and when all is added, stir the mixture until it is light and creamy. The liquid and the flour should be added alternately and thoroughly mixed each time before adding more. This stirring and beating makes the cake lighter by adding air. If the eggs are to be beaten separately and then put in the cake the yolks are as well added with the flour and liquid but the stiffly beaten whites should be carefully folded in at the very last. This method of putting in the eggs gives a lighter, dryer, more feathery cake than does adding the eggs whole, one at a time, to the cake mixture while adding the liquid and flour. A cake made by the last method has a finer grain, is more moist and more tender than when made by the first method. The oven may be somewhat hotter for a butter cake than for a sponge cake. An excess of flour renders a cake dry and bready. When baking powder is used in cake-making, it should be added with the last of the flour.

Heat of oven for sponge cake: Test by placing a piece of white paper in the oven and allowing it to remain five minutes, when it should be a light yellow color.

Heat of oven for butter cake: Place white paper in oven same as for sponge cake. In five minutes it should be a dark yellow.

Heat of oven for fruit cake: Heat between that of sponge cake and butter cake.

Heat of oven for bread: A loaf of bread should show specks slightly browned over the surface after having been in the oven ten minutes.

For bulletins on Domestic Science see appendix.

SEWING CONTEST

Prizes are offered for the best exhibits in sewing in the following classes: See appendix for prizes.

Class I Plain Work Apron
Class II Fancy Apron
Class III Over-hand Patch
Class IV Stockinet Darning
Class V Dressed Doll

PLAIN WORK APRON. Use any suitable colored material, as gingham. The checked gingham is easiest to work on as the checks act as a guide for turning hems, etc.

In making the work apron, two widths of material of the desired length should be taken, allowing three inches for a hem. One width must be gored a very little for the front. The other width should be cut in two and sewed to each side of the gored width. In sewing, take a back-stitch with every needleful. After it is sewed, overcast each seam.

The band for the apron should be 2½ inches wide. Gather the apron across the top and pull gathers in place. Find the center of the apron and the center of the band and sew the gathers on by placing each gather. Hem the other side of the band over onto the wrong side of the apron.

FANCY APRON. Make of fine white material. Batiste and Persian Lawn are always pretty. Use rolled hems, instead of the common hems, and hemstitching as much as possible for trimming.

This apron should be made in a length to come just below the knees, allowing for a three inch hem. Make a rolled hem on each side. Then turn your hem three inches, draw six threads for hemstitching and make a hemstitch hem.

In making the band for the apron, make it long enough to go around the waist, making ties three-fourths of a yard long and three and one half inches wide. Make rolled hems on the sides

and a hemstitch hem an inch wide at the end. Make fine gathering stitches pulling each gather in place. Find the center of the apron and the center of the band and sew on by using a backstitch, hemming the other side of the band over onto the wrong side.

OVERHAND PATCH. Use some checked or figured material and exactly match the figures or checks. Cut the patch one-half inch larger than the hole, which should be square or oblong. Cut the corners of the hole diagonally one-eighth of an inch. Crease one edge of the patch and the side of the hole where it is to be joined. Place the right sides together, having the folded edges even and the checks exactly matched. Baste, and overhand that side of the patch. Remove the basting, crease, and overhand the remaining sides in the same way. Overcast both sides of the seam and also around the edge of the model.

STOCKINET DARNING. Take a stocking with a hole in it, about ¾ inch in diameter and darn it as follows: Baste the part of the stocking which contains the hole on a piece of cardboard to prevent its being stretched or drawn out of shape, and remove all worn threads. Run a thread around the hole about one-fourth inch from the edge. Form the warp threads, which should be very close together, by bringing the darning cotton up through the loop stitch at one edge and down through the stitch on the opposite edge. All of these stitches should be taken up so that they will not ravel back after the darn is completed, and so that there will be no roughness on the right side of the stocking. A small loop of the darning cotton should be left at each end to allow for shrinkage in washing. When the warp threads are all in, begin at the lower right hand side of the hole to fill in the woof threads taking up the alternate threads of the warp. In the next row only those threads missed in the preceding row are taken up. The woof threads should be put in as close together as possible. Continue in this same manner until the hole is filled. Both the warp and the woof threads should be carried at least one-quarter

of an inch beyond the hole in the stocking, so that the darning may be firm and not pull away from the worn edges.

DRESSED DOLL. Four garments are to be made for the doll: Chemise, drawers, skirt, and dress. They may be made of any material desired. In dressing the doll, use good materials because your stitches will look much better than on poor material. In all sewing, use fine thread and fine needles. The doll should be not less than fifteen inches long. In making undergarments, it shows good taste to use hemstitch and a fine lace edging. In making the dress, make it plain and beautiful. In judging the work, the stitches will count as one of the strongest points.

No garments should be starched because it spoils the looks of the stitches, neither should they be washed if it is possible to avoid doing so. Stitches are never so pretty after the garment is washed.

There have been no bulletins published on sewing but there are several books available, a list of which may be obtained by writing to Mr. R. S. Beardsley, 300 Wabash Ave, Chicago

FRUIT CONTEST

APPLE CONTEST. Exhibits must have been grown on home farm of contestant, and selected by him.

moths.

A plate of apples shall consist of four specimens.

A plate of crabs shall consist of eight specimens.

Exhibits will be judged by size, condition, color, uniformity and neatness and taste in arrangement.

Liberal prizes will be offered in the following classes: See page

Class I Best plate of Hibernal.
Class II Best plate of Wealthy.
Class III Best plate of Northwestern Greening.
Class IV Best plate of any variety.
Class V Best plate of Seedling apple.
Class VI Best collection of winter apples.
Class VII Best plate of crabs.

APPLES

Minnesota produces each year about 500,000 bushels of apples. Not all of these by any means go to market; a large portion of them are used, as they should be, by the farmer and his family. A good many are raised in southern Minnesota for market. These are mostly Duchess, Wealthy and Northwestern Greening, and also a few kinds of crabs. Apple growing in Minnesota has been attempted from the first settlement of the state. The early settlers were largely from apple growing districts and tried to use the same varieties and methods of culture here that they had used at their homes, with the result that few trees lived to produce fruit.

Apples of the hardy kinds, such as Duchess, and Hibernal are easy to grow and bear fruit quite soon if they are given about the same care as is given corn.

About twenty-five years ago many Russian apples were brought over here and from among these and seedlings that some of the pioneers grew, have come the varieties we see at the fairs and county exhibitions each year.

The apple is a native of northern Europe and Asia. Its botanical name is Pyrus malus.* The crab apples have descended from the wild Pyrus baccata of Siberia. These two kinds often become mixed when grown near each other and some of our apples show the characters of both. The native crab, familiar to many for the beauty of its flowers in spring and the hard, green and bitter fruit in fall, is not adapted to cultivation because it blights badly, even when wild, and would spread the disease in an orchard.

CRAB APPLES: In England the term "crab" is applied to small apples. In America we mean by the term "crab" Pyrus baccata or its hybrids. It is characterized by smoother and more wiry growth than the apple. It has nar-

*Pyrus Malus is the scientific name for a kind of an apple. The Pyrus is the genus or large group to which all apples belong. The malus is a smaller group (the species) of a particular class of apples.

rower and thinner, longer-stemmed leaves, which are not very woolly. The seed is enclosed in very hard, close-fitting hulls and the calyx falls off when the fruit is ripe.

APPLE: The leaves of the true apple are woolly on the underside and have a woolly calyx and flower stem. The fruit is of various shapes and sizes but always holds the calyx, i.e., the parts of the flower, on the end of the fruit. The leaves are also thicker and broader than those of the crab.

SEEDLINGS: The apple does not come true from seed. That is, you might plant the seeds of a nice red Wealthy and get just as many different kinds of apples as there were seeds. Some might be like the Wealthy and some perhaps would look nothing like it. This is the way, though, that new varieties are originated. One of the seeds planted might produce a tree that would bear fruit better in many ways than the one from which the seed came.

GRAFTING: Since apples do not come true from seed like carrots and onions, desirable kinds must be propagated by taking a piece of one tree and attaching it to another or to a small seedling root, in such a way and at such a time that it may grow and produce a tree like the original one That is how we have thousands of trees of one variety offered for sale. They have not grown from seed but have been budded or grafted onto roots of seedling apple trees. The work of grafting is done in the winter from January to March. Budding is done in August.

BUDDING: By budding is meant the taking of one bud from a tree and placing it in the bark of another tree and then as it grows the other parts of the tree or seedling are cut away, leaving the tree or branch produced from the bud. There is not space in this bulletin to go into detail about the culture, planting, grafting, etc., of apples and plums but these things may be found in detail in some of the books and bulletins mentioned at the end of this article.

APPLE BLIGHT: Not many insects or diseases trouble the apple in Minnesota. Sometimes in July or June the leaves in the top of the trees or on the new growth turn brown as though they had been burned. This is what is meant by "fire blight." It is caused by the growth of disease germs in the wood of the branch. If the tree is badly affected it is best to cut out the tree as the disease will spread. If there is not much of it present, cut out and burn the twigs affected, at once. Some varieties are more likely to blight than are others.

SCAB: Sometimes we see rough blotches on the skin of apples. This is due to a disease called scab. It may be prevented by using Bordeaux mixture, much diluted, in the spring.

CODLING MOTH: This insect is the cause of the wormy apples we see in the fall and winter. In the spring, just as the blossom falls, the moth lays eggs in the calyx of the apple. When the eggs hatch the larvae or worm, eats into the apple, where it stays until time for it to change to a moth; it then eats its way out, spins a cocoon on the side of the barrel or box in which the apple is stored, lives in this until it becomes a moth. Picking up of the fallen fruit and destroying it helps to keep the moth in check. Hogs will eat the early fallen fruit that is of no value, and thus destroy the codling moths.

EXHIBITION: A plate of apples usually consists of four specimens; one of crabs of eight specimens. In selecting these the very best colored, nicest-looking fruits should be carefully picked, taking pains to leave all of the apple stem on each specimen. If there is any "bloom" on the fruit, be careful not to rub this off.

The fruits should each be wrapped in clean dry paper, (tissue or soft newspaper,) and placed in a box or basket in such a way as not to allow any bruising of the skin, either before or during transit. Some varieties as Longfield, show the effect of a slight bruise very quickly.

For further information see list of publication page

VEGETABLE CONTEST

VEGETABLE CONTEST. Contestants should select a good, rich, well drained piece of ground, plant and cultivate the crop themselves, then select the very best specimens for their exhibit. Exhibits will be judged: 1st, on general appearance; 2nd, market condition; 3rd, uniformity. Liberal prizes will be offered in the following classes:—See pag

Class I Potatoes, best early (1 peck.)
Class II Potatoes, best late (1 peck.)
Class III Onions, Yellow Globe, best ½ peck.
Class IV Onions, Red Globe, best ½ peck.
Class V Carrots for table use (6 specimens.)
Class VI Carrots for stock (6 specimens.)

POTATOES

Potato growing in Minnesota is an important industry. From 16,000,000 to 20,000,000 bushels are grown annually, of which from one-third to one-half are shipped out of the state. They are shipped east and south, where they are used for food and also for seed.

STARCH IS MADE FROM POTATOES: Some years more potatoes are raised than can be readily sold and then the price is likely to be low. If they are not worth more than twenty cents a bushel they may be profitably made into starch. This industry helps to keep up the price of potatoes, as the grower knows he can always have some sort of market for his crop.

PROPAGATION: Potatoes are grown usually by cutting up the tuber or potato, leaving one or two eyes to the piece, and planting these pieces. The tuber might be likened to a branch of a tree (except that it grows underground) and the "eyes" to the buds found on the branch.

POTATO SEED: True potato seed is found in a little ball on the top of the vine. These may be found in most any potato field, after the plants are through blooming. If the seed from these balls is saved and planted early in the spring, potato plants will grow and form small tubers. If these tubers are saved in the fall and planted the next year, full-sized potatoes will result. This is the way new varieties of potatoes have been obtained. As many varieties as there are seeds in the ball may result, none however, may be any better than those we already know. There is always a chance of something better, and that is why so many people plant the seed from the seed balls.

POTATO BLIGHT: This is a disease caused by bacteria, that affects the potato vines causing them to turn brown and dry up. It frequently destroys entire fields. In 1845-46 this disease destroyed the potato crops of Europe and

America. A man in New York State named Rev. Chauncey Goodrich, thought that if some of the wild potatoes growing in the mountains of Chili in South America (where the ancestors of our potato were first found) were brought here and planted and mixed with the kinds that blighted, perhaps a new variety which did not blight so badly might be originated. He did this and from some of the seedlings he raised has come the potatoes we know. He did not entirely prevent the attacks of blight. We therefore, have to use Bordeaux mixture sometimes to prevent it injuring the potato vines and thus sometimes causing potato rot, because the plant is weakened by the blight. If the spraying for blight is to be effective it should begin before the blight has any foothold, say when the vines are about six inches high, and be repeated every two weeks the rest of the season. Paris green put in the Bordeaux mixture will at the same time destroy many potato bugs.

LAND: Potatoes do best on a rather light, sandy and warm soil, especially if they are wanted for early use. Grown on sandy land they are usually cleaner and smoother than when grown on heavy land. In selecting the tubers for planting, size, shape and appearance should be taken into consideration for what you plant—that you are very likely to harvest, and we always want to harvest the best.

POTATO SCAB: Sometimes we have scabby potatoes in a bin with other good ones. Those which are scabby are likely to spread the disease to the others and so all potatoes planted should be treated by soaking them in a solution of corrosive sublimate or formalin before planting. They should be thoroughly cultivated during the summer until they are too large to work among.

SELECTION FOR PLANTING: The yield of marketable potatoes may be increased by proper selection. In the fall when digging potatoes, save for seed the hills which have the largest number of tubers, of the kind

you desire. Continue doing this for several years and you will notice a marked improvement in your potato crop.

EXHIBITION: Select one peck of smooth, sound, medium-sized, uniform, shallow-eyed and nice looking potatoes; clean them thoroughly, being careful not to bruise the skin. Place in a neatly made box or basket and carry carefully to the place in which they are to be exhibited.

ONIONS

The onion is a native of South Western Asia and through long continued selection and cultivation has developed into large bulbs, sometimes producing as high as 800 or 1,000 bushels per acre. It is a biennial (requires two years to produce seed) or sometimes a perennial. It belongs to the same family of plants as the lilies. It has no true stem, but a stem is represented by the base of the bulb. Sometimes instead of producing flowers a long stalk with a head of small bulbs is produced.

Onion seeds are black, angular and flattish. Some kinds also produce cloves or small bulbs as well as seeds. These are the perennial kinds. The potato onion never seeds but is propagated by division of its bulbs. Onions vary in shape, size and color. The red and yellow globe onions probably find the readiest sale

ONION SETS: Onion sets are small onions planted in the spring instead of seeds. They are grown by sowing onion seed very thick in the row the latter part of May These onions do not have a chance to grow large and in the fall are pulled and stored the same as other onions. When set out the next spring they grow rapidly thus furnishing onions earlier than they can be grown from seed.

TRANSPLANTING ONIONS: Sometimes onions are sown in hotbeds or the greenhouse early in the spring and then transplanted to the open ground as soon as it is in condition. These come to edible size very quickly. Tender kinds are sometimes grown this way to advantage.

SOIL FOR ONIONS: Any good corn land is good for onions. Some hoed crop should precede onions as this will leave the land clean of weeds and it is difficult to grow onions on weedy land.

SOWING THE SEED: Onion seed may be sown as early as the land can be worked and in rows about fifteen inches apart and covered one inch deep. Ninety per cent. of good onion seed should germinate if conditions are favorable. Thorough cultivation should be given as long as possible, to keep the soil mellow and no weeds should be allowed to grow. Some onion seed is grown in Minnesota but most of it comes from Europe or California.

"SCALLIONS": Scallions are onions, the tops of which, on account of poor seed, do not drop onto the ground as is the case when onions ripen properly. The tops may be pushed over and thus helped to ripen, but such onions are usually poor keepers.

STORING ONIONS: Onions may be stored in a cool dry place where there is a good circulation of air. They may also be frozen and kept frozen over winter. This causes them to become soft and they must be used soon to be of any value.

EXHIBITION: Take one half peck of medium-sized onions for the variety, having good color and shape, and perfectly sound. Remove all roots, tops and rough or unsightly skin, and pack carefully.

CARROT

The carrot is a native of Europe: it is a biennial, that is, the seed is planted one year and in the fall the root is taken up and stored. The next spring the root is planted out and from this comes a flower stock which produces seeds.

Carrots have red, white, and yellow flesh and are grown both for table use and for stock food.

Some kinds, such as Oxheart or Danvers are intended only for table use while others such as Mastodon grow much larger and coarser. They are not so good to eat and are called stock carrots. Seedsmen sell varieties recommended for table use and other varieties for stock food.

Wild carrots do not have much root and they are of no value. The plant itself is a bad weed. Under cultivation, however, it has developed a large root which is used for food. From ten to thirty tons of carrots may be grown per acre.

FORCING: Carrots are sometimes grown in greenhouses but there is not much demand for them as the roots are so easily stored over winter.

CARROT SEED: To raise carrot seed set out the roots in the spring in rows two feet apart and gather the seed as it ripens. All will not ripen at once.

EXHIBITION: Bulk is wanted for stock while quality is the aim for table use. So from the stock varieties select the largest, best-looking, and most uniform half dozen specimens. Clean well and pack carefully for carrying to the place of exhibition.

TABLE CARROTS: For exhibition as table carrots select from any of those you have grown and are usually sold as table carrots, six specimens of medium size for the variety, uniform in appearance, in good market condition, and of good quality. Clean thoroughly and pack neatly and carefully.

NOTE.—The Division of Agriculture of the Agricultural Department of the University of Minnesota will be glad to assist the teachers and others in any way possible in securing material and furnishing data needed in executing the work as designed in the foregoing pages.

For further information regarding the working plans, prizes, meetings, etc., address The Farmers Club, St. Anthony Park, Minn.

APPENDIX

INDUSTRIAL CONTEST FOR MINNESOTA BOYS AND GIRLS.

Plan of Contest. The plan of the state contest is to encourage the taking up of the work in the counties, and to offer additional inducement to the winners of prizes, in the county contest, by giving them a chance to compete in the state contest.

The plan of the county contest is very similar to that followed in many of the counties before the state contest was started; that is the contest is under the supervision of the county superintendent of schools. Where the County Farmers' Clubs are organized the members will co-operate with the county superintendent in every possible way to help make the contest a success.

Who May Compete. Any boy or girl in Minnesota, under eighteen years of age, or any public school student, is eligible to enter this contest. All that is necessary to enter the contest is to send your name to the county superintendent of your county and state in which of the classes described in this bulletin you wish to compete.

Place and Time of Contests. Where desired the county contests may be held in connection with the County Fair. Arrangements should be made to have a special session for the boys and girls where the judges of the exhibits may explain the reasons for their decision and give a general talk on the subject of the contests. Where a county fair is not held other arrangements for the exhibits will be made by those in charge in that county. The county contests should all be held before the first of December if possible.

It is planned to hold the state contest at St. Paul, December 19-20-21. The first day will be given to placing the exhibits and visiting the state capitol. The second day will be spent at the School of Agriculture where instruction will be given in Agriculture, Horticulture, Domestic Science, and Domestic Art. It is hoped that each county superintendent will head a delegation of teachers and students from his or her county and that the school boards throughout the state will allow teachers who go with pupils to the state meeting to close their schools on the 19th and 20th of December.

Written Report. Each contestant in any of the classes must present with his exhibit a **written report** describing in full the methods by which he grew and selected or made his exhibit.

Prizes. County. The county superintendent or members of the Farmers' Club, or both, will solicit from the business men and other citizens of each county reasonable prizes for the various exhibits made. This will insure substantial prizes for several of the best exhibits in each class.

PREMIUM LIST FOR STATE CONTEST.

The State Contest is open to the winners of the first, second and third prizes in each class in the County Contest. In case there is no county contest the contestants are requested to send their samples just the same. They will be judged at the state contest and the three highest will be allowed to compete for the state prizes.

PRIZES—WHEAT, CORN, AND OATS.

The grain and milling interests represented in the Minneapolis Chamber of Commerce appropriated $1,000.00, a year for three years for prizes on Wheat, Oats and Corn to be distributed as follows:—

	Wheat, $333.33;	Oats, $333.33;	Corn, $333.33.
First premium	$50.00	$50.00	$50.00
Second premium	$40.00	$40.00	$40.00
Third premium	$30.00	$30.00	$30.00
Fourth premium	$25.00	$25.00	$25.00
Fifth premium	$20.00	$20.00	$20.00
Sixth premium	$10.00	$10.00	$10.00

The next 31 best in each class will receive $5.00 each.
The 38th in order in each class will receive $3.33.
This makes a total of 114 cash prizes.

PRIZES—COOKING CONTEST.

The Business League of St. Paul appropriated $100.00 cash for prizes in the Cooking Contest to be distributed as follows:

	1st	2nd	3rd	
White bread	$5.00	$3.00	$2.00	Next 12—$1.00 each
Graham bread	3.00	2.00		Next 8— 1.00 each
Steamed Corn bread	3.00	2.00		Next 8— 1.00 each
Sponge Cake	3.00	2.00		Next 8— 1.00 each
Chocolate Cake	3.00	2.00		Next 8— 1.00 each
Cocoanut Cake	3.00	2.00		Next 8— 1.00 each
Fruit Cake	3.00	2.00		Next 8— 1.00 each

This makes a total of 75 Cash prizes.

PRIZES—SEWING CONTEST.

The Business League of St. Paul appropriated $100.00 cash for prizes in the Sewing Contest to be distributed as follows.

Plain Work Apron	$5.00	$3.00	$2.00	Next 10—$1.00 each
Fancy Apron	5.00	3.00	2.00	Next 10— 1.00 each
Over Hand Patch	5.00	3.00	2.00	Next 10— 1.00 each
Stockinet Darning	5.00	3.00	2.00	Next 10— 1.00 each
Dressed Doll	5.00	3.00	2.00	Next 10— 1.00 each

This makes a total of 65 cash prizes.

PRIZES—VEGETABLE CONTEST.

Northrop King & Co., Seedsmen, of Minneapolis have contributed $50.00 cash for prizes in the vegetable contest. Their illustrated catalogue of new & valuable varieties of seeds, plants, etc., will be mailed free on application. Much information as to methods of culture of the various garden and field crops is contained in their catalog.

L. L. May & Co., Seedsmen, of St. Paul donated $50.00 in cash for prizes in the vegetable contest. Their catalog embracing thousands of illustrations of new varieties of Seeds, Plants, Trees, etc., will be ready for distribution Jan. 1st, 1908. It contains also much

information as to cultivation, preparation of soil, etc., which will be of value to amateurs. It is mailed free on application.

The hundred dollars thus appropriated will be distributed as follows:

Potatoes (Early)	$5.00	$3.00	$2.00	Next 10—$1.00 each
Potatoes (Late)	5.00	3.00	2.00	Next 10— 1.00 each
Onions (Yellow)	3.00	2.00		Next 10— 1.00 each
Onions (Red)	3.00	2.00		Next 10— 1.00 each
Carrots (Table)	3.00	2.00		Next 10— 1.00 each
Carrots (Stock)	3.00	2.00		Next 10— 1.00 each

PRIZES.— APPLE CONTEST.

The Prizes for apples are offered by the Minnesota State Horticultural Society. Any one may become a member by sending $1.00 to the secretary, A. W. Latham 207 Kasota Bldg., Minneapolis. A list of hardy fruits will be sent free on application. The society offers $100.00 in prizes for the best exhibits of apples as follows:

Pattens Greening	$3.00	$2.00	$1.00
Wealthy	3.00	2.00	1.00
Northwestern Greening	3.00	2.00	1.00

Seedling apples 1st—$6; 2d—$5; 3rd—$4; 4th—$3; 5th—$2; & 6th—$1.
Collection Apples (Named varieties)
1st,—$5; 2nd—$3; Next 8,—$2.00 each.
Crabs 1st ten best $1.00 each.
This makes 62 Cash prizes.

BULLETIN AND BOOK LIST.

The following is a list of bulletins and books which pursue the subjects discussed in this bulletin more in detail. The bulletins mentioned are free to those who ask for them.

The Farmers' Bulletins may be obtained by writing to the Secretary of Agriculture, Washington, D. C., and stating the number and title of those wanted.

Farmers Bulletin List.

No. 34, Meats—Composition and Cooking.
No. 35, Potato Culture.
No. 39, Onion Culture.
No. 54, Some Common Birds and Their Relation to Agriculture.
No. 85, Fish as food.
No. 91, Potato Diseases and Their Treatment.
No. 111, The Farmer's Interest in Good Roads.
No. 112, Bread and Principles in Bread Making.
No. 113, The Apple and How to Grow It.
No. 134, Tree Planting on Rural School grounds.
No. 145, Carbon-bisulphid as an Insecticide.
No. 146, Insecticides and Fungicides.
No. 148, Celery culture.
No. 154, The Home Fruit Garden.
No. 156, The Home Vineyard.
No. 157, Propagation of Plants.
No. 161, Suggestions to Fruit Growers.
No. 171, Control of The Coddling Moth.
No. 176, Cranberry Culture.
No. 181, Pruning.
No. 182, Poultry as Food.

No. 183, Meat on The Farm.
No. 195, Annual Flowering Plants.
No. 198, Strawberries.
No. 199, Corn Growing.
No. 203, Canned Fruits, Preserves and Jellies.
No. 213, Raspberries.
No. 218, The School Garden.
No. 220 Tomatoes.
No. 229, The Production of Good Seed Corn.
No. 247, The Control of the Codling Moth and Apple Scab.
No. 248, The Lawn.
No. 250, The Prevention of Stinking Smut of Wheat and Loose Smut of Oats.
No. 253, The Germination of Seed Corn.
No. 254, Cucumbers.
No. 255, The Home Vegetable Garden.
No. 256, Preparation of Vegetables for Table Use.
No. 101, Studies in Bread and Bread Making. Price 10c.

Bureau of Entomology Circulars.

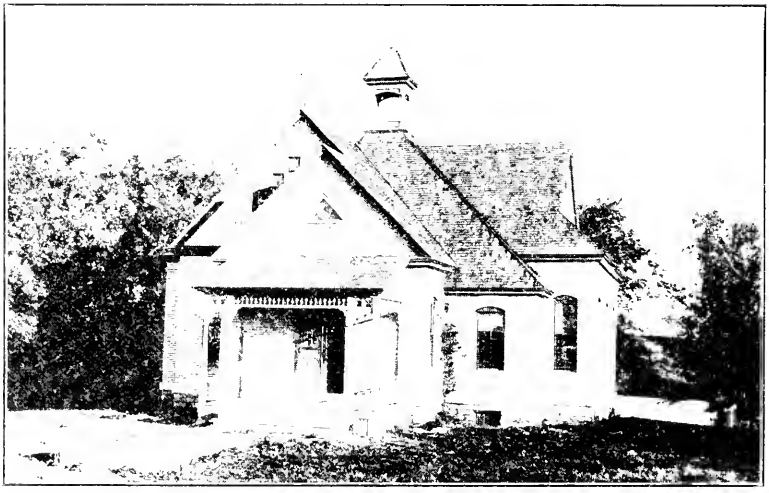
No. 60, The Imported Cabbage Worm.
No. 62, The Cabbage Worm.

The following Minnesota bulletins may be obtained free of charge by writing to the Minnesota Experiment Station, St. Anthony Park, and giving number of bulletin desired.

No. 24, Seed Grain (Press Bul.)
No. 38, Garden & Tillage Implements.
No. 74, Human Food Investigations
No 83, Apples and Apple Growing.
No 87, Potatoes.
No. 96, Ornamental Trees, Shrubs, and Herbaceous Plants.
No. 15, Corn Breeding (Press Bul.)
No. 95, Common Weeds and Their Eradication.

Book List.—

Vegetable gardening by Prof. S. B. Green	$1.00
Amateur Fruit Growing by Prof. S. B Green.	.50
Model Sewing and Garment making by Mrs. Margaret J. Blair.	1.00
Household Science by Juinata L. Shepperd.	1.75
Cereals in America by Prof. Thomas F. Hunt.	1.75
The Book of Corn, by Specialists	1.50
Soils & Crops of the Farm by Morrow & Hunt.	1.00



An up to date district school. This School building is being enlarged to accommodate pupils on the Consolidated plan.