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## 4-H Winter Wheat Production and Marketing Club Manual : Extension Circular 1-41-2

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August 1955

E.C. 1-41-2

**4 H Winter Wheat Production**  
**and**  
**Marketing Club Manual**

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## 4-H WINTER WHEAT PRODUCTION AND MARKETING CLUB MANUAL

Extension  
Circular  
1-41-2

### I. GENERAL INFORMATION

#### A. Purpose of the Club

The purpose of the 4-H winter wheat project is to help club members learn the best methods and practices in winter wheat production.

This club offers its members practical experience in preparing the seedbed, choosing the best variety, planting, harvesting, storing and marketing the crop. It also offers a good opportunity for profit. Except on irrigated land or fertile bottoms in eastern Nebraska, the income from winter wheat is better than that from any other crop grown in the state.

Although each winter wheat production project will be similar, it is expected that members will enroll each year for several years in order to become more familiar with the many phases of wheat production. Members may choose either (1) a commercial grain production project or (2) a certified seed production project. Beginners will usually prefer the commercial grain production project. Those with previous experience should enroll for at least one year of certified seed production.

#### B. Importance of the Wheat Crop in Nebraska

Winter wheat ranks second to corn among Nebraska crops,  $3\frac{1}{2}$  to 4 million acres being grown each year. Nebraska wheat is used for manufacturing bread flour, and is known throughout the United States for its excellent milling and baking quality. Nebraska ranks third among the states in the production of hard red winter wheat.

#### C. Working Out the Project Agreement

Each club member should work out a definite agreement with his parents regarding the number of acres of wheat he will plant, where the land will be located on the farm, and how the crop will be handled from the seedbed preparation to sale of the grain. He should work out arrangements for the machinery and power he will need and have a clear-cut agreement regarding the crop share he is to give or the cash rent he will pay for use of the land. Plans for financing such items as seed, fertilizer, and weed spraying should be considered.

If these arrangements are made at the beginning of the season, there will be no doubt later on how the project is to be handled. Parents and club members should make every effort to carry out the project in a business-like manner.

### II. WINTER WHEAT PRODUCTION CLUB REQUIREMENTS

The club member may enroll for either (1) the production of commercial grain for the market or (2) for the production of certified wheat for seed. The requirements for the two projects are somewhat different.



## A. Commercial Grain Project

1. If the crop is to be sold as market grain, plant, care for, and harvest at least three acres of winter wheat. Use a variety recommended for your locality--preferably certified seed. Certification of the crop is not required for a commercial grain project.
2. Keep a complete record of all items of expense incurred in growing, harvesting, and marketing the crop. This includes a record of the number of hours used in doing each job. On page 31 you will find a table showing usual machinery, labor, and power costs which you may use in estimating costs if you do not have actual figures.

Form 1-11-2, Project Instructions and Record Book--4-H Small Grain Project is supplied to each member for these purposes.

3. Decide on the disposal of the grain. In the commercial grain project the member must decide whether his wheat is to be sold outright, stored for future sale, or "sealed" under a loan arrangement with the Commodity Credit Corporation. Whether the wheat is sold, stored, or "sealed," take a sample to the elevator and get the test weight, moisture content, and current price of the grain. Put this information in the record book.
4. Turn in the completed record of the project to the club leader before the end of the 4-H club year.

## B. Certified Seed Project

1. If the crop is to be grown for seed, plant, care for, and harvest at least one acre of winter wheat. Use certified seed of a recommended variety. Attach certification tag or other evidence of certification to the project record book.
2. Keep a complete record of all expense items incurred in growing, harvesting, and marketing the crop. This includes a record of the number of hours used in doing each job. On page 31 you will find a table showing usual machinery, labor, and power costs which may be used in estimating costs if you do not have actual figures.

Form 1-11-2, Project Instructions and Record Book--4-H Small Grain Project, is supplied to each member for these purposes.

3. Take the steps necessary for completing official certification of the crop:
  - (a) Check the field for land requirements and field standards. This information can be obtained from the County Extension Office or the Nebraska Crop Improvement Association.
  - (b) Apply for field inspection through the County Extension Office not later than May 20.



- (c) Submit sample of threshed grain to the Nebraska Crop Improvement Association for laboratory analysis.
  - (d) Attach a copy of the laboratory test report to the project record book.
4. Turn in the completed record of the project to the club leader before the end of the 4-H club year.

### III. SUGGESTED TOPICS FOR MEETINGS

#### Problem 1: Choosing a Variety and Preparing the Seed For Planting

Only good seed of a recommended variety should be planted. Good seed is clean, pure as to variety, free from weed seeds, and free from rye. The seed planted should be of an adapted variety which is recommended by the Nebraska Agricultural Experiment Station for the locality where the crop is to be grown. Good seed is important. The crop can be no better than the seed that is planted.

##### A. Choosing a Variety

In choosing a variety the wheat farmer must consider:

1. The yield and performance of the variety on his farm. The farmer wants a variety that will withstand dry weather, cold winters, insect pests, and diseases. He also wants one that will yield well, one that has a strong straw which will stand up well for combining, and one which does not shatter when ripe.

Varieties differ in their ability to meet these requirements. Hence, a knowledge of the variety is important in making the right choice.

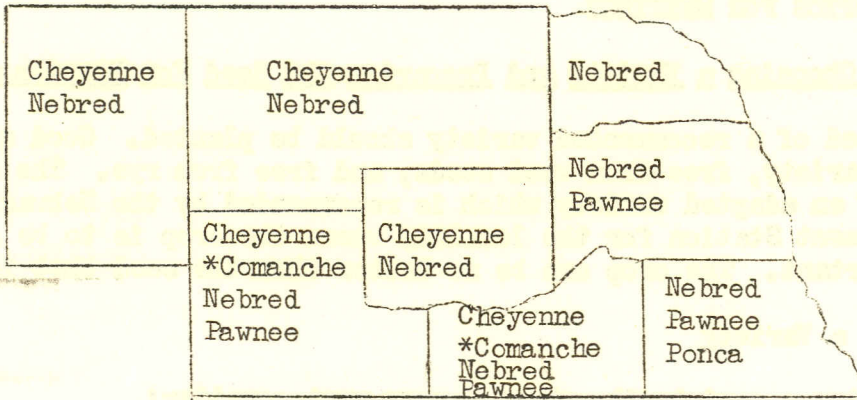
2. The milling and baking characteristics of the variety. Most of the wheat grown in Nebraska ends up in the form of bread. It is sold to country elevators and finally finds its way to flour mills all over the country. About 80% of the wheat is made into bakery flour--a flour which must be "just right" for use in giant mechanical dough mixers and for baking operations that are "timed to the minutes." Wheat varieties differ in milling and baking characteristics. Hence, the wheat grower must produce a variety that has desirable milling and baking quality if he is to find a ready market and receive the top price for his grain.

More than 200 named varieties wheat are grown to some extent in the United States. Only a few of these are adapted to Nebraska conditions. It is neither necessary nor desirable for the farmers to experiment with many different varieties for that is the job of the Nebraska Agricultural Station. Named varieties, plus thousands of experimental varieties are tested by experiment stations each year in order to find the best varieties for each wheat-growing locality of the state. Any one variety may vary in performance from year to year, so the average yield over a number of years is a better measure of value than are the results from a single year. Wheat variety



recommendations by the Nebraska Agricultural Experiment Station are based on yield per acre, resistance to disease, and insect damage, strength of straw, milling and baking characteristics, and other factors which affect the desirability of a variety from the standpoint of the grower, the miller, and the baker.

The varieties shown on the map below are recommended for Nebraska:



\* Southern two tiers of counties

Since winter wheat variety recommendations may change from time to time, the list should be checked before a decision is made. To obtain the latest recommendations for any cropping district, ask your county extension agent for a copy of the most recent Outstate Testing Circular on Fall Sown Small Grain Variety Tests. This publication is issued each fall and contains a listing of the recommended winter wheat varieties along with results of field tests conducted in each cropping district.

Club members will find a description of different winter varieties in Circular No. 938, Varieties of Hard Red Winter Wheat in The United States.

#### B. Cleaning and Treating the Seed

After the variety has been chosen, the next step is to examine the seed. If it contains weed seeds, chaff, straw, dirt, trash, shriveled or diseased kernels, clean it with a good fanning mill.

Seed surveys conducted in Nebraska show that many of the farmers are planting wheat which contains numerous weed seeds. These weed seeds, if planted with the wheat, will grow and use moisture and plant food needed to produce a crop of grain. Certified seed is usually cleaned before it is sold and no noxious weed seeds are permitted.

As good insurance, treat the wheat seed with a disinfecting material that protects the crop from "stinking" or covered smut and reduces possible losses from diseases that may attack the sprouts or young plants. Tests at Kansas State College have shown an increase in stand of  $7\frac{1}{2}\%$  from treated seed. Iowa State College reports an average increase in yield of 1.1 bushels per acre from treated seed.



Use treating materials such as Ceresan "M" or Panogen. You may treat the seed at home for a cost of 2 to 3 cents per bushel or have it treated by one of the many custom machines which are now being operated throughout the state. If you treat seed at home, be sure to follow directions on the containers carefully. The treating materials mentioned are poisonous to animals and human beings, so they must be handled with care. For best results, treat the seed several days before planting.

## Problem 2: Seedbed Preparation and Planting

### A. Seedbed Preparation

A good seedbed is one that is firm, free of weeds, well supplied with plant nutrients, and one that has enough crop residue left on the surface to protect the soil and young crop against either wind or water erosion. It is the most expensive phase of wheat production. The two most important purposes of preparing the seedbed are the development of available nitrates and the conservation of moisture. Timely tillage is sometimes more important in accomplishing these things than the type of machine used.

Summer fallowing is the customary method of preparing land for wheat in the western half of the state. On continuously cropped land in other parts of the state, the seedbed for winter wheat is prepared by plowing and other tillage during the few weeks between small grain harvest and wheat planting time.

#### 1. Summer fallowing:

Summer fallowing is considered the best method of seedbed preparation for wheat in western Nebraska or other semi-arid regions where rainfall is not sufficient to produce a crop every year. It consists of tilling the land for one or more years during which no crop is grown. The most important functions of summer fallowing are to store moisture and promote the accumulation of available nitrate nitrogen. Extensive studies at the North Platte Experiment Station have shown that an average of about 26% of the moisture received in the fallow year may be stored in the soil for the next crop year. This varied from as little as 8% to as much as 41%, depending on weather conditions during the year of fallowing.

If the land is clean tilled, the lack of cover may contribute to soil erosion, from both wind and water. Therefore, methods of fallowing in which all vegetative material is worked under early in the fallow period are not desirable.

The field operations for summer fallowing in Nebraska usually start in April of the year after a crop has been harvested. Stubble should be left standing during the winter to catch snow and prevent wind erosion. The standing stubble is first cultivated with a sub-tiller or one-way disk. Sometimes a mold board plow is used, but this method does not leave as much crop residue on the surface as the other methods.



When the weeds start again, the next operation may be done with a rod weeder, spring tooth harrow, chisel tool, or the sub-tiller. Each crop of weeds must be destroyed when the plants are small if the moisture is to be conserved. Till the soil only as often as is necessary to prevent the weed growth. Avoid excessive turning up of fresh, damp soil because such tillage dries out the soil. If straw and other crop residues are turned under in a "clean fallow" program, the soil should be handled in a manner that will maintain a cloddy surface to help prevent wind erosion and crusting.

Just prior to seeding it may be well to give the land a final treatment with a plain rod weeder. This will kill small weeds and pack the soil, making an ideal place in which to plant the seed.

During recent years, a new system of preparing wheat land has spread over millions of acres of the Great Plains. Commonly called stubble-mulch farming, this new method consists of leaving the residue from one crop on the land while the land is prepared for the next crop. This method of fallowing provides a cover for the land thereby preventing wind and water erosion, increasing the intake of water into the soil, and improving the tilth of the soil. Details regarding this method of summer fallowing will be found in E. C. 54-100, Stubble Mulch Wheat Farming Methods For Fallow Areas.

## 2. Continuous Cropping:

Early seedbed preparation for winter wheat after the previous crop has been removed is highly desirable on continuously cropped land in eastern Nebraska and other areas where summer fallowing is not practiced. Plowing and harrowing in July followed by disking in August and again just before seeding is recommended. In experiments at the Nebraska Experiment Station this practice gave yields of 34 bushels per acre compared with 20 bushels per acre for land which was not plowed until September 15. Similar results with lower yields are reported from experiments at the North Platte Experiment Station.

If early plowing is impossible, disking or some other tillage operation should be done in July, followed by plowing and disking at later dates.

Soil nitrates and moisture are conserved by early seedbed preparation and the seedbed is firmed for planting. Better stands, higher yields, and greater protein content of the grain are assured by following this practice. The depth of plowing should be 5 to 6 inches. Experiments show that plowing deeper than  $5\frac{1}{2}$  inches does not materially increase the yields.

## B. Date To Plant Wheat

### 1. Eastern and Central Nebraska:

Where hessian fly is a problem, the best time to plant wheat is largely determined by that insect itself. Because of the danger of fly damage to the wheat, delay planting until the fly-free date. This date varies from year to year, but usually ranges from September 20 to October 1 for different areas. The fly-free date for the counties where fly is a problem will be announced each year by the College of Agriculture. Consult your county agent for the fly-free date in your county.



Planting before the fly-free date may expose the crop to two hazards: (1) the danger of a hessian fly epidemic, and (2) excessive growth of the wheat plants in the fall which is wasteful of soil moisture. Delay after this date results in less fall growth, less fall stooling and root development, poor establishment of the plants in the fall, less certain winter survival and the possibility of greater heat and rust injury.

## 2. Western Nebraska:

In western Nebraska the wheat grower has little trouble with hessian fly, but he has less choice of planting time because of limited rainfall and the danger of wind erosion on his fields during the winter and spring months.

Studies made by the Nebraska College of Agriculture show that severe damage from western streak mosaic and root rot diseases is much more likely to occur in early planted wheat. Excessive fall growth of the crop, with resulting waste of much needed moisture, is also encouraged by early planting.

Late planting on the other hand may not allow sufficient time for the wheat to cover the ground in the fall. Under these conditions there is less fall stooling and root development and more opportunity for the wind erosion during the winter and spring months.

Hence, mid season planting--possibly September 5 to 20--is now considered the best time for planting wheat in western Nebraska. The early September dates apply to the high altitude areas of Kimball and Banner counties and the later dates apply to the southwestern counties.

Information such as that collected from Chase and Banner county tests and shown in the table below indicates that even later dates of planting may be desirable.

### DATE OF PLANTING WINTER WHEAT TEST RESULTS, 1953-1954

| <u>Date of Planting</u> | <u>Yield - Bushels Per Acre</u> |                     |
|-------------------------|---------------------------------|---------------------|
|                         | <u>Banner County*</u>           | <u>Chase County</u> |
| August 15               | None**                          | 15                  |
| August 22               | 13                              | --                  |
| August 25               | --                              | 20                  |
| August 29               | 16                              | --                  |
| September 5             | 21                              | 26                  |
| September 12            | 24                              | --                  |
| September 15            | --                              | 32                  |
| September 19            | 20                              | --                  |
| September 25            | --                              | 34                  |
| September 26            | 30                              | --                  |
| October 3               | 29                              | --                  |
| October 5               | --                              | 28                  |
| October 10              | 18                              | --                  |

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\*Banner County 1954 only; Chase County 1953-54 Average.

\*\*August 15 seeding was 85% winter killed and yield was not measured.

The best date for planting wheat in a particular locality may vary somewhat from year to year, but early planting is not desirable.

Growers in summer-fallow areas should depend more upon strip cropping and crop residues to control wind erosion than upon the cover obtained from fall growth of wheat.

### C. Rate of Planting

In western Nebraska, wheat is seeded at the rate of 30 to 40 pounds per acre. The smaller rate is used in the extreme western part and becomes heavier as one moves east. In central Nebraska, four pecks is sufficient, while in eastern Nebraska the rate is 5 to 6 pecks. These rates are increased somewhat if wheat is seeded late.

### Problem 3: Soil Fertility For Wheat

- A. Wheat needs good soil fertility for best yield and quality. Wheat on manured land in eastern Nebraska yields 9 bushels more than without manure (12 tons per acre). Wheat in a six-year rotation with two years of red clover or sweetclover yielded four bushels more than without the legume, even though the wheat was planted two years after the clover was plowed up.
- B. The soils of southeastern Nebraska are generally too low in phosphorus for best wheat production. In this region it usually pays to use phosphate fertilizer when planting wheat on legume ground. On land which has had no legume for two years or more, the wheat yield is increased 10 to 12 bushels by applying fertilizers containing both nitrogen and phosphorus.
- C. To find out whether fertilizer is needed for the wheat, take soil samples and have them tested by the Soil Testing Service. Ask your county agent or club leader to show you how to take the soil samples. Submit the samples at least four weeks before you will need to buy the fertilizer.
- D. Even in regions where summer fallowing is the usual preparation for planting wheat, it is wise to have soil samples tested, and use fertilizers according to soil test. Where the soil is black and deep, it may not need phosphate nor nitrogen fertilizer for maximum yield. But where the soil is light-colored, eroded, shallow, or sandy, it probably needs both phosphate and nitrogen. In any case, tests on soil samples properly taken in the field will tell you what fertilizers are needed, how much to use, when to apply them, and how to apply them.
- E. Nebraska wheat is valued for its protein percentage and quality. When wheat is grown after a legume in the crop rotation system, or on manured land, it usually has a higher protein content. The proper use of nitrogen fertilizers usually increases the protein percentage in the grain. These practices are therefore useful in producing high quality, as well as high yield.

See Nebraska Station Bulletin 416 and Nebraska Outstate Testing Circular 38 for data and recommendations.



## Problem 4: Controlling Weeds in Wheat

### A. Provide a Clean Seedbed

Common weeds are not likely to bother wheat if the seedbed has been properly prepared at the right time. To keep weeds out of wheat land which has not been summer fallowed, follow these practices:

1. Start preparing the land for wheat as soon as possible after the previous crop has been harvested.
2. Work the ground whenever weeds or volunteer wheat start to grow.
3. Disk or harrow the ground shortly before planting so the wheat will have an even start with any weeds that remain in the field.

Summer fallowed land is relatively free of weeds where timely tillage operations have been performed prior to planting.

### B. Plant Clean Seed

Planting clean seed is an important step in the control of weeds. Drill box seed surveys have been conducted in Nebraska to find out the kind of seed that is being planted. Samples were picked up from drills, wagons, trucks, and trailers in the fields where farmers were actually planting their wheat. These surveys showed that some seed wheat was heavily infested with weed seed. In one central Nebraska county the seed averaged 570 weed seeds per pound of wheat. If the planting rate for wheat in this county was six pecks per acre, the farmers were also planting one weed seed per square foot of field areas. One sample of seed contained 8,650 weed seeds per pound of grain or more than one-half million per bushel of grain. This farmer was seeding about 20 weed seeds on every square foot of his field. In some counties 5% of the farmers were planting wheat infested with bindweed. Obviously, it is impossible to control weeds if they are planted each year with the crop seed.

Certified seed samples picked up in the surveys averaged only 1 or 2 weed seeds per pound. Thus, farmers who used certified seed planted only one weed seed on 240 or more square feet.

### C. Keep Field Borders Clean

Fence rows and borders between fields are often the sources of weed seed which infest crops. Seed field borders and fence rows to perennial grasses such as brome, intermediate wheat, crested wheat, or other adapted varieties. Grasses help keep weeds under control. Remove useless fences so the weeds can be more easily destroyed.

Spray fence rows and field borders with 2, 4-D to control broadleaf weeds. Spray early in the season when the weeds are small.

# 1. Use 2,4-D for Broadleaf Weeds in the Wheat

When wheat stands are poor because dry weather, insects, blowing, or freezing has destroyed part of the stand, weeds such as sunflowers, fireweed (kochia), hemp, ragweed, and pigweed may become problems. If these weeds do become numerous, destroy them by spraying with 2,4-D. This chemical will kill the broadleaf weeds without injuring the wheat if used properly. Some pointers to remember when using 2,4-D in wheat:

- (a) Do not spray the same fall the wheat is planted.
- (b) Do not spray when the wheat is in the early boot or early heading (flowering) stages.
- (c) Spray with 2, 4-D when weeds are young and are growing rapidly as they are more easily killed at this stage of growth. One-half pound amine salt (1 pint of 40% material) or one-fourth pound of ester (1/2 to 3/4 pint of most of the ester forms commonly available) will generally do an excellent job if applied during favorable conditions.
- (d) If it is hot and dry, cold, or the weeds are tough and woody, it may be necessary to use twice the amount of chemical required under favorable conditions.

See Extension Circular 198 for additional information.

## D. Special Weed Control Problems

### 1. Downy Brome and Hairy Chess (Wild Bromes)

Downy brome and hairy chess may be a major weed problem in wheat in some parts of the state. They are more difficult to control than most weeds because their growth habits are so much like those of wheat. These weedy grasses germinate in the fall, live through the winter, and start growing early in the spring the same as winter wheat. There are no chemicals which will remove downy brome or hairy chess from winter wheat without also damaging the wheat crop.

If these wild bromes become a major problem, probably the best method of control is to substitute a row crop of sorghum, corn, or safflower for wheat in one year of the crop rotation. For example: Suppose the land is seeded to wheat in the fall of 1956. The wheat will be harvested in 1957. Corn, sorghum, or safflower could then be planted in the spring of 1958 and harvested that fall. The land would then be summer fallowed and planted to wheat in 1959. The crops substituted for wheat in this program make their growth at a different time of year than wild bromes. This fact, plus cultivation of the row crop during the growing season, makes control of downy brome much easier in those crops than in winter wheat.

In any wild brome control program, be sure to clean up the field borders. Seed them to perennial grasses or treat with TCA, Dalapon, or a similar grassy-weed killer.



## 2. Field Bindweed

Field bindweed is another serious weed pest. It takes several years of work to bring this weed under control. There are several ways of controlling bindweed:

- (a) Spray bindweed patches with 2,4-D. Spray the seedbed before planting wheat in the fall or spray the growing wheat in the spring.
- (b) Deep plow bindweed infested areas immediately after the wheat is harvested. Then cultivate with a duckfoot machine each time the plants reach a height of 6 or 8 inches. Cultivation with the duckfoot should be continued throughout the summer and until seeding time in the fall. Delay seeding until October 1.

Bindweed patches usually can be cleaned up in about three years by using the deep plowing, duckfoot tillage combination method.

- (c) Deep plow immediately after harvest, cultivate with the duckfoot machine until the later part of August. Then discontinue the duckfoot tillage program and allow the bindweed to grow until about September 25. At that time, spray with 2,4-D and seed the wheat about October 1.

## Problem 5: Diseases of Wheat

### A. Diseases

There are many diseases of wheat but those most likely to be found in Nebraska are bunt or covered smut, loose smut, leaf rust, stem rust, mosaic and root rots.

1. Loose smut is a fungus disease which shows up clearly at heading time. When plants are affected with the disease, the heads are dark colored masses of powdery material (smut spores) which soon blow away, leaving naked stems in place of heads.

Since the loose smut infection is carried inside of the wheat kernel, chemical treatments applied to the surface of the seed will not control it. The most practical control for this disease is the purchase of new disease-free seed. Certified seed is recommended. Pawnee is a resistant variety.

2. Bunt, also known as covered or stinking smut is another fungus disease. Both the yield and market value of wheat can be drastically reduced by this disease. Bunt usually is not noticed until harvest time. Instead of grain, the heads contain balls of smut that resemble kernels of wheat in size. These smut balls are made up of foul smelling powder or fungus spores. The spores are mixed through the grain in the threshing process thereby spreading the disease to the surface of the sound kernels.



Since bunt spores live on the outside of the wheat kernel, they can be killed by chemicals applied to the seed before planting. Treat the seed with Ceresan M or Panogen. Ceresan M--in the dust form--can be applied at home at the rate of 1/2 ounce per bushel of seed. Panogen is a liquid and must be applied with special seed treating equipment.

Some wheat varieties such as Nebred and Comanche are resistant to bunt.

3. Rusts--There are two kinds of rusts, stem rust and leaf rust. Both rusts can attack the stems and leaves of the wheat plant so they cannot be distinguished by their location in the plant. Both kinds cause small reddish spots or streaks. This reddish dust (rust spores) will rub off on the fingers or clothes.

When wheat plants become heavily infected with rust, the plants tend to dry up and produce only small yields of light, shriveled grain. Both stem and leaf rust spores turn into a black dormant stage as the grain reaches maturity.

- (a) Leaf rust, also known as orange leaf rust appears on the leaves (or stems) in circular, powdery masses of bright orange-colored spores. If the infection is heavy, the leaves may die. When attacks occur early in the season, the yield will usually be reduced and the test weight of the grain may be lowered.

- (b) Stem rust, also known as black stem rust, first appears in dark red elongated masses of powdery spores, mainly on the stems. In a few days the stems may have a roughened, split or broken appearance. The disease soon reaches the black spore stage. At this stage, however, the disease is in a dormant or resting period. Severe outbreaks of stem rust cause badly shriveled kernels and greatly reduced yields.

Planting adapted, rust resistant varieties, if they are available for the locality, is the best means of preventing rust. Pawnee is partially resistant to leaf rust and slightly resistant to stem rust. Nebred has some tolerance for this disease but is not resistant. Earlier maturing varieties such as Pawnee often escape rust injury to a greater extent than the later maturing Cheyenne and Turkey, as stem rust usually develops late in the season.

4. Mosaic is a virus disease which is spread by a tiny mite that feeds on volunteer wheat. The disease causes the plant to become stunted and have yellowish streaking of the leaves. The streaks usually run parallel to the leaf blade. Both tall and short stems may be produced with many of the heads being blank or containing only poor quality, shriveled kernels.

The critical time for mosaic infection is in the fall, although the symptoms usually are not noticed until warm weather comes in the spring. To control mosaic, destroy early crops of nearby volunteer wheat and avoid early planting.



5. Root rot shows up in the form of a brownish decay of the roots and crowns of the wheat plant. Like mosaic, it causes stunting irregularity in height and gradual drying up of the plant. Control by avoiding early planting.

#### Problem 6: Insect Pests of Wheat

Nebraska crops are subject to serious losses each year from a great many different insects. Yearly losses of yield from insects may be minor or extensive. A few of the more common insects that attack Nebraska wheat are mentioned below:

##### A. Hessian Fly

The adult fly is a tiny black fly that lives only a few days. During this time it lays eggs on the young leaves of the wheat plant. Larvae hatch from the eggs and make their way to the junction of the leaves and stem where they feed for several days and then turn into the flaxseed (pupa) stage. The adult fly appears in a week or more. Several generations may occur in a favorable year. The summer and winter are usually spent in the flaxseed (pupa) stage in order to resist unfavorable weather conditions.

The injury from this insect is caused entirely by the larvae which feed on the lower parts of the wheat stem. Infected stems usually break over just before harvest. Yield losses are in proportion to the number of broken stems.

Control by using varieties of wheat that are resistant to the insect, and by planting wheat after the fly-free date recommended by your county agent or the Agricultural Experiment Station.

##### B. Armyworm and Army Cutworm

The army cutworm is dark colored, up to  $1\frac{1}{2}$  inches in length, and usually hides during the day under the surface of the soil or under debris in the field. Cutworms, which later turn into moths, usually appear in March and early April, cutting off wheat plants at the soil line or feeding on the leaves. Feeding usually occurs at night or on dark cloudy days.

Armyworms are climbing cutworms that may attack wheat about the time it is heading. They generally appear later in the season than army cutworms, and feed both day and night. When heavy infestations occur, they are usually found in rank or lodged grain.

Control by spraying with insecticides or using poison baits recommended by your county agent.

##### C. Pale Western Cutworm

This kind of cutworm is light gray colored. It feeds underground, cutting off wheat plants during the spring months. It occurs in the western counties of Nebraska, usually during April and May. In sufficient numbers, it may destroy entire fields of growing wheat in a few days.



Spraying with a recommended insecticide will control pale western cutworms, although, they are more difficult to control than other insects because of their habit of feeding below the soil surface.

#### D. True and False Wireworms

True wireworms are the larvae of click beetles. The wireworms are usually hard, dark brown, smooth wire-like worms, varying from  $\frac{1}{2}$  to  $1\frac{1}{2}$  inches in length. They may attack germinating seed, but their greatest damage is to the roots and underground portions of the stems.

False wireworms are also the larvae of a beetle. These adult beetles cannot fly, but are commonly observed crawling about on the soil surface. When molested, they often will stand on their heads. The false wireworm larvae, which resemble true wireworms, cause injury in the fall by feeding on the roots of fall seeded wheat. They increase during dry years.

False wireworms can be controlled with seed treatments of several insecticides. True wireworms are more difficult to control. Soil applications of insecticides are effective but expensive.

#### E. White Grubs

White grubs injure wheat by feeding on the roots. Injury may occur in the spring or fall and can be identified by wilted and dead plants. Grubs may be found near the roots of infected wheat.

Soil insecticides and insecticides mixed with the seeding in the drill at planting are methods of control.

#### F. Greenbugs

Greenbugs are a species of small plant lice or aphids. They are bright green with black tipped legs and black cornicles (body tubes on the back). The eyes and feelers are also dark colored. They feed on the upper side of the leaves, behind the boot, and on the stem. Damage generally occurs in the spring and is caused by the sucking of plant juices by the insects.

Control with a contact spray recommended by the county agent.

#### G. Wheat Curl Mite

These insects are microscopic, slender, white mites with only four legs. Leaves infected with white mites curl at the edges and fold. Tips of the leaves are often trapped by lower leaves making a loop of the trapped leaf.

The mites themselves do not cause serious damage to the plant, but they are dangerous because they transmit a serious virus disease called wheat streak mosaic.



There is no practical control for the mites as they feed on volunteer wheat and other grasses. They are easily carried from field to field by the wind. Mite populations can be held down by destroying early stands of volunteer wheat. Delayed planting of wheat reduces the chances of mosaic infection.

#### H. Brown Mite

Brown mites sometimes cause limited damage to wheat in western Nebraska. This mite can be easily seen with the naked eye. Brown mites damage the wheat by sucking the plant juices from the leaves. The plants then dry up as if they were injured by drought.

Control usually is not necessary. If heavy infestations threaten, a contact spray must be used.

#### I. Grasshoppers

Several kinds of grasshoppers may cause severe damage to wheat in the fall, also in the early summer just before harvest. They feed on leaves and if numerous, they may cut off heads of wheat.

Grasshoppers are readily controlled with several insecticides and poison baits.

### Problem 7: Maintaining Seed Supplies

It is a well known fact that the crop can be no better than the seed that is planted.

Seed surveys show that 75% of the farmers plant seed wheat which they grow on their own farm. Twenty-three percent purchase seed wheat from their neighbors. In other words, about 97% of the wheat seed is raised in the local neighborhood. Five percent or less of the seed which farmers plant is certified. This means that most of the seed is common wheat and points out the great importance of maintaining a supply of good seed on every farm.

#### A. Improving the Quality of Seed

Whether the grower is trying to improve the quality of common seed or produce certified seed, the following precautions will be helpful:

1. Avoid mixtures of other grains or varieties by thoroughly cleaning the combine, bins, and wagon or truck before the harvest starts. If more than one variety of wheat is grown on the farm, clean the combine, truck, or wagon again before harvesting of the second variety begins.

Clean out grain in the shoes, pant cuffs, and pockets so it will not unknowingly be scattered and mixed with a pure variety.



Varieties of some crops such as corn, rye, alfalfa, and sorghum, may mix in the field by cross pollinating. Wheat, oats, and barley, however, are self-pollinated so there is little chance that two varieties of these crops will cross.

2. Have seed wheat checked for purity. Common seed wheat can be checked for purity by submitting a sample to the Nebraska Grain Improvement Association, College of Agriculture, Lincoln, Nebraska. This service is offered in most of the wheat producing counties of the state. Samples of wheat are collected at harvest time from approximately 100 farms by the county agent, elevator operators, and others interested in the program. These samples are planted in test plots that fall. The following spring, after the wheat is headed, crops specialists from the College of Agriculture examine the wheat in the plot and grade each sample according to its suitability for seed. The farmer is then notified regarding the condition of his seed. If the test shows that his grain is not suitable for seed, he can obtain new seed before planting time in the fall. Public meetings are also held at the test plots where farmers may observe the growing samples and receive the latest recommendations regarding varieties, fertilizers, and cultural practices.

Ask your county agent about these test plots and field meetings. Sponsoring one of the test plots and attending a field meeting is a good activity for your club.

3. Set aside a seed production field. The quality of common wheat can be improved by setting aside a small field, or part of a larger area, as a seed production field. Avoid mixtures of volunteer wheat by selecting a field that did not grow wheat the previous year. Plant pure seed on clean seedbed.

Even getting the best seed and planting it on a clean seedbed does not assure a harvest of pure seed. Roguing must also be practiced. This means removing by hand any rye plants, or off-type or diseased wheat plants, which may be found.

Rye heads several days earlier than wheat and grows taller, which makes it easy to see. Rye plants should be carried out of wheat field and destroyed. Seed of immature rye plants may produce a volunteer growth if the plants are dropped on the ground where they are pulled. After the wheat heads, the field should be examined again. Watch for rye which may have been missed on the first inspection and for wheat plants which may differ in height, color, or kind of head.

Harvest and store the grain from the seed production field separately. By spending a little time each year removing off-type plants and by taking precautions to avoid mixtures which occur in the combine, wagon, truck, or bin, it is possible to maintain a supply of pure, common, seed for several years. Plant certified seed occasionally--perhaps once every five years.

## B. Producing Certified Seed

The certification of crop seed corresponds in a general way to the registration of livestock. When a new crop variety is developed by the Agricultural Experiment Station the Nebraska Seed Certification program provides a way by which the purity and quality of this seed can be assured year after year. Under this



system the original seed of a variety is distributed only to those farmers who agree to produce seed under the rules and regulations provided by the state certification program.

The rules of certification require that the crop be grown and handled in such a way that it will be kept free from mixtures and free from noxious weeds, as well as other objectionable weed seeds. The seed must meet high standards of purity and germination. A record of each crop of certified seed is maintained by the Nebraska Crop Improvement Association.

All farmers are eligible to produce certified seed for their own use or for sale.

Following are the general requirements for growing certified seed in Nebraska:

1. Varieties Eligible:

Choose a variety eligible for certification in Nebraska. Check with your county agent to find out which varieties are recommended for your locality. Recommended varieties are eligible for certification.

2. Land Requirements:

The seed must not be planted on land that was in wheat the previous season except in those cases where the previous crop was certified and of the same variety.

3. Seed:

The wheat planted must be either certified seed or foundation seed in order to be eligible for re-certification.

4. Field Inspection:

Field inspections will be made by representatives of the Nebraska Crop Improvement Association. The inspections will be made after the wheat is fully headed.

5. Field Standards:

- (a) A field cannot be divided for the purpose of certification. Definite field boundaries such as permanent fences or five foot strips of ground planted to another crop must be established.
- (b) Isolation--Since wheat is self-pollinated, it does not need to be isolated from other wheat varieties or crops except by the permanent field boundaries.
- (c) Field Inspection Requirements--To be eligible for certification at the time of field inspection, winter wheat must not contain more than the following:
  - (1) 2% loose smut or 0.1% covered smut (or a combined total of 2% smut)
  - (2) one head of rye per each two acres

- (3) one head of winter barley per each acre
- (4) 1000 heads of spring small grain per acre
- (5) 100 heads of other winter wheat varieties per acre
- (6) no noxious weeds (field bindweed, hoary cress, leafy spurge, Russian knapweed, and Canada thistle)

Any field may be turned down because of serious diseases other than smut or because of too many weeds.

#### 6. Laboratory Standards:

After the crop is harvested and the winter wheat is submitted to the laboratory for analyses, it must meet the following standards:

- (a) 97% pure seed
- (b) not more than 25 kernels of other winter wheat varieties per pound
- (c) not more than 20 kernels of spring grain per pound
- (d) free of rye
- (e) not more than 1 kernel of other winter crops per pound
- (f) only 3% inert (chaff, straw, etc.)
- (g) a total of only ten weed seeds per pound
  - (1) no noxious weeds
  - (2) only one secondary noxious weed (mustard, dock, pennycress, quackgrass, horse nettle, and dodder)
- (h) the germination test must be at least 85%
- (i) the test weight must be at least 54 pounds

#### Problem 8: Harvesting, Drying and Storing

Harvesting, drying, and storing of wheat should be considered together, since each operation is dependent to some extent upon the other.

Not many years ago wheat was always left in the field to dry before combining. Prior to that time, wheat was either harvested with a binder or header. These early methods of harvest were, of course, dependent upon nature.



Through the years man has been trying to make these operations independent of nature through mechanical or chemical means. Mechanical drying of wheat harvested at high moisture is another step by the farmer to be less dependent upon the weather and thus to reap a larger harvest of higher-quality grain. In this problem each of these processes will be discussed separately to give the member a better understanding of what is involved.

## A. Harvesting

### 1. Time to Harvest

The time of harvesting wheat is very important for successful operation of the machine and safe storage of the grain.

Wheat loses moisture very rapidly as it approaches maturity and the time of harvest is influenced by the method to be used and the moisture content of the grain.

The time to harvest wheat by various methods is shown below:

- (a) Combining for direct storage of grain = when the grain contains 14% or less moisture, 7 to 10 days after binder-ripe date.
- (b) Combining for artificial drying of grain before storage = when grain contains 20% moisture or less.
- (c) Binding and threshing = when the grain is mature--may still contain 25% to 30% moisture.

The only satisfactory way to find out the moisture content of grain is with a moisture tester. Your elevator operator will be glad to test a sample of the grain for you.

### 2. Preparation of Machinery for Harvest

The machine should be examined well ahead of the harvest season to find worn or broken parts that should be replaced and to check adjustment of all working parts of the machine. The Operator's Manual gives the recommended settings of machine parts. (If you do not have an operator's manual, your dealer will furnish one.)

### 3. Machine Operation

How well a machine operates is a direct result of the skill of the operator. The operator should know how and why each part of a machine works. The Operator's Manual and Harvesting With Combines has a section on troubles and remedies, also suggestions for locating the cause of trouble when the machine is not working properly.

The field should be examined before cutting to determine field losses resulting from crop variety, insects, diseases, or other causes. After harvest starts, check the ground behind the machine to determine machine losses (18 - 20 kernels of wheat per square foot equal 1 bushel per acre loss). Well-adjusted combines have operated at 98% efficiency. Observe all safety practices.

The machine should be thoroughly cleaned when changing fields or variety of crop harvested to prevent the mixing of crop varieties and the spread of weeds.

## B. Mechanical Drying

Mechanical drying should become a part of your regular crop management program. Controlled drying fits in with modern production, harvesting, and handling methods.

With drying equipment wheat can be:

- (a) Stored safely.
- (b) Marketed without a moisture discount.
- (c) Harvested as soon as mature, reducing chance of storm damage.
- (d) Harvested faster by operating combines early in the morning and late at night.
- (e) Saved even in wet harvesting weather or with weed growth.

### 1. Methods of Drying:

Two methods of drying are (1) with natural or unheated forced air, and (2) with heated forced air. Natural air drying uses air only and heated air drying uses heated air. These two methods require entirely different equipment and methods. A heated air drying system is not a natural air drying system with heat added. Which system to use will depend upon conditions found on each individual farm. Following are some comparative features.

#### Natural Air

#### Heated Air

- |   |  |
|---|--|
| (a) Low initial equipment cost.                         | (a) High initial equipment cost.   |
| (b) Long drying time.                                   | (b) Short drying time.   |
| (c) Capacity based upon available electric horse power. | (c) Capacity based upon size of burner and hatch container.                |
| (d) No effect upon rate of harvest.                     | (d) Rate of harvest based upon capacity of dryer which may detain harvest. |
| (e) No fire hazard.                                     | (e) Some fire hazard.  |
| (f) No additional grain handling equipment required.    | (f) May require additional grain handling equipment.                       |
| (g) Grain is dried in storage.                          | (g) Grain must be moved to storage after drying.                           |
| (h) Deep storage bins not suitable.                     | (h) Storage structure not a part of drying system.                         |
| (i) Can be used for aeration of grain.                  | (i) Separate aeration system required.                                     |
| (j) Little supervision required.                        | (j) Considerable supervision required.                                     |



Under Nebraska conditions and proper management, either system will accomplish a good drying job. The system for your farm will depend upon your farm conditions and requirements.

## 2. Amount of Moisture Removed from Wheat By Drying:

You may be interested in knowing how much water must be removed from wheat for safe storage. The following table gives the weight of water to be removed by subtracting the final weight of water after drying from the weight of water before drying. To convert to gallons, divide by 8.3.

### Pounds of Water Per Bushel of Wheat at

#### Different Moisture Content Percentages

|             |           |             |           |
|-------------|-----------|-------------|-----------|
| 35% . . . . | 27.8 lbs. | 24% . . . . | 16.4 lbs. |
| 30% . . . . | 22.1 lbs. | 22% . . . . | 14.6 lbs. |
| 28% . . . . | 20.1 lbs. | 20% . . . . | 12.9 lbs. |
| 26% . . . . | 18.2 lbs. | 18% . . . . | 11.4 lbs. |
| 16% . . . . | 9.8 lbs.  |             |           |
| 14% . . . . | 8.4 lbs.  |             |           |
| 12% . . . . | 7.0 lbs.  |             |           |
| 10% . . . . | 5.8 lbs.  |             |           |
| 8% . . . .  | 4.5 lbs.  |             |           |

## C. Storing The Grain

### 1. Wheat Must Have A Low Moisture Content

Grain can be stored safely for long periods of time only when it has a moisture content of about 12%. Excessive moisture will cause souring, heating, or molding, and will promote insect infestation.

Wheat can be dried in storage to a safe moisture content using either unheated or heated air as has been previously mentioned.

Even in dry wheat there is a tendency, in the colder climates and in the larger bins, for moisture to build up in the upper layers of the grain during the fall and winter. This can be prevented by aerating the grain with small pressure fans or with a drying system for natural air.

The moisture build up results from the wide differences in temperature of the grain in various parts of the bin. These differences in temperature cause air currents that carry water vapor from the warm bin center to the cooler areas. Generally, the warmer air moves upward, and, when it meets the cooler upper layers of grain, moisture is deposited. Unless this moisture buildup is prevented, the grain will mold and cake.

Spoilage can be prevented by operating your bin drying system during the cold weather. This draws cool air through the grain to equalize the temperature and prevent moisture from being deposited in the upper layers. This process also helps retard insect activity and mold growth.

## 2. Protect from Stored Grain Insects

Insects that attack stored grain take a bigger "cut" out of Nebraska farm income than most insects attacking crops in the field. Most of the damage to stored grain can be prevented by providing a good tight storage bin which has been thoroughly cleaned and sprayed with a long-lasting insecticide two or three weeks before filling. Areas surrounding the bin should also be sprayed. DDT, methoxychlor or activated pyrethrum sprays are recommended. Use a 2½% solution of either product applied at the rate of 2 gallons for each 1,000 square feet of area. Effective protective powders and sprays of pyrethrum products are also available for mixing with stored wheat to protect it from stored grain insects.

Storage bins should also be screened and otherwise protected to keep out rats, mice, chickens, birds, cats, and other animals. Rodents and birds that get into grain cause enormous losses. They waste the nation's food supply and eat away the farmers' profits. They contaminate grain which is to be used for food. Club members are urged to take part in the nation-wide clean grain program by undertaking a year around rodent control program on their home farm if such a program is not now in operation.

Stored grain should be checked at frequent intervals to make certain that it is not going out of condition. The best way to check stored grain is to take samples with a grain probe at several locations in the bin. This permits careful checking to determine the condition of grain, or the presence of stored grain insects at various levels in the bin. Fumigate the grain if stored grain insects are present. Move the grain if heating occurs.

## D. Grain Storage Structures

### 1. Requirements For A Safe Storage Structure

#### (a) Materials

There is a wide variety of materials that can be used to construct storage structures. These include steel, lumber, plywood, waterproof wallboard, asphaltic roofing and siding, aluminum, concrete, and building tile. Each material, however, must be used with proper regard for its ability to withstand stress and keep out moisture.

#### (b) Location

The wheat storage structure should be located preferably 100 feet from other buildings for fire protection and on a site that is well drained, free from surface water, and is not subject to flooding.



## (c) Strong

Wheat storage structures must be tighter and stronger than most other farm buildings, in order to withstand the grain pressure against the walls and supports, and the weight on the floor and foundation. Failures from poor construction result in loss of grain and costly repairs.

## (d) Weathertight

All grain-storage structures should be weathertight. Rain or snow entering through walls and the roof can cause heavy damage to stored grain. All door and hatch openings should be weathertight. Special attention should be given to cracks and knotholes in wood construction and to open bolt holes and loose bolts in metal construction. Metal-backed, black neoprene washers should be used under all bolt heads in metal bins.

## (e) Moisture Proof Floors

Protection must be provided against the movement of moisture from the ground through the floor of the bin and into the grain. Concrete floors when properly constructed with moisture barriers are very satisfactory. Floors that are supported above ground, such as are usually found with frame construction, are relatively free from hazard of ground moisture.

## (f) Convenient to Fill and Empty

The right size and type of openings for filling and emptying the storage structure will depend on the type of filling and emptying equipment used. A roof hatch is satisfactory for some types of portable elevators if the building is not too high. The main duct of the drying system is frequently used in connection with an auger or elevator to help empty the bin.

## (g) Convenient to Inspect, Fumigate, and Clean

The design of the storage structure should permit inspection, sampling, and fumigation of the grain in storage. The grain can be sampled with a deep grain probe if the grain is not more than 16 feet deep and there is 2 to 4 feet of head space above the grain. Cleaning and spraying is relatively easy if the number of places where grain can lodge while emptying is kept to a minimum. Fumigation may be necessary, so provision should be made for temporary sealing of all openings.

## (h) Rodent and Bird Proof

To reduce damage from rats and mice, the storage structure with a wooden floor should have an open foundation. The floor should be 12 to 18 inches above the ground. Birds can be kept out of bins by screening the ventilators and other openings.

## Problem 9: Marketing The Winter Wheat Crop

The marketing of wheat differs from the marketing processes of **other grains** because wheat is used primarily for human food, whereas the other grain crops are used primarily for livestock feeds. Flour mills are the biggest buyers and processors of wheat. They are quite particular about the quality of wheat they buy--depending on the final use of the product.

### A. Classes of Wheat

There are seven classes of wheat established by the U. S. Department of Agriculture grain grading standards. Each of these classes has certain quality characteristics which cause it to be suited to certain uses. The seven classes of wheat and the principal use to which each is suited is as shown below:

| <u>Market Class</u>      | <u>Principally Suited For</u>       |
|--------------------------|-------------------------------------|
| I Hard Red Spring Wheat  | Bread                               |
| II Durum Wheat           | Macaroni and Spaghetti              |
| III Red Durum Wheat      | Poultry, Livestock, & Dog Food      |
| IV Hard Red Winter Wheat | Bread                               |
| V Soft Red Winter Wheat  | Cake, Cookies, Biscuits, & Crackers |
| VI White Wheat           | Pastries and Breakfast Foods        |
| VII Mixed Wheat          | Poultry, Livestock, & Dog Food      |

Nebraska produces hard red winter and hard red spring wheat so it is strictly a bread wheat producing state. Production of any other class of wheat is considered undesirable in this state.

### B. Grain Grading

The class of wheat is not the only thing which those who handle and store wheat must consider. The wheat in each class is divided into six grades according to standards set up by the U. S. Department of Agriculture. The characteristics which determine the grade of the grain are dryness, purity of type, weight per bushel, plumpness, cleanliness, soundness, and general condition.

"Condition" is a general term and refers to whether the grain is in good keeping quality or poor keeping quality. Grain which goes out of condition usually heats and may become musty or sour. Condition is also indicated by such words as "smutty," "garlicky," "weevily," "bright," "stained," "tough," or "treated." These terms describe various conditions in which grain is sometimes found and if applicable, may be added to the grade designation.

The six grades are No. 1, No. 2, No. 3, No. 4, No. 5, and Sample. Sample grade is the lowest. No. 1 and No. 2 are the grades most desired for milling and making breakfast cereals. The grade of the wheat, as well as the class determines the price.



When the grain is delivered to the local elevator, it is inspected and graded by the dealer himself. At terminal grain markets the grades are determined by official inspectors licensed under a law called the Grain Standards Act. This act provides that all grain must be officially inspected and graded if it is sold by grade when shipped from one state to another or to foreign countries. Buying and selling grain by grade makes it possible for buyers and sellers to know the quality of grain without having actual samples of the grain in their possession. Grading also makes it possible to store grain of like quality together in large terminal elevators without danger of lowering the value of high-quality grain by mixing it with grain of lower quality.

### C. Wheat Quality As It Affects the Market

Since Nebraska is in the hard red winter wheat region, this discussion on marketing will apply to this class of wheat. Approximately 80% of the hard red winter wheat milled into flour goes into the production of bakers' flour--flour which must meet the rigid specifications required by today's assembly-line production of bakers' bread. The remaining 20% is sold as family flour designed for use in the homes. Bakers' flour is not made from a single variety from any one locality. It is made by blending wheats of varying characteristics in order to end up with a flour that meets an individual baker's specifications.

One of the important characteristics of good bakers' flour is its gluten quality. Gluten is the substance in wheat flour which gives it the strength or ability to hold together, stretch, and retain gas while the fermenting dough expands or "rises". Some varieties such as Cheyenne, Nebred, and Comanche have "strong" gluten. Dough made from Nebred and Cheyenne flour is elastic and has the ability to withstand long mixing in mechanical equipment. Other varieties, such as Pawnee and Sioux, have medium strong or mellow gluten. These varieties make excellent family type flour, but when used alone they lack the strength needed for bakers' flour.

Most of the wheat produced in the hard red winter wheat region has mellow or medium strength gluten quality so there is an abundance of this type of wheat. On the other hand, there is a shortage in production of varieties having strong gluten quality. More wheat of strong gluten is needed for blending with mellow gluten varieties in the production of bakery flour. This situation has resulted in increased demand and premium prices for the strong gluten wheats--especially those of higher protein content.

Much of this premium wheat has been produced in the western third of Nebraska. This area of the state has earned an enviable reputation in grain marketing channels because it represents the only sizable area in the hard red winter wheat region which raises the strong-gluten wheats almost exclusively. Nebred and Cheyenne varieties account for approximately 80% of all the wheat grown in this section. Growers in this section will find it profitable under present market conditions to grow only strong gluten varieties.

### D. Grain Marketing Systems

The finest and most efficient grain marketing system in the world has been developed in the United States. The grain is first delivered to the local elevator. The farmer may sell it or place it in storage. He may ask the dealer to send it on to a terminal market for storage. Under this arrangement, the grain remains the property of the farmer until he directs that it be sold.



In addition to huge storage facilities at the terminal markets, grain exchanges or boards of trade have been established. These exchanges do not buy, sell, nor own any grain. They provide the meeting place for buyers and sellers. Here the commission firms buy and sell grains consigned to them for a fixed charge per bushel. They buy and sell the grain based on samples of the actual grain offered for sale and which has been graded by a trained federally licensed inspector. Grain is bought and sold at the exchanges for "cash" which means for immediate delivery, to the buyer, or as "future" which means that the grain is to be delivered at a certain time in the future. Through this system, buyers from any place in the world may place orders for immediate or future delivery. Some grain markets such as the Omaha Grain Exchange maintain facilities for cash-grain handling only, while others, such as Chicago, Kansas City, and Minneapolis, have facilities for both cash and future trading. These markets, though complex, are efficient and maintain a constant market for the producer. The grain may be bought and sold many times without actual delivery taking place between buyers and sellers.

#### IV. SOME SUGGESTED ACTIVITIES

Group activities, in which the entire club takes part, and in which parents might participate, can be included in the club program. Such activities help to build interest, enthusiasm, and cooperation. A tour of one of the facilities for grain marketing (local elevator, terminal elevator, or grain exchange) or a similar trip should be included in the club program. This should be well planned in advance in order to get the greatest benefit from the tour. Usually those facilities will welcome visits by 4-H clubs, but they appreciate advance notice and planning.

Some crops judging and demonstration work is generally required of each member. Numerous grain judging contests are held in county, regional, and state fairs, as well as state-wide grain shows.

Club members will have opportunities to exhibit samples of their grain at county regional, and state fairs and other grain shows. The club member should take pride in his grain and enter an exhibit at one or more of the fairs and grain shows during the year.

The following suggested activities are offered. The club may think of others to add to the list.

##### A. Tours

1. Visit a farm with grain drying facilities.
2. Grain fields nearing maturity, observe plant characteristics, estimate yields, and check the results.
3. Terminal elevator and facilities.
4. Local elevator.
5. Terminal grain market and grain exchange.
6. Grain processing plant (feed and flour mills, breakfast food plant, seed processing plant, etc).



7. Local bakery.
8. Federal inspection of grain on railroad cars.
9. Nearest Agricultural Experiment Station.

#### B. Demonstrations

1. Cleaning seed.
2. Treating seed.
3. Reading and explaining a Certified Seed Tag.
4. Benefits of the State Seed Law.
5. Comparing different fertilizers.
6. How to grade grain.
7. Preventing weevil and insect damage of stored grain.
8. Keeping grain free from rodent contamination.
9. Grain moisture content as it affects grain storage.
10. The importance of proper ventilation in grain storage.
11. Field demonstration to show the benefits of planting cleaned and treated seed as compared to uncleaned and untreated seed.
12. Adapt a bin or wagon box to dry your wheat from your project. A  $\frac{1}{4}$  horse power motor will dry from 100 to 600 bushels depending upon depth and initial moisture content. Obtain all possible detail information and have your extension agent check the system before using. Keep record of initial cost and operating cost.
13. Demonstrate amount of water in wheat of various moisture content with quart and gallon jars.

#### C. Individual Activities and Studies

1. Trace a carload of grain shipped from a local elevator.
2. How grain is financed as it is moved through market channels. (Particularly locally).
3. Uses of futures market.
4. Purpose and operation of terminal grain markets--cash and futures.
5. Make a report on grain marketing in radio interview or talk.
6. Chart market price trends of members crop project for the period of the club project.
7. Take part in seed grading and variety identification schools and contests.
8. Inspect grain storage buildings on your farm. Are they in condition for storing high quality grain?
9. Consider how your grain storage can be adapted for drying.
10. Check a wheat field for field losses.
11. Check a harvesting machine for broken or worn parts.
12. Check machine losses.
13. Check a machine for safety practices and hazards.
14. Prepare and display a collection of:
  - (a) Recommended crop varieties.
  - (b) Weed mounts.

#### D. Group Activities

1. Show and see slides, slide films, and movies on grain production and marketing.
2. Give a panel discussion, play, or other presentation which stresses grain marketing.
3. Prepare a report on participation by the club and its members in marketing the grain from 4-H projects.

4. Invite representatives from different types of grain marketing enterprises to talk at meetings of the 4-H club.
5. Have someone from a farmers cooperative grain marketing organization tell the club about how the cooperatives market the farmers grain.
6. Sponsor a wheat variety demonstration plot.
7. Conduct a field loss survey. Eighteen to twenty kernels per square foot equals one bushel per acre. Survey can be made before and after harvest.
8. Inspect new farm or other grain storages built in your community.
9. Obtain set of Midwest Grain Storage plans from your county agent. Discuss these at club meeting. Note different types of construction.
10. Check a wheat field for field losses.
11. Check a harvesting machine for broken or worn parts.
12. Check machine losses.
13. Check a machine for safety practices and hazards.

## V. WHERE TO GET MORE INFORMATION

The information in this manual on the producing, harvesting, storing, and marketing of wheat is by no means complete. 4-H members and leaders who want more detailed information on these subjects are referred to the following sources:

### A. Selecting Varieties and Growing The Crop

Fall Grain Varieties For Nebraska -- Extension Circular 55-102

Growing The Winter Wheat Crop -- Bulletin 389, Published by the Nebraska Agricultural Experiment Station

Nebraska Varietal Tests of Fall-Sown Small Grains -- Outstate Testing Circular, Published each year by the Nebraska Agricultural Experiment Station

Varieties of Hard Red Winter Wheat in the United States -- Circular 938, Published by the U. S. Department of Agriculture.

### B. Seed Treatments

The Hows and Whys of Cereal Seed Treatment -- Extension Circular 1809

### C. Fertilizers

Commercial Fertilizer Results with Winter Wheat and Rye -- Outstate Testing Circular, Published each year by the Nebraska Agricultural Experiment Station



General Fertilizer Recommendations For Central Nebraska -- C. C. 106

General Fertilizer Recommendations For Western Nebraska -- C. C. 107

#### D. Seed Certification

Nebraska Certified Seed Handbook -- Published annually by the Nebraska Crop Improvement Association, College of Agriculture, Lincoln, Nebraska

#### E. Insect and Rodent Control

Armyworm and Its Control -- Farmers' Bulletin 1850

Grasshopper Control -- Farmers' Bulletin 2064, U.S. Department of Agriculture Publication

Green Bugs and Their Control -- Extension Circular 1560

Insects In Farm Stored Wheat -- Leaflet No. 345

Rat Control on Nebraska Farms -- Extension Circular 1562

#### F. Grain Rusts

Stem Rust of Wheat, Oats, Barley, and Rye -- C. C. 1802

#### G. Weed Control

2,4-D For Weed Control in Field Crops -- Extension Circular 198

Spray Equipment For Weed Control -- Extension Circular 174

#### H. Machinery Costs

Cost of Operating Farm Machinery on Nebraska Farms -- Experiment Station Bulletin 413

#### I. Harvesting

Operators' Manual For Your Machine -- Manufacturer

Harvesting with Combines -- USDA Farmers' Bulletin 1761

Eliminate Hazards on Your Farm -- Extension Circular 792

## J. Grain Drying and Storage

Drying Shelled Corn and Small Grain With Heated Air -- USDA Leaflet No. 331

Drying Shelled Corn and Small Grain With Unheated Air -- USDA Leaflet No. 332

Storage of Small Grains and Shelled Corn on the Farm -- USDA Farmers' Bulletin 2009

You Can Store Grain Safely On the Farm -- USDA Farmers' Bulletin 2071

Midwest Grain Storage Plans Catalog -- Complete set of plans available from agent's office--Individual plans can be obtained for 15¢ per sheet.

## K. Grain Marketing

Course of Study in Grain Grading -- Published by Seedburo Equipment Company, 618-626 West Jackson Blvd., Chicago 6, Illinois

4-H Grain Grading Demonstrations -- Misc. Extension Publication No. 62 -USDA

Hedging-- An Insurance Medium in Marketing Agricultural Commodities -- Published by the Chicago Board of Trade, Chicago, Illinois

Handbook of Official Grain Standards of the United States--USDA

Important Facts About The Grain Exchange -- Published by the Board of Trade, 141 West Jackson Blvd., Chicago, Illinois

Marketing Grain Through A Grain Exchange -- Published by the Chicago Board of Trade, Chicago, Illinois

The Story of Grain From Farm to You -- Published by the Omaha Grain Exchange Omaha 2, Nebraska

Most of the above references may be obtained through the office of the county agricultural agent. Other publications may be obtained by writing the publishers named.

It is suggested that the leader be responsible for obtaining copies of the publications wanted so they can be used by the members at club meetings in discussing problems involved.

## L. Films and Movies

Black Scourge--(sound) 11 minutes. Subject: Smut and other diseases of grain.

4-H Looks Forward--(sound, color) 20 minutes.

Grain Thieves--(sound) 10 minutes.



How Seeds Germinate -- (silent) 15 minutes.

Killing Weeds With 2,4-D -- (sound) 20 minutes.

Lost Harvest -- (sound, color) 20 minutes. Subject: Smut and Seed treatment.

Plant Growth -- (sound) 11 minutes.

Reconditioning a Grain Drill -- (sound) 30 minutes.

Rural Rat Control -- (sound) 22 minutes.

Seed Certification in Nebraska -- (sound, color) 32 minutes.

Stem Rust -- (sound, color) 22 minutes.

Strips and Curves -- (sound, color) 32 minutes. Subject: Control wind and water.

These and many additional films can be ordered from University of Nebraska Audio-Visual Aids Department through the county extension office. A small service fee is charged.

#### VI. MACHINERY, LABOR, AND POWER COSTS

This table will serve as a guide for figuring a fair charge for the use of Machinery. One column is included here for labor in operating the machine. Another column lists approximate costs of getting the equipment ready and servicing it. If you rent the equipment enter the rental fee in the "cash expense" column on the "Expense" page. If you use Dad's machinery and tractor at no cash cost to you then, on the basis of costs listed below, make an entry in the "non-cash expense" column on the Expense page.

Cost per acre of doing work with various types of tractor-drawn equipment, Nebraska, 1951 (Power and Labor Costs are included.) From Nebraska Bulletin 413.

| Kind of Machine                               | Size      | Acres<br>per/hr | Use of<br>Machine | Power | Labor at<br>.90 p/hr | Prel.<br>Prep. | Total |
|---|-----------|-----------------|-------------------|-------|----------------------|----------------|-------|
| <u>Land preparation and tillage equipment</u> |           |                 |                   |       |                      |                |       |
| Disk, single                                  | 12 foot   | 3.5             | .14               | .28   | .26                  | .13            | .81   |
| Disk, single                                  | 15 foot   | 4.3             | .14               | .29   | .20                  | .12            | .75   |
| Disk, tandem                                  | 8 foot    | 2.4             | .20               | .40   | .37                  | .19            | 1.16  |
| Disk, tandem                                  | 10 foot   | 3.1             | .21               | .40   | .29                  | .17            | 1.07  |
| Harrow, spike-tooth                           | 18 foot   | 5.1             | .05               | .19   | .18                  | .08            | .50   |
| Harrow, spike-tooth                           | 24 foot   | 7.8             | .05               | .12   | .12                  | .06            | .35   |
| Harrow, spring-tooth                          | 12 foot   | 4.7             | .06               | .21   | .19                  | .09            | .55   |
| Harrow, spring-tooth                          | 18 foot   | 6.3             | .05               | .19   | .14                  | .08            | .46   |
| One-way disk                                  | 8 foot    | 2.9             | .17               | .42   | .31                  | .18            | 1.08  |
| One-way disk                                  | 10 foot   | 3.5             | .16               | .40   | .26                  | .16            | .98   |
| Plow, gang                                    | 2-16 inch | 1.1             | .37               | .88   | .82                  | .41            | 2.48  |
| Plow, gang, two-way                           | 2-14 inch | .8              | .79               | 1.21  | 1.13                 | .62            | 3.75  |
| Rod weeder                                    | 12 foot   | 4.5             | .06               | .28   | .19                  | .11            | .64   |
| Rod weeder                                    | 16 foot   | 6.6             | .06               | .18   | .14                  | .08            | .46   |
| Rotary hoe                                    | 7 foot    | 2.9             | .22               | .29   | .31                  | .17            | .99   |
| Stalk cutter                                  | 2 row     | 2.8             | .18               | .30   | .32                  | .16            | .96   |
| Subsurface tiller                             | 10 foot   | 3.0             | .20               | .41   | .29                  | .18            | 1.08  |
| <u>Seeding Equipment</u>                      |           |                 |                   |       |                      |                |       |
| Grain drill, press                            | 10 foot   | 2.9             | .33               | .34   | .31                  | .20            | 1.18  |
| Grain drill, press                            | 12 foot   | 3.3             | .32               | .37   | .27                  | .19            | 1.15  |
| Grain drill, press                            | 14 foot   | 4.9             | .32               | .25   | .18                  | .15            | .90   |
| Grain drill, semi-furrow                      | 14 foot   | 5.0             | .32               | .24   | .18                  | .15            | .89   |
| <u>*Harvesting Equipment</u>                  |           |                 |                   |       |                      |                |       |
| Combine, without motor                        | 6 foot    | 1.4             | 1.41              | .69   | .64                  | .55            | 3.29  |
| Combine, with motor                           | 6 foot    | 1.4             | 1.96              | .69   | .64                  | .66            | 3.95  |
| Combine, with motor,<br>2 men                 | 12 foot   | 2.7             | 1.96              | .62   | .90                  | .70            | 4.18  |
| Combine, self-propelled                       | 14 foot   | 3.6             | 2.21              | --    | .25                  | .49            | 2.95  |
| Grain binder, 2 men                           | 10 foot   | 2.4             | .84               | .40   | .75                  | .40            | 2.38  |
| Mower, mounted                                | 7 foot    | 2.4             | .36               | .36   | .37                  | .22            | 1.31  |