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## 4-H Soil Conservation Club Manual Second Year : Extension Circular 18-11-2

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1950

E. C. 18-11-2

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4-H

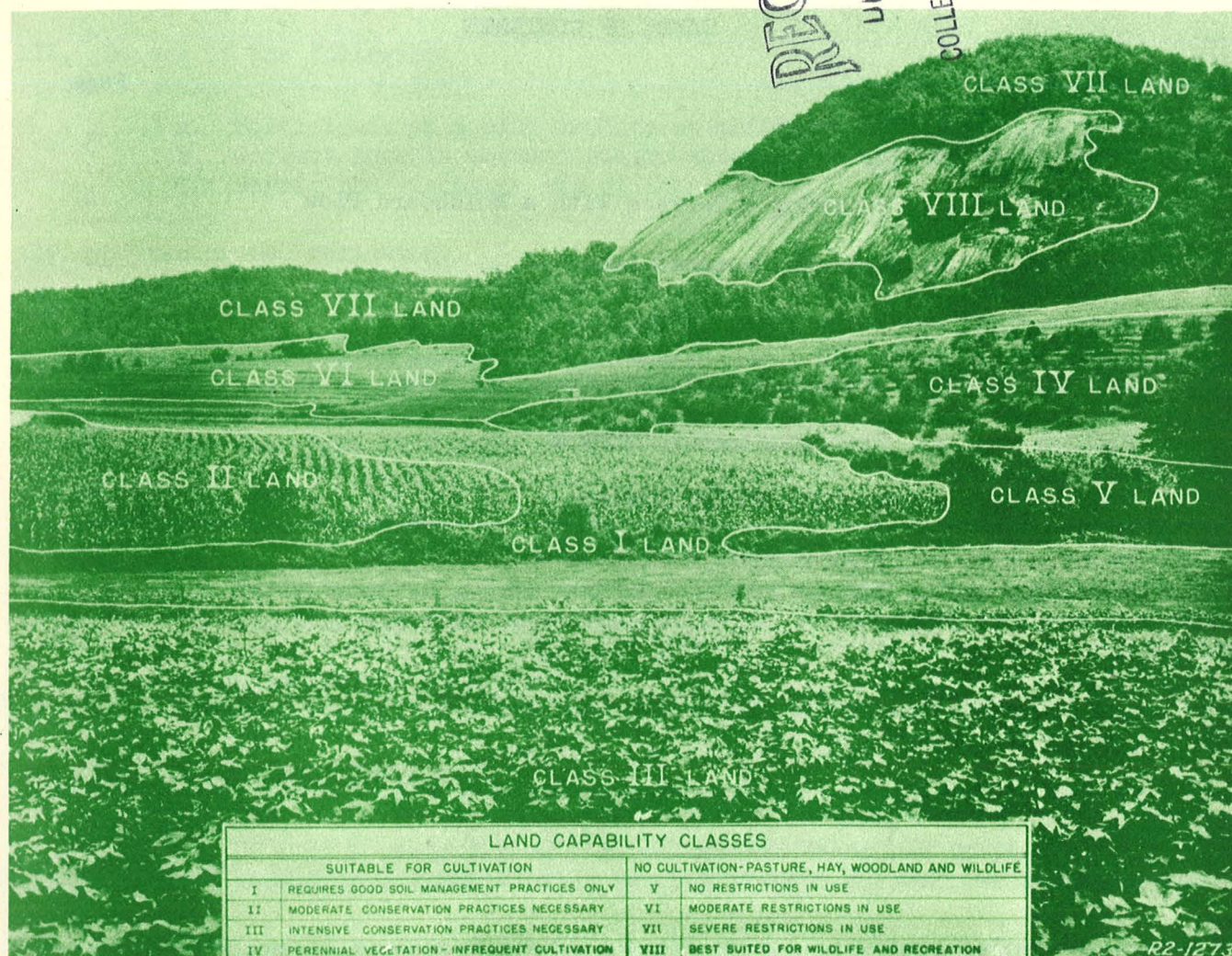
## SOIL CONSERVATION CLUB

## MANUAL

Second Year

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LAND CAPABILITY CLASSES			
SUITABLE FOR CULTIVATION		NO CULTIVATION - PASTURE, HAY, WOODLAND AND WILDLIFE	
I	REQUIRES GOOD SOIL MANAGEMENT PRACTICES ONLY	V	NO RESTRICTIONS IN USE
II	MODERATE CONSERVATION PRACTICES NECESSARY	VI	MODERATE RESTRICTIONS IN USE
III	INTENSIVE CONSERVATION PRACTICES NECESSARY	VII	SEVERE RESTRICTIONS IN USE
IV	PERENNIAL VEGETATION - INFREQUENT CULTIVATION	VIII	BEST SUITED FOR WILDLIFE AND RECREATION

R2-1273

COOPERATIVE EXTENSION WORK IN AGRICULTURE AND HOME ECONOMICS.  
 UNIVERSITY OF NEBRASKA COLLEGE OF AGRICULTURE, AND THE UNITED  
 STATES DEPARTMENT OF AGRICULTURE COOPERATING, W. V. LAMBERT,  
 DIRECTOR, LINCOLN.

E.C. 18-11-2

C-1



# ACKNOWLEDGEMENT

This circular was prepared under the direction of the Agricultural Extension Service of the University of Nebraska. It is built around an idea conceived by the Lancaster County Soil Conservation District and the Lancaster County Extension Service. All of the problems have been written so that the principles will apply in any section of Nebraska. The Agricultural Extension Service deeply appreciates the assistance given by the U. S. Soil Conservation Service and the Nebraska Game, Forestation and Parks Commission.

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## CLUB REQUIREMENTS

### Problem

- I. Assist in building a terrace. The best solution to this requirement is for the member to build a terrace on his home farm. If this can't be done, the member should assist or observe the building of a terrace on a neighbors farm and become thoroughly familiar with the procedure. Any appropriate farm machine may be used. The moldboard plow method is presented in Problem I.

Take part in scoring a terrace.

- II. Do or assist with some of the farming operations on terraced land. Follow the procedures outlined in Problem II. You may substitute other procedures that are recommended by your Soil Conservation District.
- III. Do one of the following:
- A. Participate in a club problem of maintaining a terrace by plowing.
  - B. Correct lows in terrace ridges and high points in channels.
  - C. Repair the discharge end of the terrace.
- IV. Do two of the following:
- A. Assist in planning a pasture program for your farm using warm and cool season grasses, supplemental feed, and temporary pastures.
  - B. Assist in preparing and seeding five acres of permanent pasture.
  - C. Set up a system of rotational grazing on your farm.
  - D. Take part in a grass identification contest.
- V. Do one of the following:
- A. Participate in a club problem of setting out a farm windbreak. You can probably find some farmer in the neighborhood who wants a windbreak established. The club leader or program committee can make the arrangements with him.
  - B. Help care for a windbreak that is already established.
- VI. Do one of the following:
- A. As a club group put on a demonstration described on page 28.
  - B. Assist in a stubble mulch farming program on your own farm.
- VII. Hold a group discussion with Soil Conservation personnel about the conservation farm or ranch plan.
- VIII. Hold an achievement day. See the first year Problem VII for suggestions. You may substitute a club tour--see the first year Problem VI for instructions.



## Problem I

### BUILDING A TERRACE WITH A MOLDBOARD PLOW

The ordinary moldboard plow is a piece of farm machinery that every farmer has. It will build a very good terrace. Several methods of constructing terraces with a moldboard plow have been developed. All of the methods have some advantages. The island method described below is the most common in Nebraska. This method may be varied to meet different conditions.

The grassed waterways that drain the terraces must be established properly. Before attempting to establish a terrace, call upon your U. S. Soil Conservation Service office for assistance. The Soil Conservation Service will also be available to assist you with the construction of your first terrace.

The soil should be in good plowing condition and any heavy vegetative cover should be mowed and raked from the proposed terrace site. Discing the area may be sufficient where the vegetative cover is quite light.

A tractor with adequate power to travel along at a good speed is important. The plow will scour better and throw the loose soil rather than push it.

The plow should have a good polish on the moldboards. For best results high clearance in the plow is desirable. Remove the rolling coulters and jointers. The plow should be set to move a maximum amount of soil -- deep enough to place the bottoms in undisturbed earth, but not to depth that will slow the tractor speed or allow soil to fall back into the furrow. CAUTION: Do not plow over 4" deep in the first series. Plowing too deep in the first series will prevent the bottoms from going into the hard ground on the following series. The hard or undisturbed ground aids plow scouring. Packing the terraces during construction will also aid the scouring of the plow.

Here are a few definitions which will help you to understand this problem. Study them carefully.

**Series:** As used here this term means a group of 4 rounds made with a moldboard plow in building a terrace.

**Gradient Terrace:** A terrace which is laid on a grade to allow drainage.  
**Example -** a terrace laid on a .4% grade would have a fall of .4 of a foot in 100 lineal feet toward the waterway.

**Island:** That portion of undisturbed land left between the furrows made by a complete round when building a terrace.

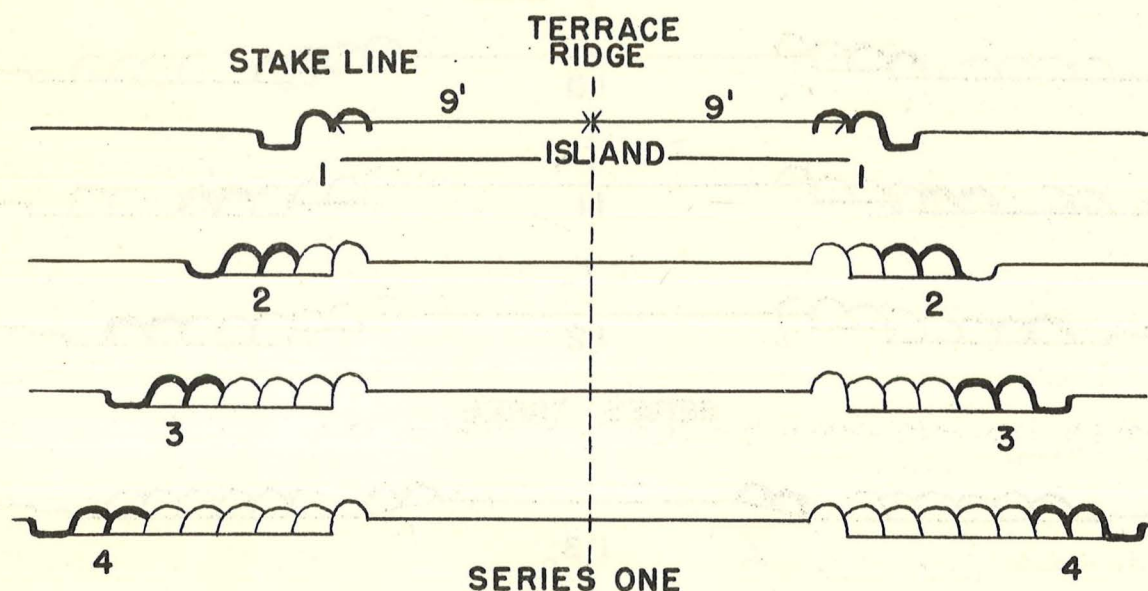
The diagrams on the following pages show in detail the steps to be followed in building a terrace with a moldboard plow. The heavy lines in each sketch indicate the furrows that are being turned by the plow. The lighter lines indicate those that have been turned. Ten different series are presented. Each series is made up of four rounds.



# Series I

Round 1. Most gradient terraces are staked on the terrace channel. Therefore, as the diagram below shows, the first round is made on the stake line throwing the soil down the slope. The return trip on round 1 is made 16 to 18 feet downhill from the staked line. The ground is plowed uphill. Measure carefully and maintain an even width of the island that is formed.

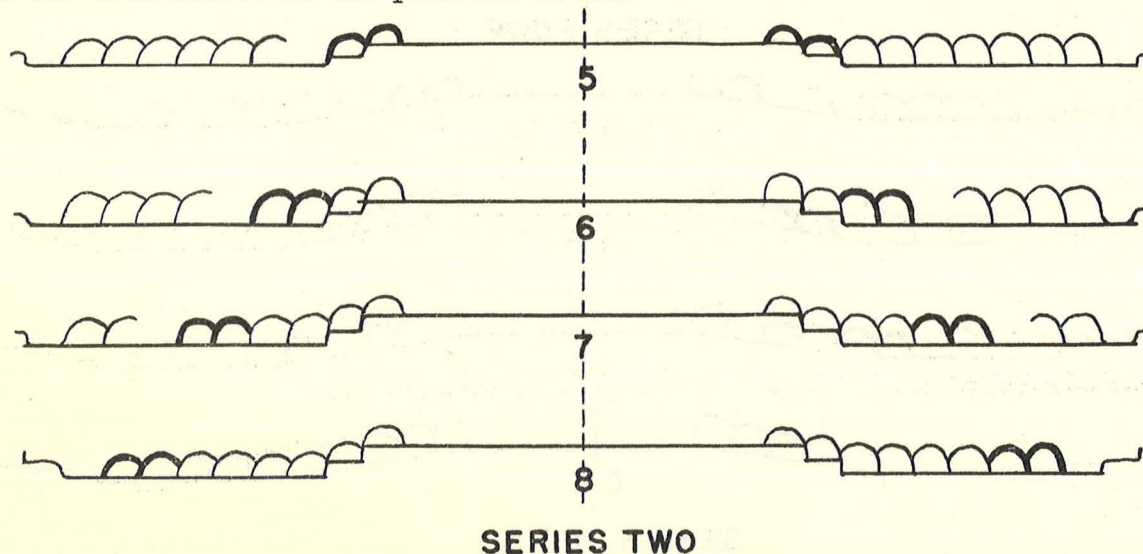
Round 2, 3, and 4. Continue to plow on the outside of round 1. Plow as one normally plows a field; that is, the furrow wheel of the plow is placed in the dead furrow of the previous round.



# Series II

Round 5. Round 5 starts a new series. In starting round 5 you must use care. Much of your success depends on the placing of the plow in this series. Here the plow is placed so it moves the same soil as moved in round 1. In case of 14 inch bottom plows, the plow is started 14 inches nearer the center of the unplowed area or island than on round 1. Thus the back plow is in the furrow cut made by the front plow in round 1, and the front plow is cutting into the undisturbed soil covered by the front moldboard in round 1.

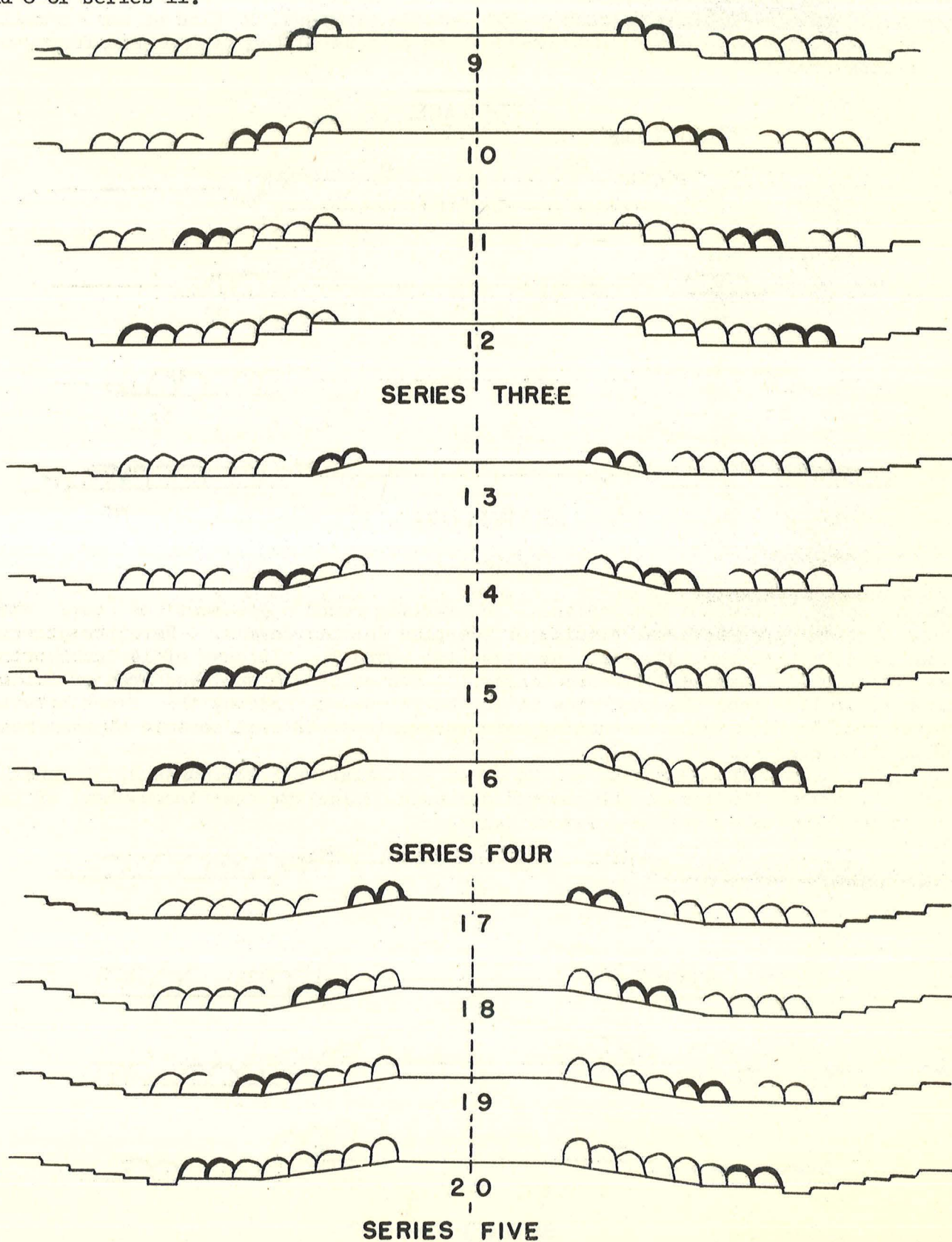
Round 6, 7, and 8. These rounds are made in a similar way to rounds 2, 3, and 4. That is, continue to plow on the outside of round 5 placing the furrow wheel of the plow in the dead furrow of the previous round.



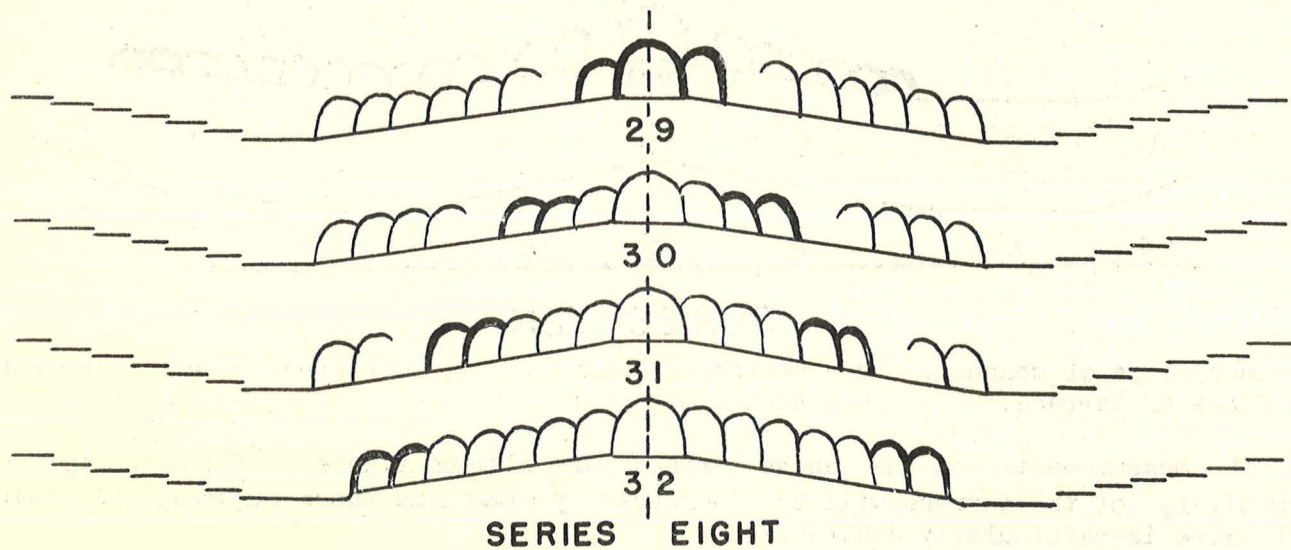
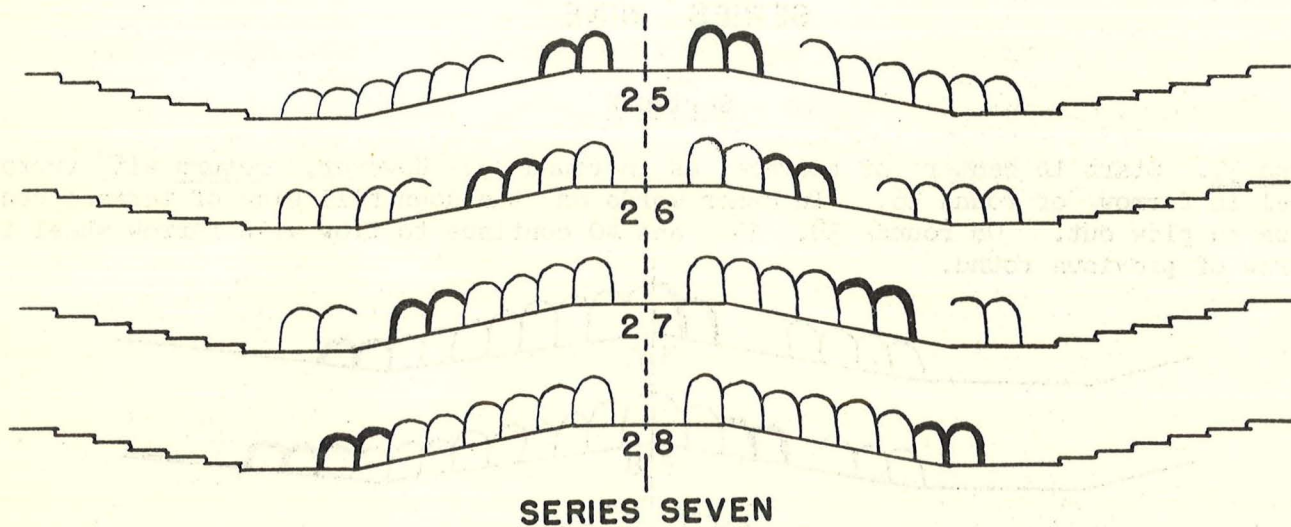
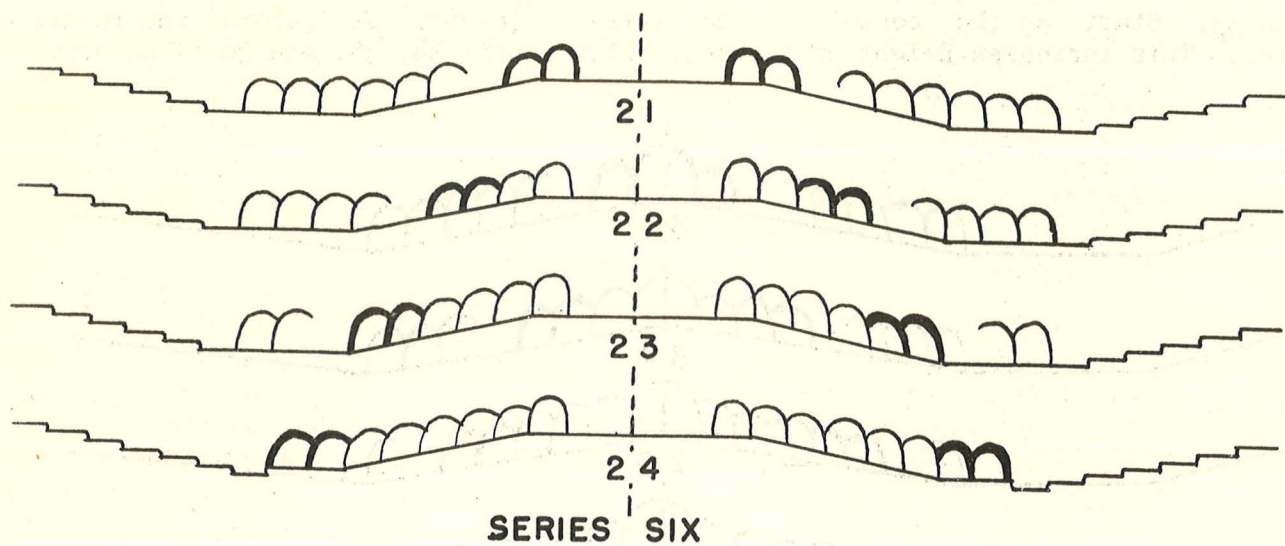


Series III, IV, V, VI, VII, and VIII.

Start the first round of each of these series in the same manner as round 5. That is, the plowing commences 14 inches closer to the center of the island in each following series until the island is closed. The 2nd, 3rd and 4th round of each series is plowed in the same manner as rounds 2, 3 and 4 in Series I, and rounds 6, 7 and 8 of series II.



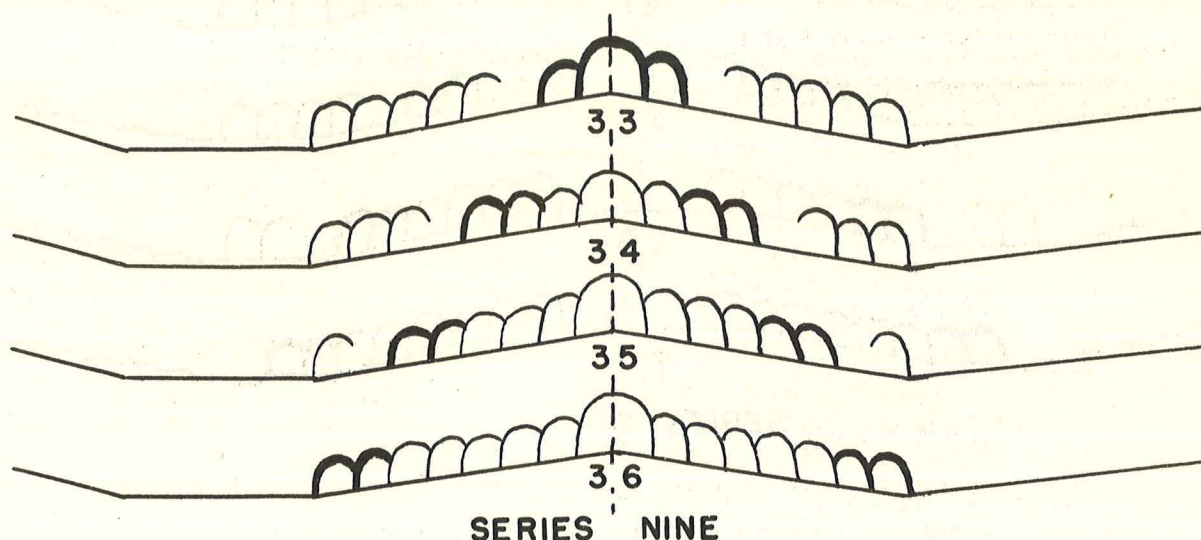






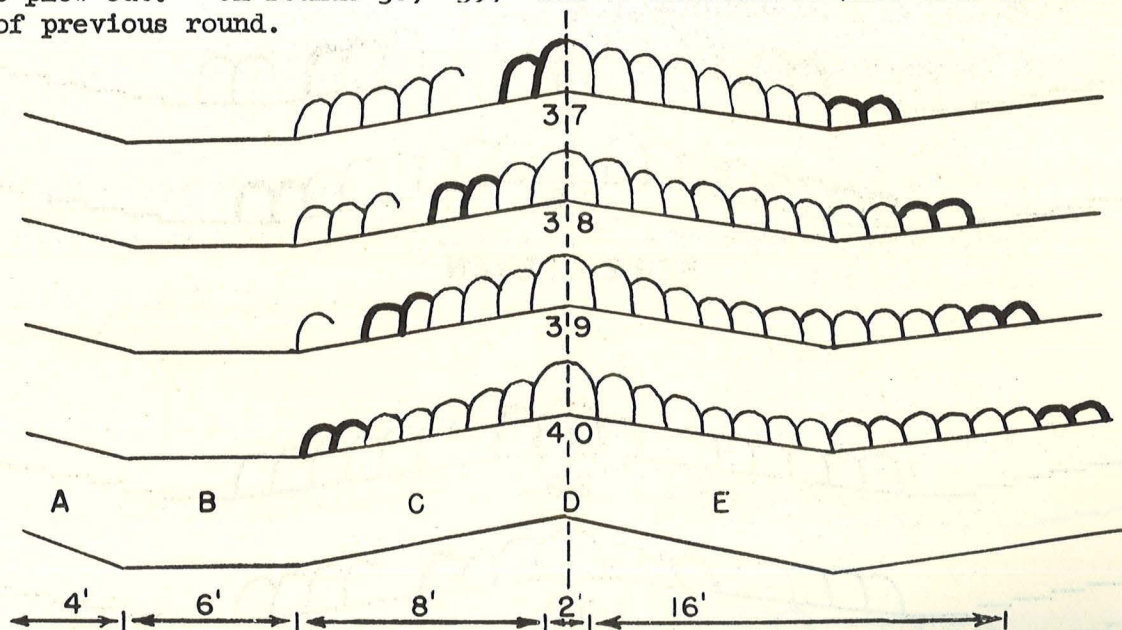
Series IX

Round 33. Start at the center of the terrace (center of island) and return on center. This increases height of terrace. Plow rounds 34, 35, and 36 as before.



Series X

Round 37. Start in center of terrace as in round 33. However, return with furrow wheel in furrow of round 36. In other words on the down hill side of terrace continue to plow out. On rounds 38, 39, and 40 continue to plow with furrow wheel in furrow of previous round.



A - Back slope of channel.    B - Bottom of channel.    C - Front slope of terrace  
D - Ridge of terrace.    E - Back slope of terrace.

The measurements on the above terrace are minimum figures. The capacity and farmability of the terrace will be increased by exceeding those figures. A longer back slope is particularly desirable.

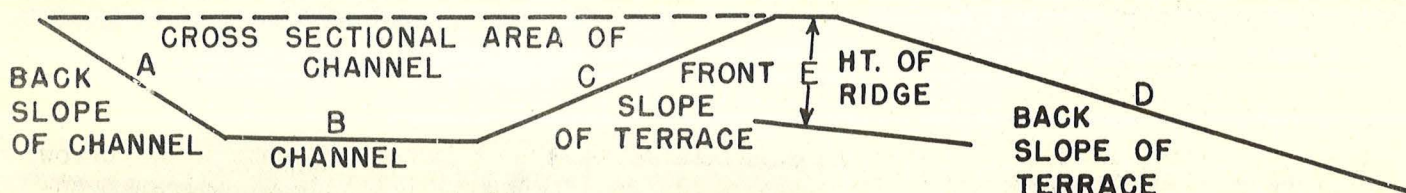


### Scoring a Terrace

In order to be able to build a good terrace we must, of course, know the parts of one and how these parts should be built. A terrace should be built to do the job for which it was intended and at the same time allow continued cultivation with ordinary farm equipment.

Scoring a terrace is similar to judging in some of the other 4-H clubs. A club member learns to know good quality. This makes an excellent problem for your meeting. Below is a suggested procedure to use in scoring a terrace to find out if it does meet the necessary requirements.

A terrace is scored by its cross section. What is a cross section? If you were to cut an iron rod in two and look at it from one end, you would see a circle which is known as the cross sectional area of the iron rod. If you cut a terrace in two and look at it from one end, you would see something similar to the cross section shown below.



#### Directions:

1. Estimate distances in feet.
2. Estimate height of terrace ridge in inches.
3. Estimate cross sectional area of channel in square feet.

Observe a terrace closely and score it using the following form.

- |                                    |                   |
|------------------------------------|-------------------|
| a. Back slope of channel           | _____ feet        |
| b. Channel                         | _____ feet        |
| c. Front slope of terrace ridge    | _____ feet        |
| d. Back slope of terrace ridge     | _____ feet        |
| e. Cross sectional area of channel | _____ square feet |
| f. Height of terrace ridge         | _____ inches      |

After you have made your estimates, measure the terrace with a tape and compare your answers. Invite a Soil Conservation Service man to be present at the meeting and help with the problem.

Compare this terrace with the good typical broadbase terrace described on page



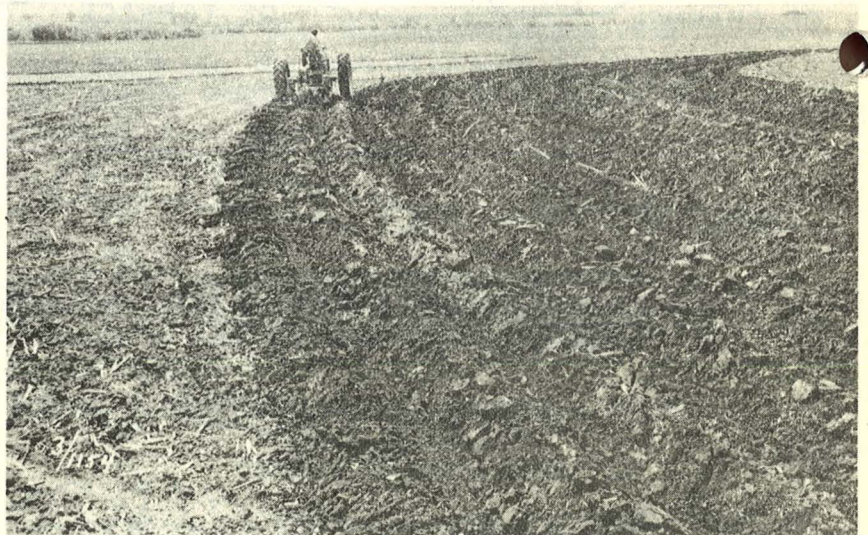
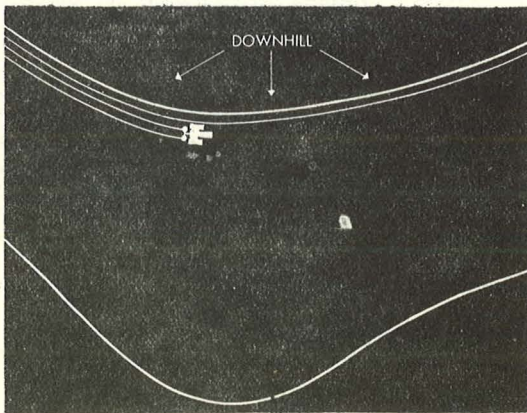
Problem II.

FARMING TERRACED LAND

Almost everything made by man requires some care and repair to keep it usable. This is true of buildings, fences, and earth structures such as terraces. Terraces not only suffer a certain amount of natural erosion, but are subjected to the various farming operations which tend to level them out. Terraces cannot perform the job for which they are intended unless a reasonable height is maintained.

It is desirable to learn to farm terraces in a way that is least harmful to them. It is also important to learn the least difficult way of farming terraced land.

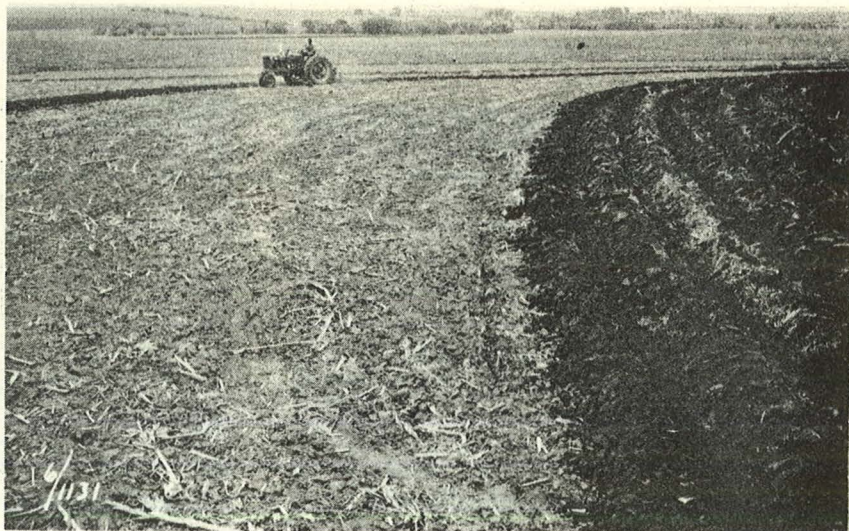
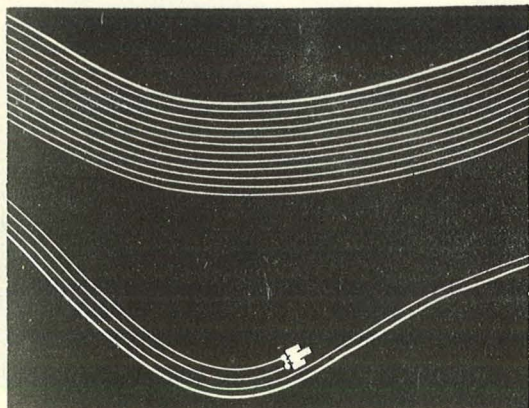
The pictures and sketches shown on this and the following page illustrate a very desirable way of listing terraced land. The same principles should be kept in mind in other farming operations. The explanation is given below each picture.



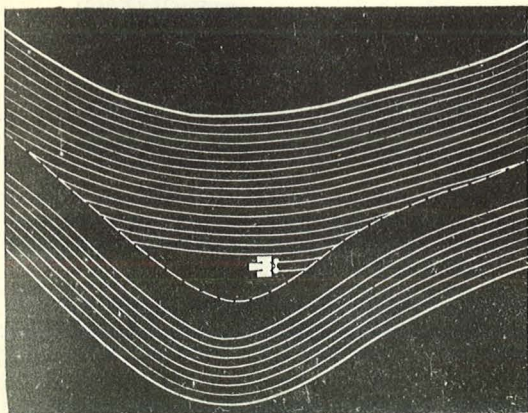
Step 1. Start listing at the upper guide line or terrace ridge. List down from the terrace ridge one-half to two-thirds of the distance to the next lower terrace.

List from the upper terrace to the top of the field.



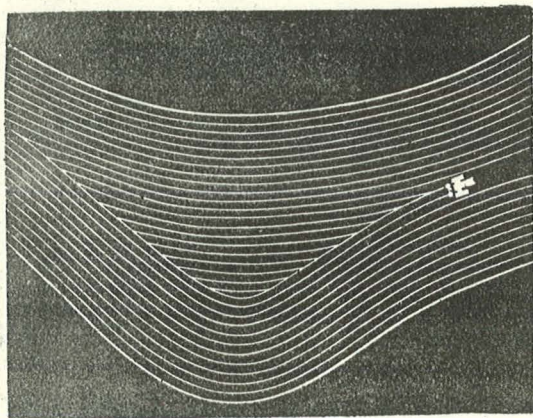


Step 2. List up from the next lower terrace one-third to one-half of the distance to the terrace above or work uphill until there is room for only 4 rows at the narrowest point.



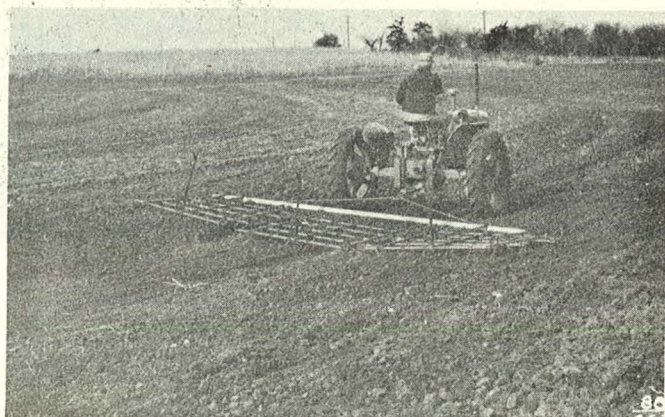
Step 3. Now go back up and list out the point rows beginning at the upper rows and working down. Stop the point rows so as to leave a turn-row 4 rows wide. The 4-row turn row permits turning on unworked ground.





Step 4. When the point rows are finished, list out the 4-row wide turning strip. When cultivating, the 4 rows on the turning strip may be levelled with a harrow or other implement. The corn may be picked first from the last 4 rows planted in the turning area. This will leave a place to turn with the corn picker. If a wider turning strip is needed, more than 4 rows may be used.

All Farming Operations Should Follow the Contour  
and be Parallel with the Terrace



Harrow on the contour

Drill on the contour



Problem III

MAINTAINING TERRACES

Terraces must be continuously maintained. Here are some of the reasons:

1. Repair breaks in the ridges caused by overtopping water.
2. Correct silting or cutting in the channel.
3. Stop reduction of ridge height through erosion or travel of machinery.
4. Improve the terrace cross-section so it can be easily farmed without side slip of the machinery.

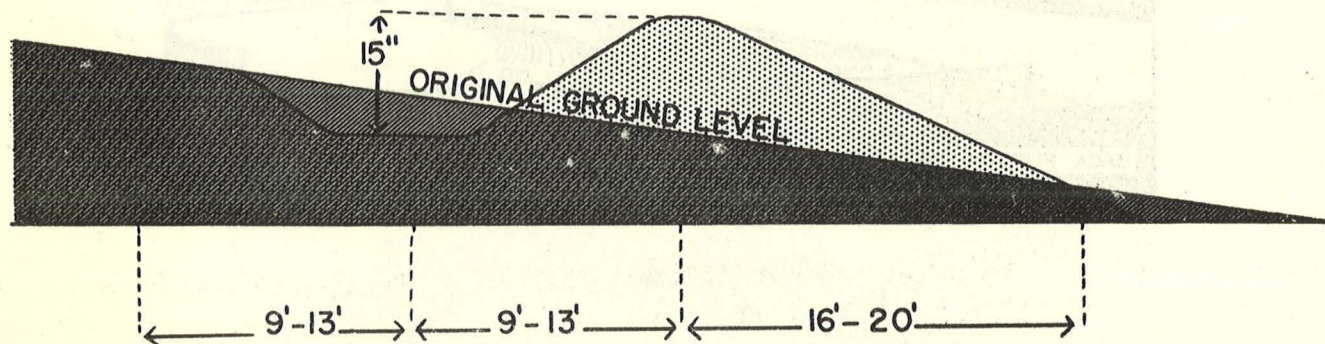
Some of the maintenance may be done with special equipment at a suitable time of the year, but much of the annual repair can be accomplished with a plow, disc, one-way, or similar equipment while the field is being prepared for planting to crops.

Correcting Lows in Terrace Ridges and High Points in Terrace Channels

Low spots in ridges must be filled to match the rest of the terrace on both sides of this area. Extra height should be added to this fill to take care of settlement. High spots in the channel must be removed to create a uniform flow of water.

Maintaining the Ridge Height and Width

If the entire terrace ridge is less than 12 inches above the bottom of the channel, equipment must be used to increase the height and widen the base of the fill. The following sketch shows slope widths and heights that should be maintained.





The top of the ridge and bottom of the channel must be well rounded rather than peaked. This gives the terrace greater stability and carrying capacity. The wider based terraces are easier to build on land with long gentle slopes.

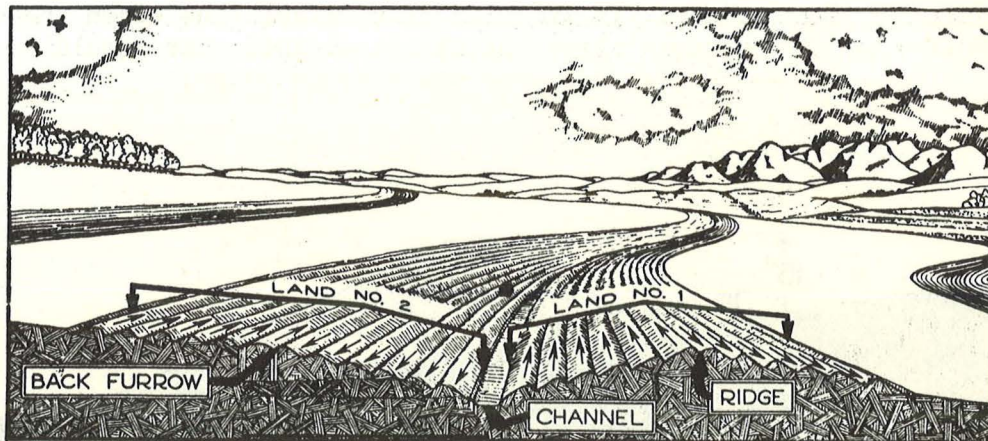
#### Discharge End of Terrace

The discharge end of the terrace must be re-shaped occasionally so that the full flow of water will enter the terrace outlet in a wide thin sheet. Any obstructions in width or depth should be removed so this part of the terrace will not "bottle neck" the flow of water. Reseeding or sodding along with the re-shaping may be necessary.

#### Maintain Terraces by Plowing Properly

The terrace cross-section can be greatly improved and maintained by properly using farm machinery in preparing the seedbed, planting, and harvesting the crop.

The "two land" method shown below is an excellent way of maintaining terraces by plowing properly.

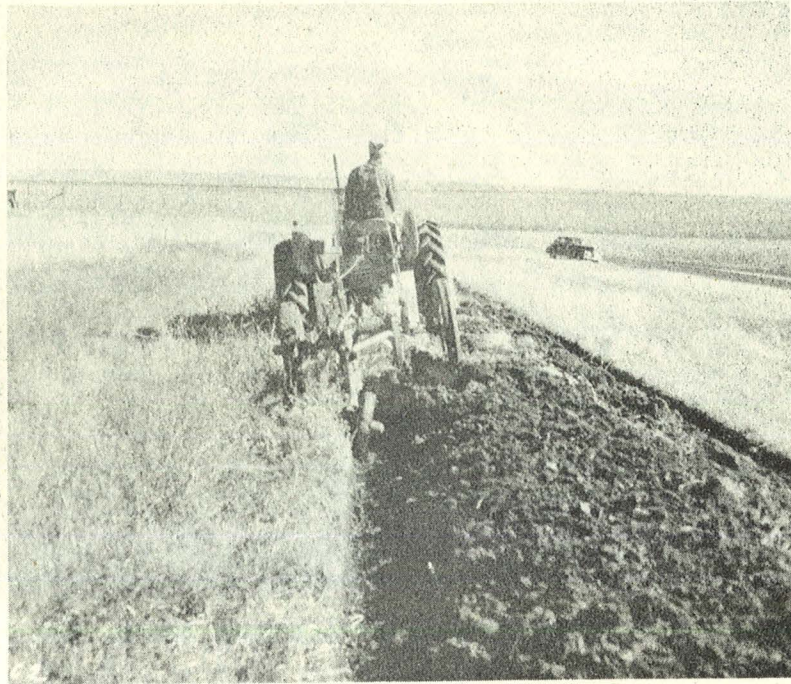


#### Two Land Method Maintaining Terraces by Plowing

This method can be varied from one year to another so that the dead furrows and back furrows are not in the same place each year.

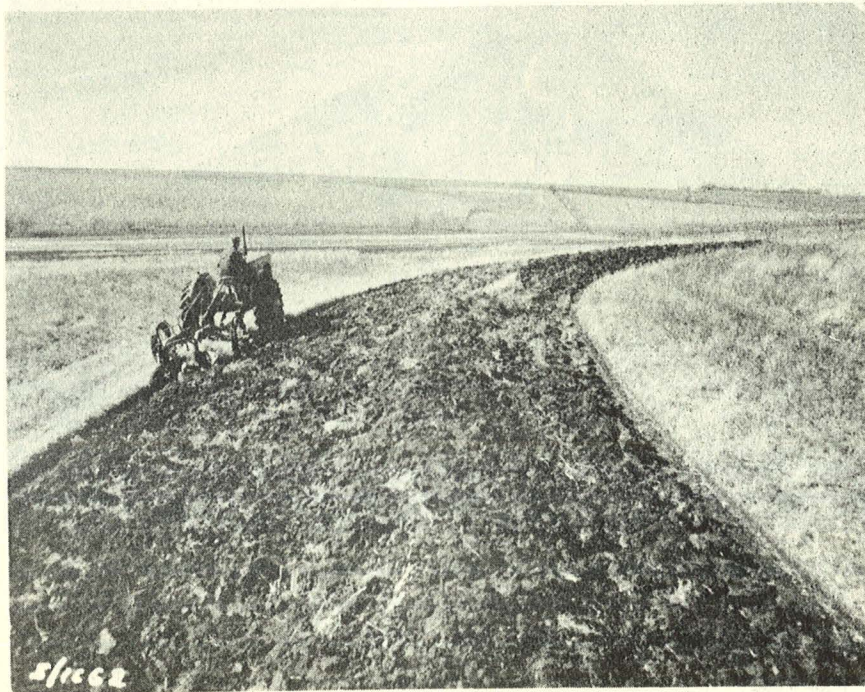


Shown here are some actual photographs of the "two land" method of maintaining terraces.



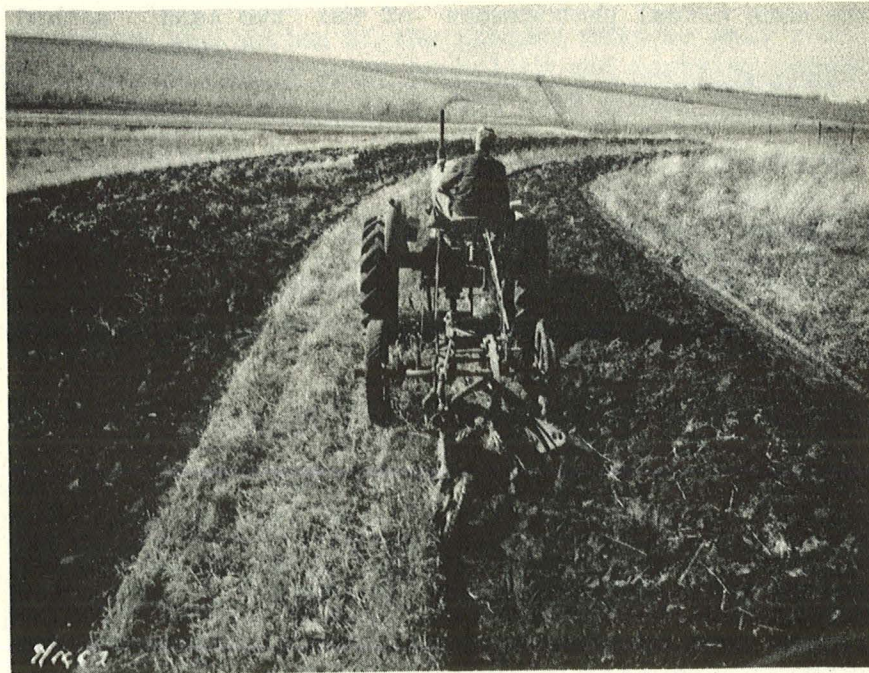
Start to plow by backfurfrowing to the terrace ridge.

CAUTION: On the return trip of backfurfrow do not lap soil on top of that of the first trip. Doing this increases the width of the terrace ridge.

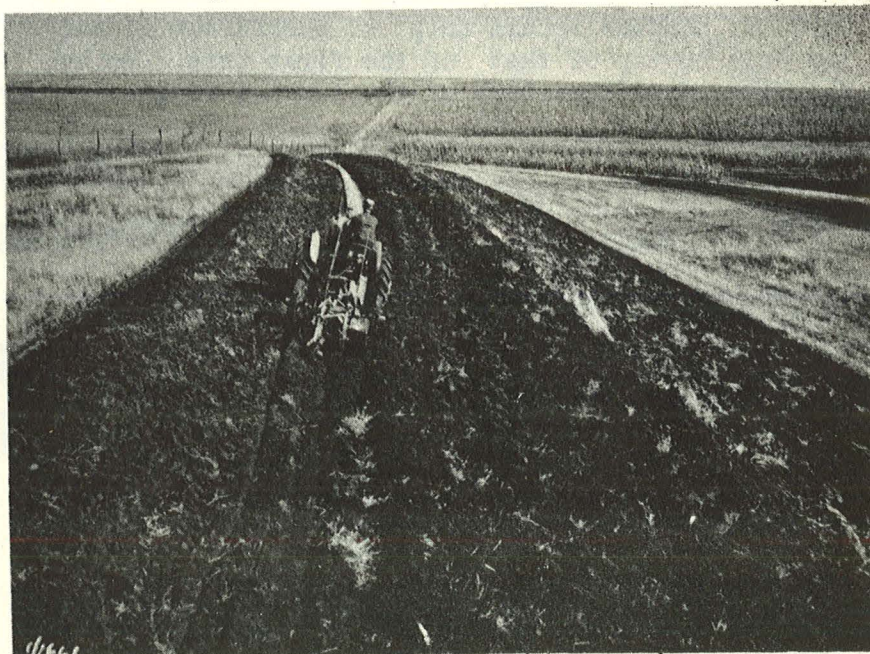


Plow 3 to 5 rounds or enough to leave the furrow in the bottom of the channel.





Start to plow a new land several rounds above the terrace channel turning the soil uphill. On the return trip do not make a ridge with the back-furrow. When plowing in the future, change the distance of the back furrow from the channel to avoid making an undesirable ridge.



Continue plowing along this land. The dead furrow will then be in the terrace channel. When plowing is completed, the terrace ridge will have from six to eight inches more height above the channel than before.

Turn row areas between terraces and at the edge of the field can be seeded to grass as a seed source area, hay, or grazing areas. The grass turn rows make conservation farming easy and conserve soil and moisture.



Problem IV

GRASS AND YOUR PASTURE

Good pasture can be our most profitable crop. For this reason alone, proper pasture management is very important to Nebraska Farmers. Not only do pastures offer a good income through the use of livestock but they may produce a cash seed crop. In addition to this and no less important is the fact that a good grass cover is an effective means of conserving soil and moisture. Certain practices must be followed if highly productive pastures are to be established and maintained to successfully carry out a good grazing program. It is important to know something about the different grasses and their growing habits. In the first year 4-H Conservation Club Manual we discussed cool and warm season grasses. Cool season grasses are those grasses which grow mainly during the cool part of the growing season. They begin growth early in the spring and set seed by July and are dormant for the remainder of the summer. They put on new growth as cooler weather approaches in the fall. Warm season grasses put on 90% of their growth during June, July, and August or during the hot part of the summer. It is not recommended that cool and warm season grasses be seeded in the same mixture. It is easy to understand how cool season and warm season grasses might both be used on a farm to work out a good pasture program.

We might also divide grasses another way, namely, native and introduced grasses. Native grasses are those which nature established and were common and covered the prairies when the pioneers settled the country. Introduced grasses are those grasses which were brought in from other areas having similar climate and growing seasons. Bromegrass is our best example of an introduced grass. It was brought to this country from Austria in about 1898.

Below is a chart which gives you a classification of some of the more common grasses we use in Nebraska.

WARM-SEASON

<u>Native</u>	<u>Introduced</u>
Big bluestem	
Little bluestem	
Sandhill bluestem	
Blue grama	
Hairy grama	
Side-oats grama	
Buffalograss	
Switchgrass	
Sand lovegrass	
Indian grass	
Sand reedgrass	
Sand dropseed	

COOL-SEASON

<u>Native</u>	<u>Introduced</u>
Western wheatgrass	Bromegrass
Reeds Canary grass	Intermediate wheatg.
Sloughgrass	Crested wheatgrass
Bluegrass	Tall wheatgrass
Orchardgrass	Russian Wildrye
Feather bunchgrass	
Canada wildrye	
Junegrass	

The objective in the management of pasture should be to secure the greatest possible returns from livestock grazing on them without decreasing the productivity of the forage plants. To accomplish it is necessary to use such grazing methods as will permit the forage plants to make enough top growth to maintain their vigor. A critical period in the life of a perennial pasture plant is in the spring of the year when new growth is taking place. During this time the plant rapidly depletes the stored food reserves in the roots. If the plant is permitted to make enough top growth, food will again be stored in the roots. Therefore livestock should not be turned into permanent pasture in spring until it has made a growth of four or five inches. Likewise pastures which have been grazed heavily during the summer and fall



have low food reserves in the roots and go into the winter in weak conditions. Grasses should therefore have at least a 4 inch stubble growth when they go into the winter. Cool season grasses can usually be grazed three or four weeks earlier in the spring than most warm season grasses. The time when livestock can be turned on pasture, however, varies with the seasonal conditions. Whenever cool-season grasses reach a height of four or five inches they are ready to graze. This will usually be in the latter part of April. Warm-season grasses should generally not be grazed till after the middle of June.

Temporary Pastures and Supplemental Feed: Care should be taken throughout the grazing season to avoid over-grazing. It may be necessary to provide temporary pasture or supplemental feeds to help maintain the livestock during the hot summer months, early spring and late fall.

Hay or silage make excellent supplemental feeds or there are several crops that may be used for supplemental or temporary pastures.

Rye is among the most important of the temporary pasture crops. Planted late in the summer it commonly provides a limited amount of grazing during the fall and is usually very productive during the early months of the following spring before perennial grasses can or should be grazed.

Sudan grass provides excellent pasture during the hot summer months of July and August. It is during this period that brome grass becomes more or less dormant and makes very little if any growth. Sudan grass however is susceptible to chinch bug injury.

Sweetclover can be used as pasture supplement--either first year sweetclover or second year sweetclover. First year sweetclover provides pasture in the late summer and early fall where as second sweetclover can be grazed from the latter part of April until late in July. When pasturing sweetclover there is some danger of bloat. The risk can be reduced by following proper grazing practices.

Grazing Practices: Overgrazing may be taking place without being evident in the earlier stages. In overgrazing pastures the root systems of plants become reduced in extent with the result that the pastures gradually become less productive. With very little top growth present, much of the precipitation runs off rolling land. Ultimately, the pasture plants become so weakened that weeds begin to come in. Occurrence of extremely hot and dry weather may result in the total loss of such a pasture, whereas pasture in a healthy condition with some top growth for protection might survive.

There is a second advantage to be gained from not stocking pastures too heavily. If less stock is put in, the grazing season can be lengthened. For example, a pasture stocked to capacity may provide no grazing after the first of October, whereas the same pasture used less intensively might be grazed until the first of December.

Rotational Grazing: That is, dividing a large pasture into two or three smaller units and then grazing these periodically in succession helps to keep pastures in a productive condition. It has been shown experimentally that a given area of pasture land will produce more forage if the area is divided into two or three smaller units and these are grazed alternately than if the entire area is grazed continuously. Rotational grazing has proven especially good on brome grass pasture which has some alfalfa on it. Brome grass pastures alone usually fall off in production after two or four years or become what is known as "Sod Bound." Alfalfa with brome tends to retard this condition. In order to keep the alfalfa in the brome however, grazing must be



regulated. Rotation grazing is most effective in doing this. Grazing three or four smaller units in rotation gives each of these units a rest period several times during the grazing season and eliminates overgrazing to a large extent.

Weed Control: Weeds do not ordinarily offer a serious problem in pastures which are properly grazed. Grass in a thriving condition grows vigorously and covers the ground so completely that weeds cannot become well established. A pasture may become very weedy as a result of overgrazing or repeatedly grazing too early in the spring. Effective weed control methods vary with growth habits of different weeds. A characteristic, such as the length of life of a weed influences materially the type of control practices which are most effective.

Besides mowing, chemical weed spraying has good possibilities depending on the species of weeds to kill. It should be remembered that chemical weed sprays will kill most legumes. Therefore, pastures containing alfalfa or clover should not be sprayed. Ref: "Weed Control in Nebraska," E. C. 179.

Other Management Practices: Burning: Burning of pastures is a harmful practice under most conditions. Any possible advantages of burning are usually more than offset by the disadvantage. Burning exposes the soil and as a result erosion takes place. Besides this, burned areas lose moisture rapidly through run-off and evaporation. Burning may also result in injury to the grass plants.

Water and Salt: Uniform grazing of pasture and range is very important in getting maximum production over a long period of time. On range and large pastures place salt away from water and out on range or pasture to induce more uniform grazing and prevent excessive grazing and trampling around water.

Bloat: Bloat is a constant worry to farmers who are pasturing a legume. Many cattle have been lost from bloat but there is little danger if a few precautions are used. Never turn cattle on a legume pasture when they are hungry. Give them a full feed of hay before turning out. Always keep dry roughage before the cattle even when they are on pasture. Provide plenty of water and salt. Once you have turned on legume and grass pasture leave the cattle on it. Don't take them off for a few days and then turn back on again.

#### Establishing New Pastures

Choose seed of adapted grasses and legumes. Contact your Soil Conservation District for recommended grasses and grass legume mixtures for your area.

Prepare a firm, mellow moist, weed free seedbed. A seedbed with a residue or mulch on the surface is most desirable. Make sure the seedbed is firm and well packed. This is the most important factor in seeding grass.

Plant the seed with a drill or broadcast it and pack and cover with a treader, harrow or land roller. The rate of seeding will vary with the kind of grass and the area where you live. See your local Soil Conservation District for recommended seeding rates. Cool season grasses and alfalfa should be planted in the fall between August 20-October 10. They may be planted in early spring about oat planting time. Warm-season grasses should be planted in the spring only about the time we plant corn. Sand lovegrass is an exception and should be planted as early in the spring as possible.

Cool season grasses should be planted, about  $3/4$  to 1 inch deep in heavy soils and 1 to  $1\frac{1}{2}$  inches deep in sandy or light soils. Warm season grasses should be planted  $\frac{1}{4}$  -  $\frac{1}{2}$  inches deep in heavy soils and  $\frac{1}{2}$  to 1 inch deep in sandy, light soils.

Consider and study the pasture program on your farm. Consult your Soil Conservation District or County Agent for help in working out a successful pasture program.



## Problem V

### THE FARMSTEAD WINDBREAK

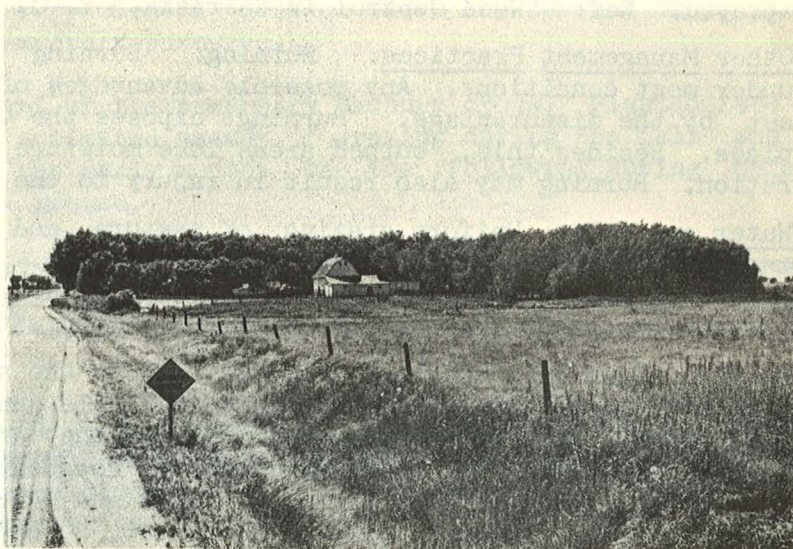
#### Why a Windbreak?

A good farmstead windbreak will make living conditions more pleasant for the farm family. It will also add much beauty to a farm or ranch.

#### Location

The windbreak should be planted on the north and west sides of the farmstead. This protects the buildings and livestock from winter winds. A narrow, low, dense windbreak on the south and west sides of a garden and fruit planting will be worth while for protection from the drying winds of summer.

The first row of the farmstead windbreak should be about 100 feet from the buildings and lots that are to be protected. A garden windbreak needs to be close to the area that it protects.



An excellent farmstead windbreak. Note protection offered from both north and west.

#### Density is Needed

Some of the plantings in the windbreak should be planted close together. This is called density.

Good density is needed to prevent snow from being driven through the plantings and being piled into the lots and around buildings. Some of the plantings that we have today lack density on the outside or windward side. This can be corrected by adding some more plantings. A row of red cedar or a dense shrub row, such as lilac, spiraea, or wild plum will help to stop the wind.

#### The New Windbreak

A good many farmsteads have no windbreaks at all. A new planting of a few rows which include some fast growing broadleaf trees and some evergreens will give protection in a short time and will make the farmstead more attractive.



### Number of Rows -- Arrangement and Spacing

Some farmers may prefer a narrow windbreak of three or four rows. This is especially true if the land is valuable for raising crops. Such a windbreak is effective if it is of the proper density and includes at least one row of evergreens. In other cases a wider planting is desired.

Suppose a five row farmstead windbreak is decided upon. The row next to the buildings should be either Austrian or Ponderosa pine planted about 15 feet apart in eastern Nebraska. Ten to twelve feet apart is better for the drier areas farther west. The row next to the pines may be hackberry, thornless honey locust, or ash. The next two rows may be Chinese elm and Russian olive--The Chinese elm being planted in the center. A good spacing for these trees is 10 feet apart in the row. The outside row should be red cedar planted about 6 feet apart in the row. However, red cedar should not be planted in the commercial apple growing section of southeast Nebraska because of its connection with the "cedar-apple" rust. In this area something that will form a dense hedge row such as Russian mulberry, caragana, spiraea, or multiflora rose should be substituted for the red cedar.

It is well to leave a space of at least 20 feet between the pine and the first row of broadleaf trees in order that the pines may grow without hindrance. Sixteen to eighteen feet between the other rows should be satisfactory in eastern Nebraska where conditions are more favorable to tree growth. However, in the drier situations farther west a wider spacing such as 25 or more feet between rows is advisable in order to permit continual annual cultivation between rows. Local conditions of soil and moisture will tend to vary these recommended spacings one way or another.

To conserve soil and moisture it is well to plant the tree rows on the contour. Corners should be rounded or the entire row planted on a uniform curve. It will make cultivation easier if there are no square corners to interfere.

### Ground Preparation

Ground where trees are to be planted should be in a good state of cultivation. It is advisable on hard land to fall plow or list. This leaves the ground rough to catch moisture. On sandy land where there is danger of wind erosion, fall plowing or listing is not advisable. In such situations, plow or list a strip 6 or 8 feet wide for each tree row.

### When to Plant

Early spring is considered the best time to plant trees in Nebraska.

### Handling and Planting Trees

Keep tree roots moist by covering them with a wet burlap sack or by placing the bundle of trees in a bucket of water. Carry the bundle or bucket of trees to the field. Then take one tree out at a time and plant it.

When planting, spread the tree roots in a natural position and hold the tree so that it will be at least as deep as it stood in the nursery. Cover the roots with moist soil and pack it solid as the hole is being filled. Water each tree before the hole is entirely full. After the water settles, some loose soil should be added and left loose and slightly cupped to catch rainfall.

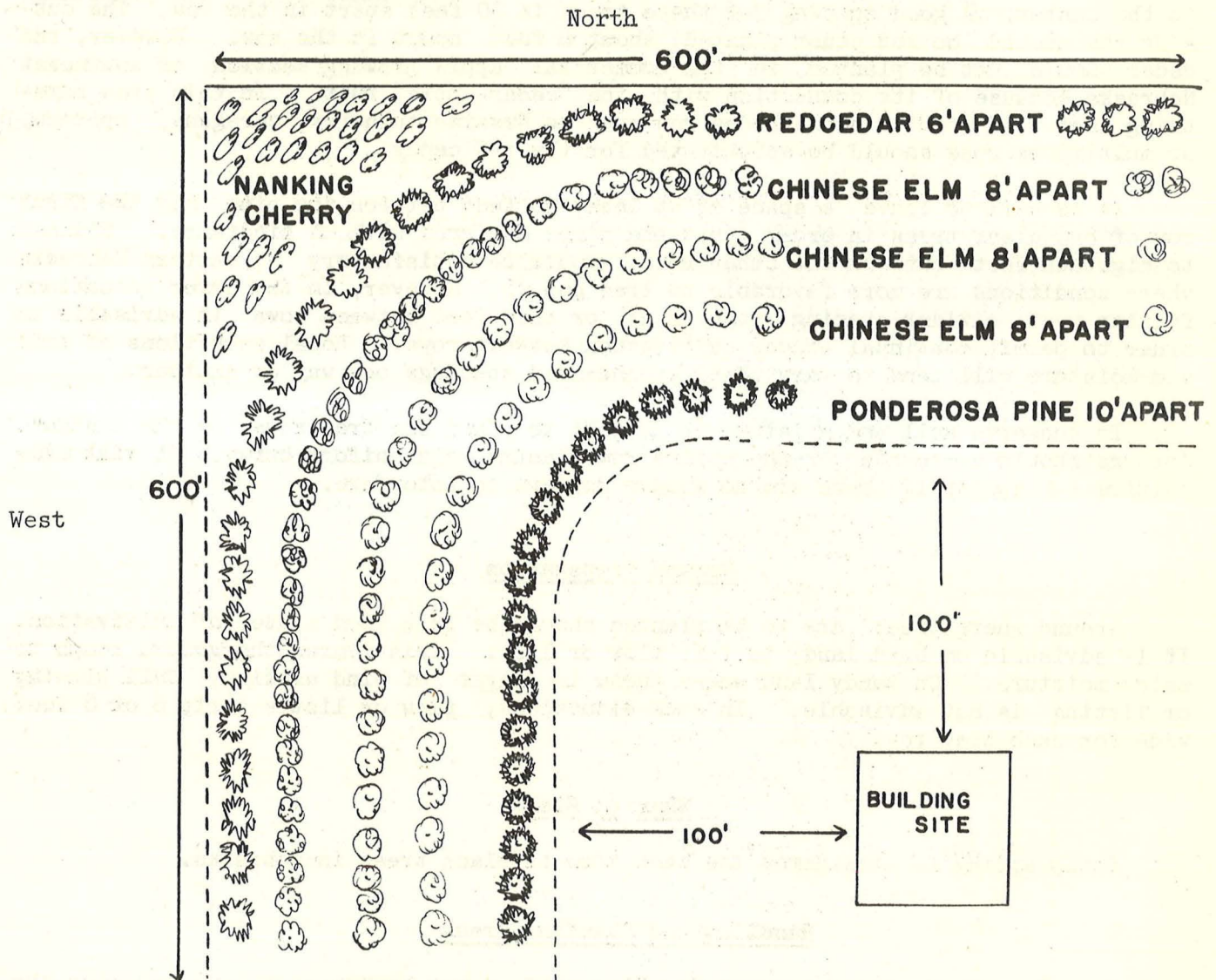


### Care After Planting

The planting should be fenced from livestock. Cultivate regularly after each rain to keep out weeds and grass. The cultivation keeps the surface of the soil from baking.

Wherever desired, some of the space between rows may be used to produce cultivated crops such as potatoes, tomatoes, popcorn, sweetcorn, etc. Do this only for the first few years. The production of these crops should not interfere with the development of the trees.

#### SUGGESTED PLAN FOR A FIVE ROW FARMSTEAD WINDBREAK FOR WESTERN NEBRASKA



APPROXIMATE NUMBER TREES REQUIRED 725  
(Plant Extra Trees in Nursery for Replacements)

Redcedar	200
Chinese Elm	400

Ponderosa Pine	100
Nanking Cherry	25



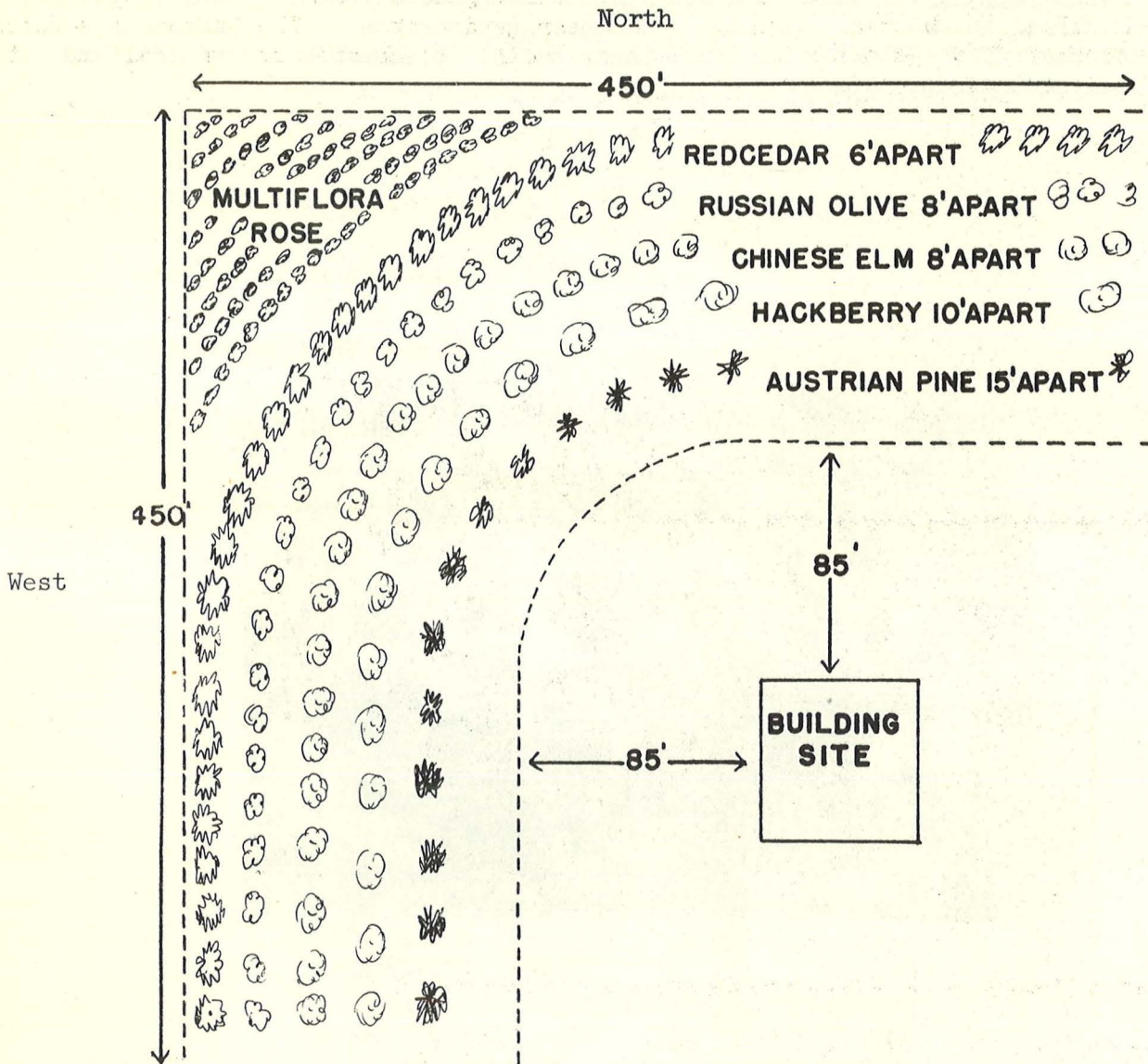
While the trees are small they should be protected in the winter from rabbits. Paint the trunk and lower branches of the trees in the fall with a good rabbit repellent. Do this a time or two during the winter if rabbits are doing much damage. See Extension Circular 1519, "Jack Rabbit and Cottontail Control."

Your County Extension Agent and The Soil Conservation Service will be glad to help with any problems that may not have been discussed in this problem.

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SUGGESTED PLAN FOR A FIVE ROW FARMSTEAD WINDBREAK FOR EASTERN NEBRASKA

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APPROXIMATE NUMBER TREES REQUIRED - 550  
(Plant Extra Trees in Nursery for Replacements)

Redcedar	150	Hackberry	100
Russian Olive	100	Austrian Pine	50
Chinese Elm	100	Multiflora Rose	50

Substitute Russian Mulberry, Caragana, Lilac or Multiflora Rose for Redcedar in the commercial apple growing section of south east Nebraska.



Problem VI

STUBBLE MULCH FARMING

Growing vegetation is the best protection for the soil against runoff and erosion. However, when there is no growing crop on the land, straw, stalks or other residue left on top of the ground cause more rainfall water to be absorbed. Such cover also helps protect the land against erosion. When land is tilled in such a way that the soil is pulverized but the crop residue is left on the surface, it is called "stubble mulch farming". This is a new system for general farming, but people have long used mulches on berries, potatoes and other garden crops. The Chinese have used "pebble mulches" for centuries to cause their soils to absorb more rainfall and to prevent soil and moisture losses.

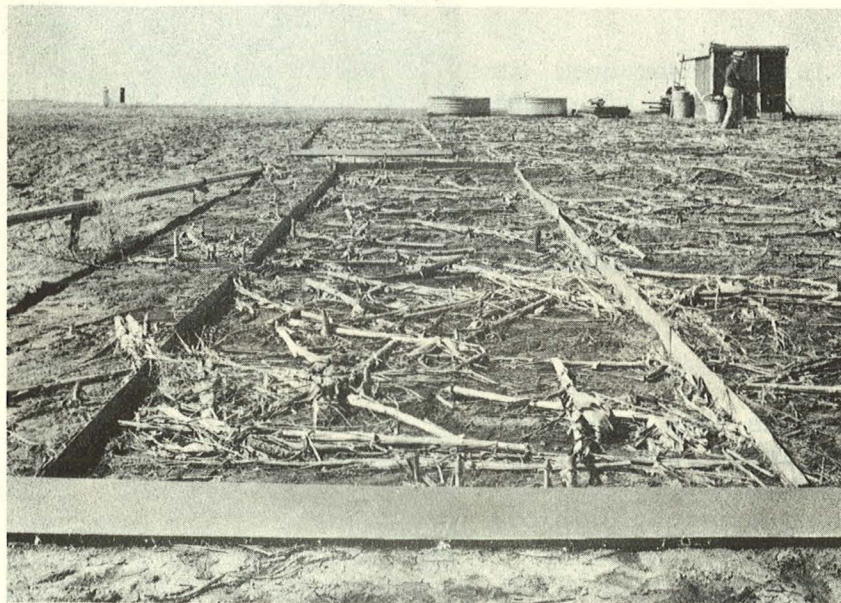
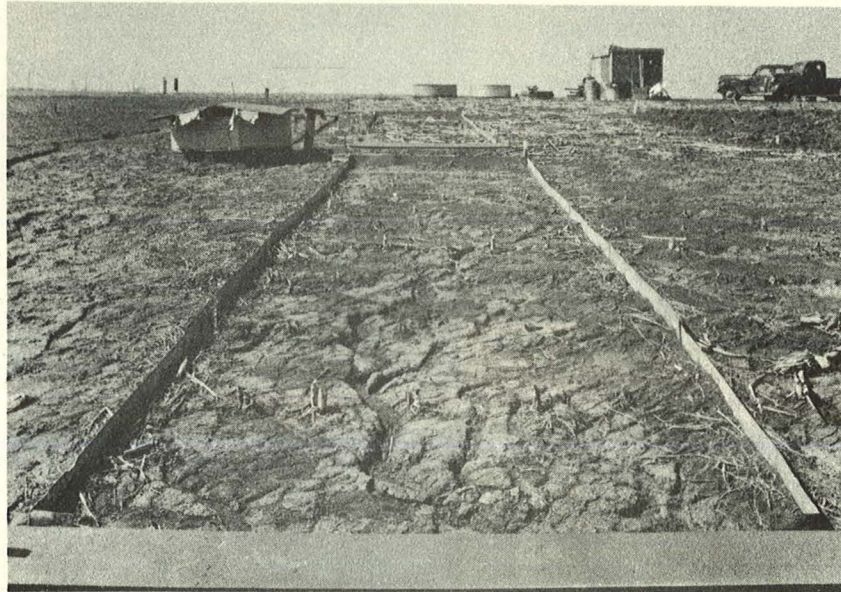


A highly magnified layer of soil  $\frac{1}{2}$  inch deep. Note dense layer at surface after a rain. This is caused by beating action of raindrops. This dense layer reduces rate of intake. If soil is covered with mulch, dense layer does not form and intake of water is more rapid.

When rain falls on a bare soil, the raindrops break the little clods and the soil runs together and becomes slick on top. Then the water runs off rapidly. The photograph above shows how this takes place.



If the soil is covered with straw, cornstalks, or other material, the raindrops do not hit the soil directly. The surface remains open and water can be absorbed rapidly. The two plots, illustrated below, show the benefit that a stubble mulch cover provides.



Effect of cornstalks on runoff and erosion

Upper - Cornstalks removed - plot bare.  
Lower - Cornstalks on land.

The upper plot lost 4 times as much water by runoff and 19 times as much soil by erosion as the lower plot.



### Equipment and Methods for Stubble Mulch Farming

Good methods have been worked out for preparing seedbeds, planting and cultivating crops while the residue is left on the surface. This makes it possible to use the stubble mulch.

A special type of plow called a sub-surface tiller is first used to stir the soil.

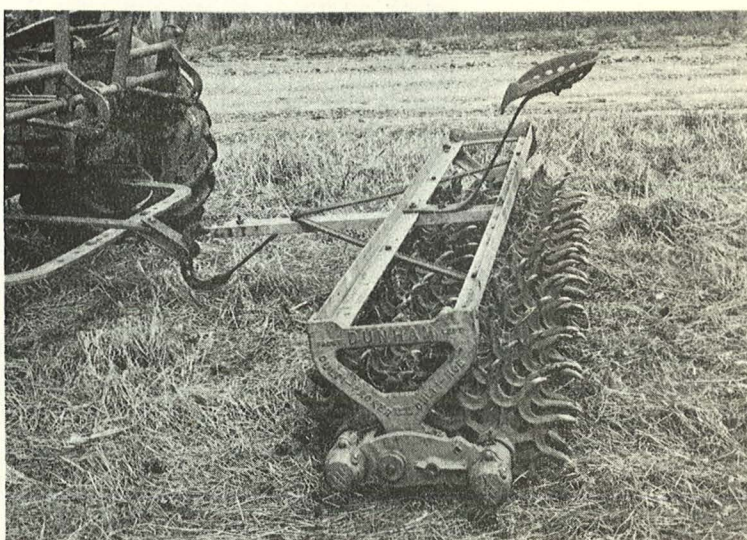
Shown here is a sub-surface tiller used for working the soil from beneath the surface without covering the stubble and straw.

The sub-surface tiller may be followed by a treader to kill weeds and pack the soil for good planting.

This is a treader used to pulverize clods after the sub-surface tiller. It may also kill many small weeds and pack the soil in preparation for planting.

Small grain is then drilled in such a way as to leave considerable straw on the surface to prevent run-off of water, soil erosion, or blowing away of the soil by the wind.

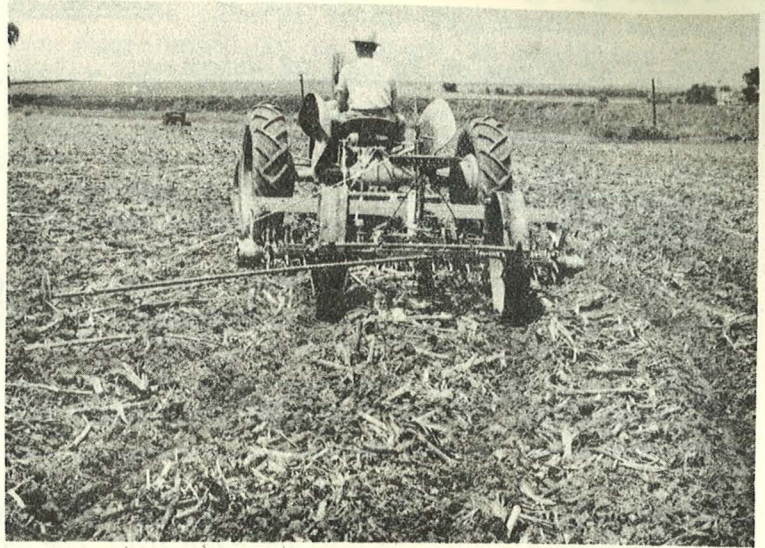
Here wheat is seeded on land having residue on surface. This type of drill works very nicely in the crop residue. The residue will reduce erosion and soil blowing.





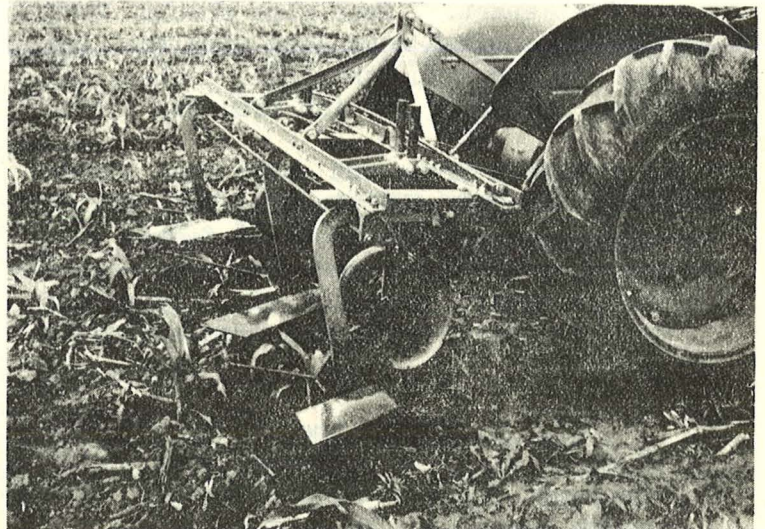
If row crops are to be planted, they can be put in with a planter having furrow openers. The corn or other row crop is then planted in the furrow.

Planting corn through cornstalk residue. The planter has disk furrow openers so that the corn will be planted in a small furrow.



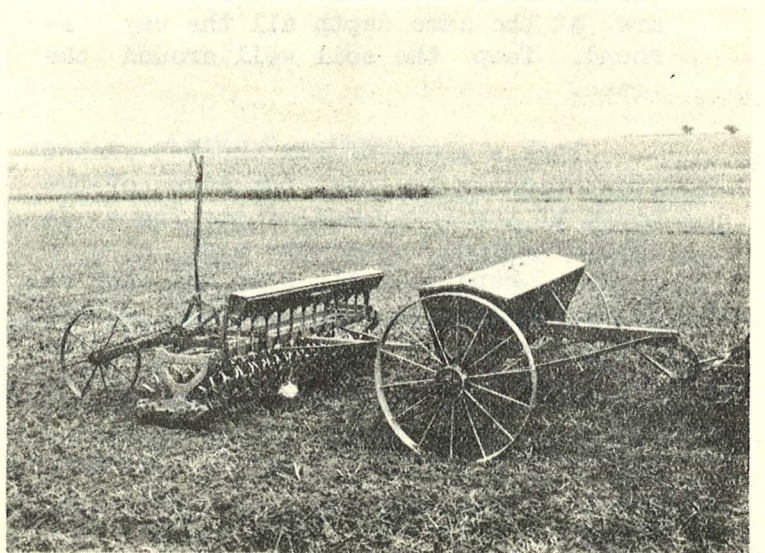
The first cultivation consists mainly of pulling the soil back into the furrow to kill weeds in the row. Later cultivation is done with a cultivator having large sweeps. This leaves most of the residue on the surface.

A 3-sweep 2-row cultivator that cultivates stubble mulch corn without burying the residue. The disc hillers help get weeds out of the row.



Small seeded crops like grasses and legumes may also be seeded under residue. This protects the soil against erosion while these crops are getting started.

Seeding a mixture of brome grass and alfalfa on land protected with residue. The brome is seeded with fertilizer spreader. Alfalfa is seeded with grass seeder attached to treader. The treader covers the seed.





## Demonstration

### Effect of Straw on Intake of Water

This demonstration will show how stubble mulch cover prevents runoff and soil erosion. The club should plan an entire afternoon for this demonstration. The preparation for this demonstration should all be done the day before. The club leader should be present and should direct the work. He should make these assignments:

one timekeeper  
one person to measure runoff  
two people to keep records

two people to apply water  
two people to assist wherever needed.  
(change with those applying water)

1. Location: Select a place in a field on a hillside where there is enough slope for water to run well.
2. The Soil: The soil should be an ordinary soil used for crops in the neighborhood. The slope should be even over the entire area where the work is to be done.
3. The Plots: Measure out two plots about 4 feet apart. Each plot should be 3 feet wide and 6 feet long with the long way up and down the hill. Clean all straw and other rubbish from the plots.

Make a frame out of 6 inch lumber to go around the plots. The inside dimensions should be 3 x 6 feet. The board at the lower end should be only 4 inches wide. When nailed in place it will then lack 2 inches from coming to the top.

Dig a narrow trench around the plots about 3 to 4 inches deep. Sink the board frame into this trench. The narrow board will be at the low end of the plot with the top edge even with the ground level. Make sure the boards are at the same depth all the way around. Tamp the soil well around the frame.

Tack a piece of tin about 5 inches wide tightly to the top edge of the board at the lower end of the frame. It should extend beyond the side about 8 inches. Bend this tin down and then up so as to make a small trough. This trough is for catching the runoff from the plot. It should drain slightly toward the end which projects beyond the side of the plot. A hole should be dug in the ground at this point so a small bucket may be set under the trough to catch the runoff water.

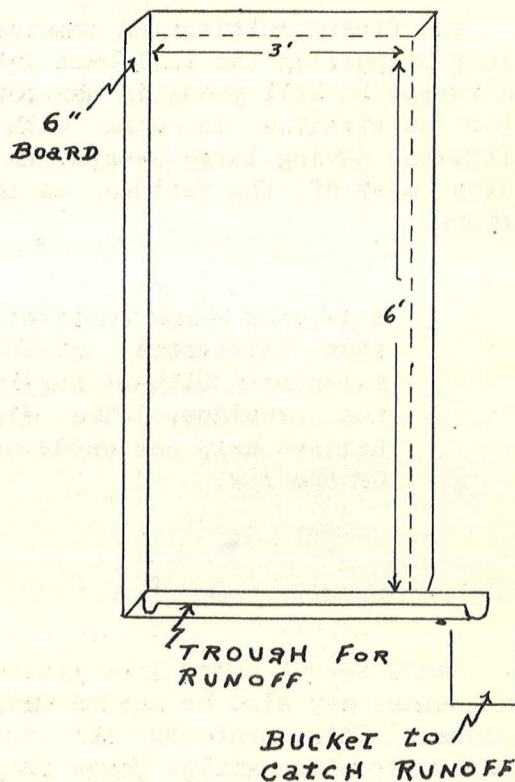


Diagram of one plot (top view)

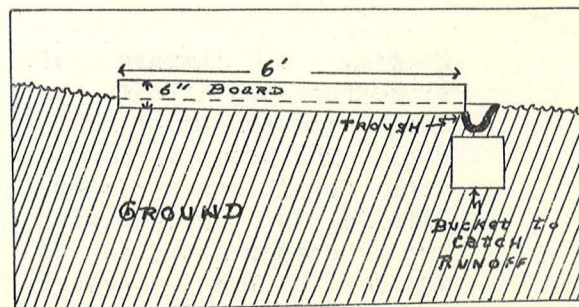


Diagram of plot (side view--cross-section)



4. Treatment of Plots: The plots inside the frames should then be dug up with a spade or hoe to a depth of about 3 inches. Be careful to do them exactly alike. Then smooth the surface with a garden rake until it is about in condition for planting a garden crop. Next, weigh or estimate  $2\frac{1}{2}$  pounds of straw and spread this evenly over one of the plots. (This amount is at the rate of about 3 tons per acre).
5. Application of Water: An ample supply of water should be at hand. If the plots can be located near a well or hydrant it will be much better. It will require about 24 gallons of water for each plot per hour. Enough water should be available and preparations should be made to run at least 2 hours. Get two small sprinkling cans or buckets with small holes punched in the bottom. Assign one person and one sprinkler to each plot. These club members should apply water by sprinkling to imitate rainfall at the rate of 1 gallon every  $2\frac{1}{2}$  minutes. This will be equivalent to slightly over 2 inches of rain per hour. (exactly 2.14 inches per hour)

- CAUTION:
1. Do not pour the water too fast. Take the full  $2\frac{1}{2}$  minutes to sprinkle the gallon of water on the plot.
  2. Use a small can. You can do a better job of timing yourself.
  3. Make the sprinkling action as nearly like rainfall as possible.
  4. Both plots will be treated more nearly alike if each person will change plots each time a sprinkler is refilled.
  5. Do not walk in the plots.

6. Records: Each club member should keep a record in the record book of what took place. The two people who keep records at the demonstration should make the information available to the other club members. Everyone should record this in his record book.

Keep record of these things:

1. Time when water application is started.
2. Time when runoff starts from each plot.
3. Amount of water applied at the time runoff starts from each plot.
4. Total amount of runoff from each plot at the end of demonstration. In order to do this the runoff from each plot must be caught and put in a separate barrel or can.

Make these calculations for each plot:

1. Inches of water put on each plot.
2. Inches of water runoff.
3. Inches of water absorbed by soil.

Assume that 11 gallons of water equals 1 inch of rainfall.

Stir the runoff water rapidly and when well mixed take two samples from each plot in quart fruit jars. Observe the muddiness of each. Set the jars on a shelf and let the sediment settle. Observe amounts in each. If more accurate data are desired, transfer to metal containers, dry the samples and weigh the dry soil. Calculate loss of soil in tons per acre. (The 3' x 6' plot equals .0004364 acre)

7. Runoff During a Second Application: In order to see the effect of the first application (or first rain) on the intake and runoff from soil it will prove very interesting if a second application can be made one day after the first. Conduct this in the same way and make the same records.
8. Conclusion: Does a stubble mulch save rainfall? Does it save soil?



Problem VII

YOUR CONSERVATION FARM OR RANCH PLAN

Know Your Land

Before you can make the best farm or ranch conservation plan, you must have a thorough knowledge of your land. Your plan is based upon putting each acre to its best use and treating every acre according to its needs. To obtain the necessary information about the land, a soil scientist goes over every acre of the farm. He studies the slope, amount of erosion, and kind of soil for each area. He records these on an aerial photograph of the farm or ranch. The farm planner then shows you how these various areas are classified into eight different classes of land. These are known as land-capability classes. Each is designated on the aerial photograph by a different color.



A Soil Conservation Soil Scientist making a soil conservation survey of a farm. The farmer and his son, a 4-H club member, are going along to learn more about the soils of their farm. A land capability map of the farm will be furnished the farmer and his son.

Descriptions of the Eight Land Classes

Land Suited for Cultivation

Class I. Very good land that can be cultivated safely with ordinary good farming methods. It is colored green on the land use capability map.

Class II. Good land that can be cultivated safely with easily applied conservation practices. It is colored yellow on the land use capability map.

Class III. Moderately good land that can be used regularly for cultivated crops in a good rotation but needs intensive conservation treatments. It is colored red on the land use capability map.

Land Suited for Limited Cultivation

Class IV. Fairly good land that is best suited to pasture and hay but can be cultivated occasionally if handled with great care. It is colored blue on the land use capability map.

Land Not Suited for Cultivation

Class V. Land that is too wet or stony or is otherwise not fit for cultivation but needs only ordinary good management to be used safely for trees or grass. It is colored olive green on the land use capability map.

Class VI. Land that is too steep, eroded, shallow, wet, or dry for cultivation but is suited for grazing or forestry if carefully managed. It is colored orange on the land use capability map.



Class VII. Land that is very steep, eroded, rough, shallow, or dry but can be used for forestry or grazing if handled with great care. It is colored brown on the land use capability map.

Class VIII. Land that has some limitation that makes it unfit for cultivation, grazing, or forestry, but land that may be valuable for wildlife, recreation, or watershed protection. It includes such areas as marshes, deserts, badlands, and mountains. It is colored purple on the land use capability map.

### Preparing Your Conservation Farm or Ranch Plan

In previous problems various ways of controlling erosion have been demonstrated. All the practices will usually not apply to all fields of a farm or ranch. In most instances a combination of practices are required to completely control erosion and reduce runoff in a given field or watershed. In all cases when two or more practices are applied to a field, each practice tends to help one or more of the others.



### Your Club Meeting for this Problem

Invite your County Extension Agent and some one from the Soil Conservation Service to explain a complete conservation plan to your club. Perhaps the club would like to visit some farm where a complete plan is being used. This would make an excellent place to discuss this problem. If your father or some farmer near your home is developing a farm plan, why not ask him to let you do some of the planning with him? This will give you a chance to put what you have learned into practice.

### Putting Conservation Practices to Work

Cropland. Terraces, as you learned, are necessary to prevent rills and sheet erosion. Nevertheless, terraces without suitable grassed waterways will not function properly. If grassed waterways are not established before terraces drain into them, gullies will form and the terrace channel may erode.

A conservationist of the Soil Conservation Service and a farmer discuss a land use map that has been jointly worked out for this farm. The land use map is a part of the complete conservation plan.

Waterways are more difficult to establish and maintain unless the area that drains into the waterway is protected. Contouring, terraces, and crop residue left on the surface help to hold rain where it falls on the land. This reduces the runoff the waterways must carry.

For the proper functioning of any one soil conservation practice it can be seen that all the required practices for a given field must be applied. In other words, a field that requires terraces must also have grass waterways, contour farming, a good crop rotation, and crop residue maintained on or near the surface.



Pasture and Hay. The lesson on pastures brought out the necessity of keeping a good grass cover. By keeping a good cover, the pasture will produce more; run-off and erosion will be reduced. Sometimes proper stocking will not completely control erosion and other practices such as grooving, fertilization, deferred and rotational grazing, and diversions may be necessary.

Permanent Pasture and Hay are usually located on the portion of the farm which is not suitable for continuous cultivation. This will vary with farms as some farms will not have sufficient area of land suited to permanent vegetation only. In these farms as well as on all farms, additional hay and pasture will be secured as part of the crop rotation.

Farmstead. The Soil Conservation practices required on a farmstead will differ greatly with each farmstead. However, in Nebraska the advisability of a good farmstead windbreak for every farm or ranch cannot be questioned. Other practices such as a contour inroad, diversion terraces in and above the farmstead, and location of the lots will depend upon the individual situation. Because of the bare ground and large area of roofs in a farmyard, considerable consideration should be given the controlling of run-off. As much as possible of the yard and lots should be established to permanent grass.

#### Soil Conservation Districts

Your farm or ranch is located in a Soil Conservation District. All of the farm and ranch lands in Nebraska are included in 87 Soil Conservation Districts.

A Soil Conservation District is governed by five local farmers or ranchers. They are called District Supervisors.

By applying to the District Supervisors the individual farmer or rancher may obtain technical assistance, information and surveys to assist in establishing and developing a complete conservation farm or ranch plan.

The first step is to file an application for assistance with the supervisors of your soil conservation district. This can be filed with a member of the board of supervisors, at the U. S. Soil Conservation Service office or the County Extension Agent's office.

Co-operation with a soil conservation district is on a voluntary basis.

After the district supervisors have approved your application, they will send a conservationist of the U. S. Soil Conservation Service to see you. He will help you work out a conservation farm or ranch plan.



### Develop a Plan

When you have decided what each acre is to be used for, you and the conservationist discuss the conservation measures needed on each field. You decide what crop rotations to use and how much fertilizer you will need on each field. You decide which fields to cultivate on the contour and where to terrace. You determine whether any fields need to be drained and where to build ponds, gully control structures and grassed waterways. You decide which pastures need to be reseeded and work out a grazing program. You may want to give special attention to a wild life area. You must also figure out how much livestock your farm will feed under the new system and plan your livestock program to fit your cropping plans.

At this stage of the planning you know just what you want to do. Then you must decide when and how to do it. You plan how you can best build terraces, farm ponds or other conservation structures needed and figure out the best time to build them. You decide what kind of grass to plant and when to plant it in your waterways or on your meadow strips or pastures. You figure out the best time to make any needed changes in field boundaries. In fact, you decide just when and how you will go about making the changes and installing all the conservation measures. You figure about what it will cost you and what you will get out of it. Conservationists of the Soil Conservation Service can give you many good suggestions. But you must make the final decisions about what you want to do and when you want to do it.

After you and conservationist have agreed on all the details of the plan, he will have copies of the plan typewritten. The plan will be written in clear, plain language. It will include aerial photographs and simple maps of your farm or ranch. Then you and the conservationist go over the written plan together. When you are satisfied the plan is what you want, it becomes the basis for a farmer-district agreement between you and the Soil Conservation District.

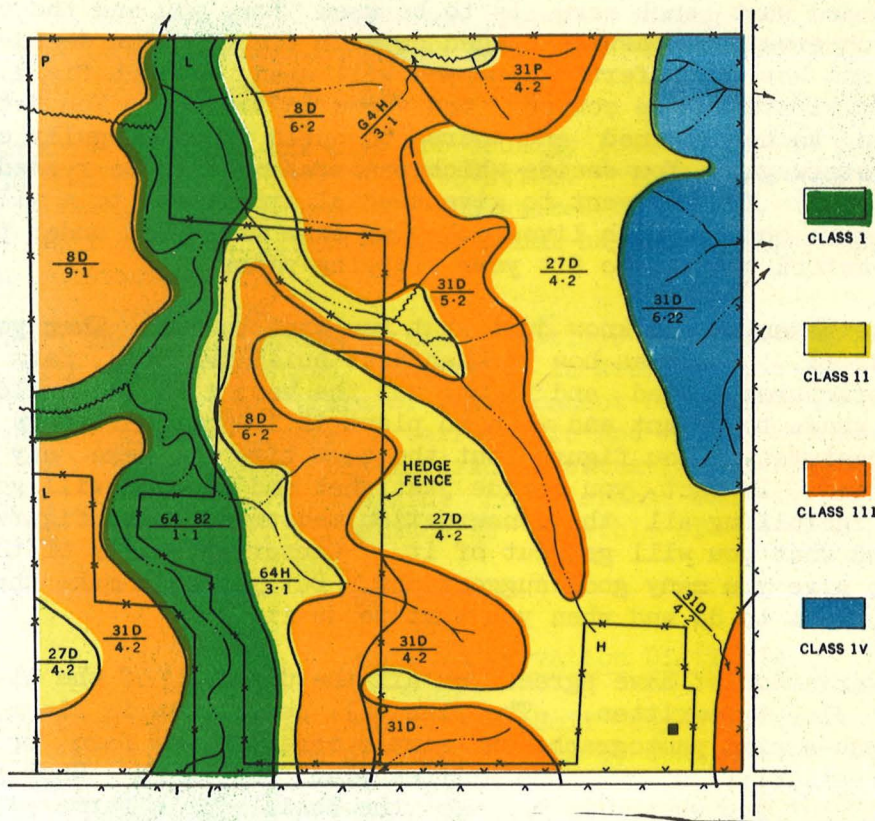
The Soil Conservation District then will arrange to give you technical help from the U. S. Soil Conservation Service in putting the plan into operation. It may also help you get equipment, planting stock, or other materials you need and do not have available.

Reference: Guide to Conservation Farming for the county in which you live.

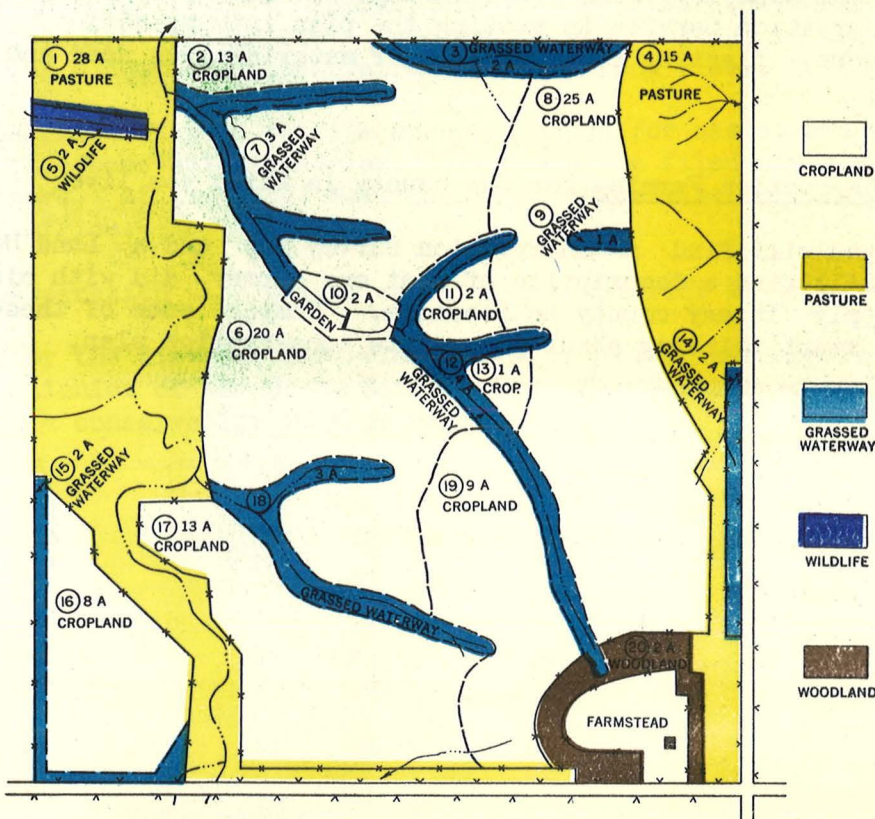
On the next page you will find a Conservation Survey Map and a Land Use Map. Opposite each map you will find a description of what one farmer did with his farm. These principles will apply in any county in Nebraska. Compare some of these ideas with your home farm and start thinking about a complete conservation plan.



# What One Farmer



Conservation Survey Map



Land Use Map



## Did With His Farm

This dairy farmer keeps 35 dairy cattle, 3 horses, 6 brood sows and 200 chickens. He grows about 20 acres of wheat and uses the remaining cropland for grain and forage for the livestock. Bromegrass is seeded with alfalfa. From 5 to 10 acres of sorgo are grown each year for ensilage.

Notice the badly eroded area in the upper right-hand corner of the Conservation Survey map on the opposite page. This is Class IV land because of serious erosion damage and steep slopes. It should not be used for row crops. The hedge row in the center of the farm interferes with proper field arrangement. Serious gullies are indicated by wavy lines.

The hedge which ran through the farm was removed for better field arrangement. The Class IV land in field 4 was seeded to bromegrass and alfalfa for hay and permanent pasture. All cropland has terraces which drain into grassed waterways. The gully in field 5 has been fenced and planted for a wildlife area.

A windbreak is being established in field 20 to protect the farmstead. Diversion terraces will carry the runoff waters from the barn lots to a grassed waterway. A pond is to be constructed in field 10 and water from it used to irrigate a garden and orchard in this field.

Fields 8 and 19 are more level and less likely to erode, so they are in Class II (shown in yellow). They can be planted to row crops with safety more years in succession than the other cropland.