



# **SOIL AND WATER**

## **CONSERVATION AND USE IN OREGON**

**Federal Cooperative Extension Service • Oregon State College • Corvallis**

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The complete report on *Soil and Water Conservation and Use Program* was submitted February 7, 1951, by a special staff committee of Oregon State College. This complete report is divided into three parts: (1) a study of the curricula of the School of Agriculture bearing on this field, (2) a resume of the contribution of all three divisions of the School to this field from 1890 to 1948, and (3) a program upon which Research and Extension can join in assisting the people of Oregon in still further progress in the conservation and use of the soil and water resources of the state.

The Staff Committee assigned this task was made up of the following persons:

- Mr. J. R. Beck, Assistant Director, Extension Service.
- Mr. P. M. Brandt, Professor of Dairy Husbandry, Head of Department.
- Mr. Henry Hartman, Professor of Horticulture, Head of Department.
- Dr. R. W. Henderson, Assistant to the Director, Experiment Station.
- Dr. D. D. Hill, Professor of Farm Crops, Head of Department.
- Mr. O. E. Mikesell, Linn County Extension Agent.
- Dr. C. V. Plath, Associate Professor of Agricultural Economics.
- Mr. C. V. Ruzek, Professor of Soil Fertility.
- Mr. J. W. Wolfe, Associate Professor of Agricultural Engineering.
- Mr. J. C. Moore, Conservation Specialist, Extension Service, Secretary.

These pages contain an abstract of part three of the complete report. This version was prepared by Dr. W. Curtis Reid, Visual Instruction Specialist, Extension Service.





## INTRODUCTION

Soil and water are the two basic resources under the management of man that provide the foundation and framework for the economy of Oregon. The expansion of acreage under cultivation has about run its course. But expansion of agricultural production through intensified use of the soil has unlimited possibilities.

Erosion of the soil and run-off of water are part of nature's never-ending cycle. They would continue even though no one lived in Oregon. As man uses these two resources, he tends to speed up, divert, or retard these natural processes.

## THE PRIMARY OBJECTIVES OF THIS PROGRAM ARE:

1. TO SOLVE THESE MAN-MADE PROBLEMS OF EROSION AND WATER RUN-OFF
2. TO DEVELOP THE MOST EFFECTIVE USE OF THESE RESOURCES FOR THE WELFARE OF THE PEOPLE.

## WHO OWNS THE LAND?

	Per Cent
Farmers .....	32
Non-farm private and corporate owners.....	10
Federal government .....	53
State, county, and municipal.....	5

Of the total land area 8% is in cropland, 43% in pasture and range, 47% in woodlands, and 2% in miscellaneous use.

The forests through logging and fire, and the range through overgrazing aggravate erosion as seriously as does the cropland. Thus more than half of the responsibility for conservation lies with non-farm ownerships.

## IS THERE

The total annual supply of water in Oregon is adequate. But rainfall is lacking everywhere in Oregon during the summer months. Also while the coastal area may receive more than 80 inches of rain during the year, some regions of Eastern Oregon have little as 8 inches.

Thus only by the help of man in redistributing the water both area and seasonwise, can



# THE PROGRAM

Most current problems in this field are not new. The solutions for many of these problems are already known and are the subject for current demonstrations and practical use by many operators. The three divisions of the School of Agriculture—Resident Teaching, Experiment Station and Extension Service—are carrying on a broad program to meet these problems, either by searching for new methods or by demonstrating successful known methods. Changing agriculture gives rise to the need for a new method for combating an old problem. It is the constant problem of research and teaching to change their recommendations to meet the changing pattern of use. Some current methods have not been acceptable because of economic problems. In such instances research is directed toward the economic as well as the basic soil and water problem. It is anticipated that with changing crops or with change in tillage tools that these same problems will demand new solutions.

The program that follows is aimed essentially at those lands owned or used by farmers for agricultural or farm forestry production. Many of the recommendations in this program are applicable to other lands within the state. Each type of farming area has its own peculiar land and water conservation and use problem. For the purpose of clarity and simplicity of treatment the program is divided into four types of farming areas as follows:

(1) the Coastal Area, (2) Southern Oregon, (3) the Willamette Valley, and (4) Eastern Oregon. Within each of these four districts are found approximately similar soil and moisture conditions.

## ENOUGH WATER?

Use of this resource be re-  
sized.

is particularly important  
protect the upper water-  
eds because it is here where  
osion and rapid run-off first  
rt. Most of the stream  
adwaters are on land con-  
lled by public agencies.  
Therefore Congress and the  
blic must recognize this  
blem and support conser-  
vation practices on such pub-  
lands.





# COASTAL AREA

## Significant Features

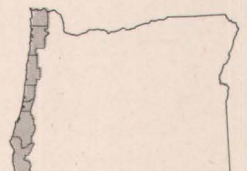
- **WET CLIMATE**  
More than 80 inches rainfall, but dry summer
- **GRASSLAND AGRICULTURE**  
Of 87,000 acres of cropland, 78% are in legumes and grass forage crops  
250,000 acres of non-plowable pasture land
- **HEAVILY FORESTED**  
73% of total area

## Major Problems

- **EROSION**  
Denuding forest lands by fire main erosion problem
- **SAND DUNES**  
Shifting dunes may engulf productive land
- **DRAINAGE**  
Needed on 100,000 acres
- **IRRIGATION**  
Needed for best yields. How much? When?
- **SOIL SURVEY**  
Complete for Clatsop County only. Needed on remainder
- **REFORESTATION**  
Logged and burned-over lands need cover. Grass or trees?
- **FIRE PREVENTION**

## Land Use

- 151,000 acres are suitable for cultivated crops or pasture  
Of these  
29,000 acres are in cultivated crops  
113,000 acres are in pasture  
**BUT 9,000 acres are in woodland**
- 63,000 acres are suitable for long-time grass rotations  
Of these  
29,000 acres are in grass  
**BUT 7,000 acres are in cultivated crops  
27,000 acres are in woodland**
- 3,654,000 acres are suitable for range or woodland  
Of these  
113,000 acres are in range grasses  
3,541,000 acres are in woodland





# SOUTHERN OREGON

## Significant Features

- **CLIMATE**  
Hot dry summers — Rainfall 20 to 30 inches
- **IRRIGATED ORCHARDS**
- **RAPID TIMBER HARVEST**

## Major Problems

- **IRRIGATION**  
Rogue River could provide adequate water for 40,000 acres not now receiving enough water.
- **DRAINAGE**  
Needed on 51,000 acres
- **EROSION**  
Severe on cultivated hill lands—especially under row irrigation
- **HILL PASTURES**  
300,000 acres need clearing and reseeding
- **FARM FORESTRY**  
Farmers do not recognize timber as successful farm crop
- **WATERSHED COVER**

## Land Use

- 216,000 acres are suitable for cultivated crops or pasture  
Of these  
207,000 acres are in cultivated crops  
8,000 acres are in pasture  
**BUT** 1,000 acres are in woodland
- 127,000 acres are suitable for long-time grass rotations  
Of these  
31,000 acres are in grass  
**BUT** 74,000 acres are in cultivated crops  
22,000 acres are in woodland
- 5,639,000 acres are suitable for range or woodland  
Of these  
1,031,000 acres are in range grasses  
4,605,000 acres are in woodland  
**BUT** 3,000 acres are in cultivated crops





# WILLAMETTE VALLEY

## Significant Features

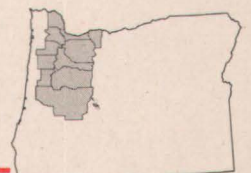
- **DRY SUMMERS — WET WINTERS**  
Growing season 165 to 260 days
- **INTENSIVE AGRICULTURE**  
Highly diversified with much grassland
- **MANY SOIL TYPES**  
16 major series varying from light sandy loams to heavy impermeable clays

## Major Problems

- **SOIL TILT AND FERTILITY**  
Maintenance of humus plant foods and lime essential to intensive farming
- **IRRIGATION**  
Flood control dams will furnish water for 300,000 acres
- **DRAINAGE**  
Needed on 600,000 acres
- **EROSION**  
Serious on cultivated hill lands
- **HILL PASTURES**  
1,400,000 acres foothill pastures—mainly underdeveloped
- **FARM FORESTRY**  
860,000 acres in farm holdings—need management
- **WATERSHED COVER — FLOOD CONTROL**  
Logging and fire accelerate water run-off with more flood damage  
Watershed cover is essential to flood control

## Land Use

- 1,560,000 acres are suitable for cultivated crops or pasture  
Of these  
1,264,000 acres are in cultivated crops  
156,000 acres are in pasture  
**BUT 149,000 acres are in woodland**
- 543,000 acres are suitable for long-time grass rotations  
Of these  
134,000 acres are in grass  
**BUT 176,000 acres are in cultivated crops**  
**233,000 acres are in woodland**
- 6,753,000 acres are suitable for range or woodland  
Of these  
273,000 acres are in range grasses  
6,473,000 acres are in woodland  
**BUT 7,000 acres are in cultivated crops**





# EASTERN OREGON—Columbia Basin

## Significant Features

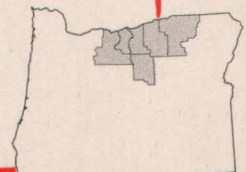
- **DRY CLIMATE**  
Rainfall 12 to 20 inches
- **SUMMER FALLOW WHEAT PRODUCTION**

## Major Problems

- **EROSION**  
Most severe soil erosion in Oregon
- **SOIL FERTILITY**  
Soil conserving rotations needed
- **LIVESTOCK PRODUCTION**  
For maintenance of soil fertility and grass rotations

## Land Use

- 1,240,000 acres are suitable for cultivated crops and pasture  
Of these  
1,238,000 acres are in cultivated crops  
2,000 acres are in pasture
- 593,000 acres are suitable for long-time grass rotations  
Of these  
84,000 acres are in grass  
**BUT 509,000 acres are in cultivated crops**
- 4,286,000 acres are suitable for range or woodland  
Of these  
2,934,000 acres are in range grasses  
1,294,000 acres are in woodland  
**BUT 58,000 acres are in cultivated crops**





# EASTERN OREGON—Blue Mountains and Central Oregon

## Significant Features

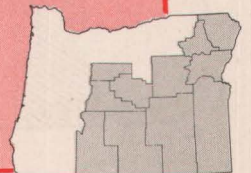
- **DRY CLIMATE**  
Rainfall 8 to 20 inches
- **RANGELAND WITH IRRIGATED VALLEYS**
- **FOREST AND GRASS INTERMINGLED**

## Major Problems

- **IRRIGATION**  
Need improved management
- **DRAINAGE**  
Needed on 200,000 acres of irrigated land
- **USE OF COMMERCIAL FERTILIZER**
- **ROTATIONS FOR IRRIGATED AND NON-IRRIGATED CROPLAND**
- **IMPROVEMENT OF RANGELAND**  
Through
  - Better management
  - Replacement of sagebrush and cheat grass with desirable forages
  - Improvement of water supply
  - Drift fences

## Land Use

- 347,000 acres are suitable for cultivated crops or pasture  
Of these
  - 333,000 acres are in cultivated crops
  - 14,000 acres are in pasture
- 177,000 acres are suitable for long-range grass rotations  
Of these
  - 58,000 acres are in grass
  - BUT 117,000 acres are in cultivated crops**
  - 2,000 acres are in woodland**
- 8,570,000 acres are suitable for range or woodland  
Of these
  - 3,725,000 acres are in range
  - 4,823,000 acres are in woodland
  - BUT 22,000 acres are in cultivated crops**



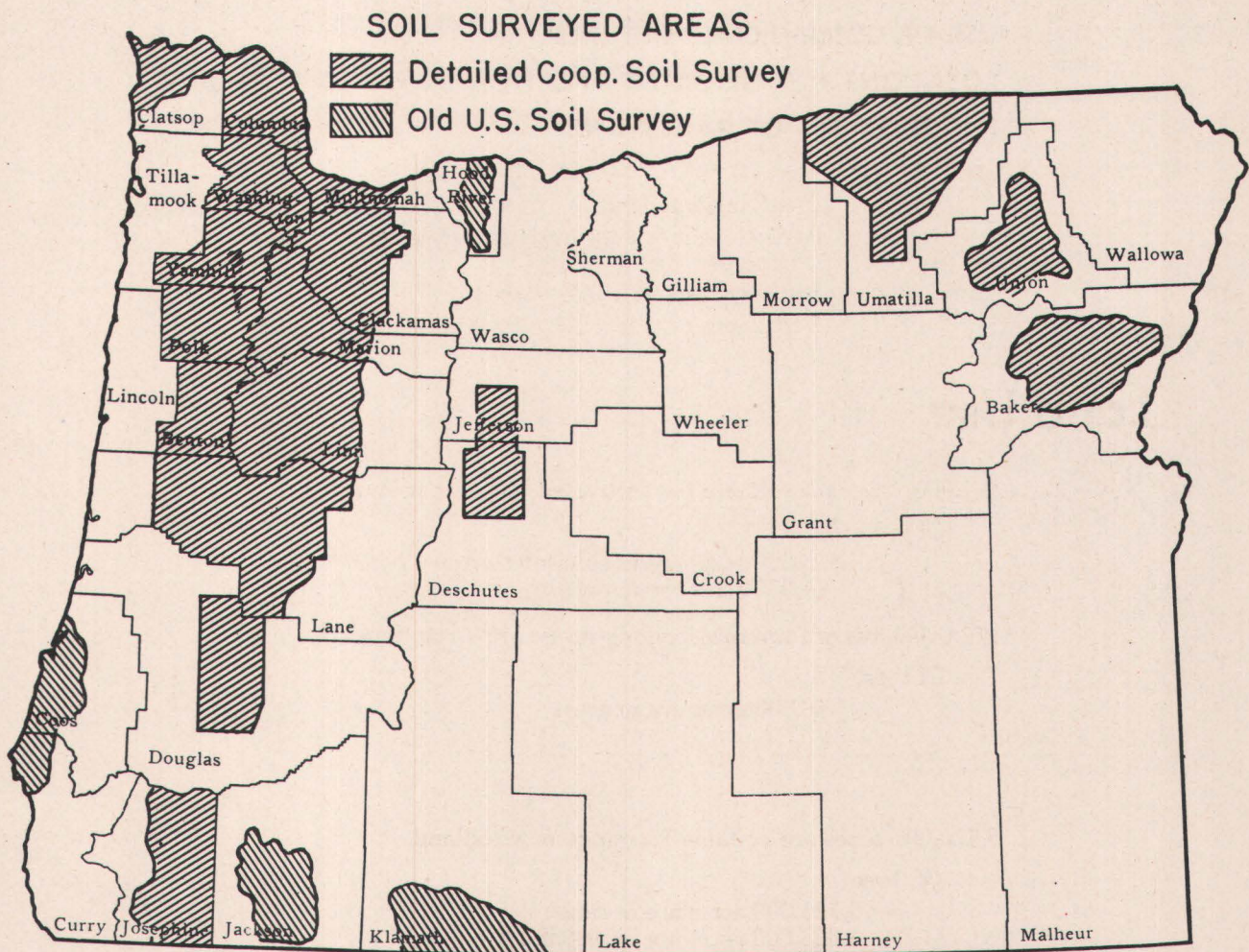


## SOIL SURVEY

Soil surveys are essential to determine best use of land. That is, to determine the suitability of soil for cultivated crops, pasture or forest. Information basic for conservation.

## Action

- Make soil surveys on all land on which there may be a choice of use.





# EROSION



Severest erosion occurs on non-irrigated wheatlands of the Eastern Oregon area. Alternate summer fallow system of cultivation, sloping hills, and light soils contribute to erosion.



Strip cropping and contour seeding have not been generally adopted due to cost and income factors.



At one time 200,000 acres of the steeper slopes of the Columbia Basin were seeded to crested wheatgrass, partly to reduce erosion. In the last decade one-fourth of this was plowed and seeded to wheat.



Soil conserving rotations with such as perennial grasses are needed on over 2,000,000 acres of non-irrigated cropland in Eastern Oregon.





Erosion is also severe in certain hill lands of Western Oregon devoted to orchards, grains, or other crops using clean cultivation. Fortunately, a grassland type of agriculture cover crops minimizes most of the erosion in this area.



Most erosion in the coast area occurs on lands denuded by forest fires or the burning of undesirable brush to clear land. Such denudation causes quick run-off accompanied by flood damage and stream-bank erosion.

## Action

- Development of good rotations on Eastern Oregon wheatlands.
- Conversion of steeper slopes from grains and row crops to permanent pastures.
- Further study of tillage methods including strip cropping, etc. for row crops of all kinds as well as grain.
- Use of sprinkler irrigation on row crops and orchards on steeper slopes.
- Clear undesirable brush by mechanical or chemical methods instead of by fire in Western Oregon.
- Reseeding logged and burned-over areas to trees or grass. Land torn up by logging machinery should immediately be reseeded to grass.



# DRAINAGE

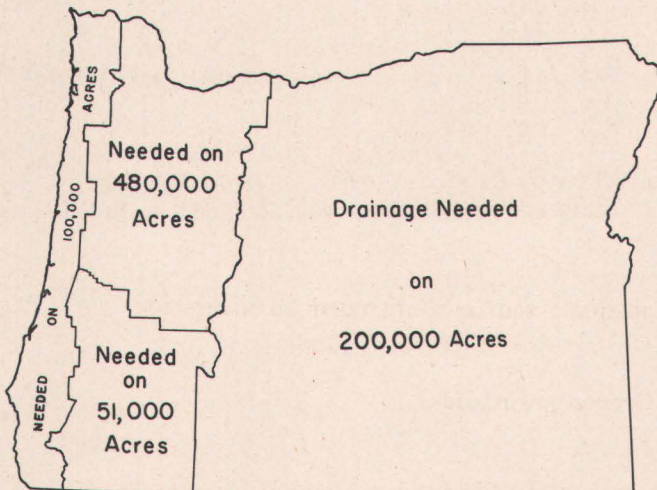


The need for drainage is evident in all sections of the state.



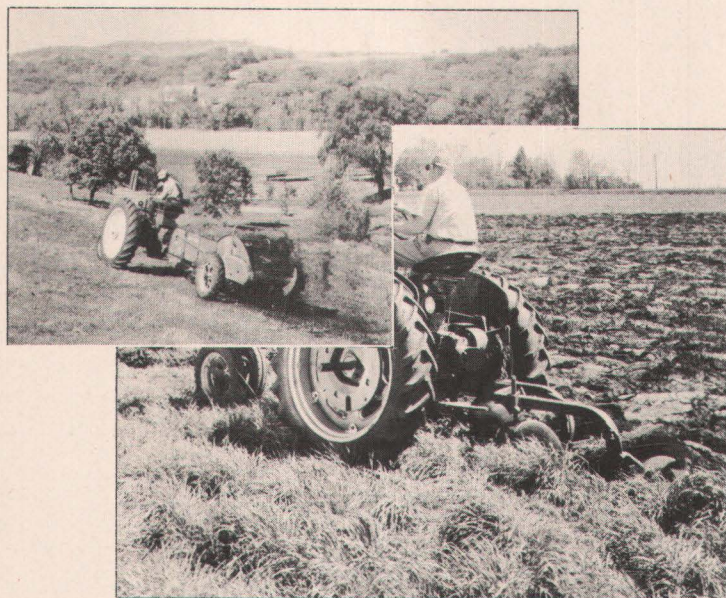
## Action

- DRAIN about 1,000,000 acres of cropland, by diking, tiling or open ditches.





# SOIL TILTH AND FERTILITY



Organic matter should be increased in all croplands, by returning manure to the fields and turning under cover crops.



In addition, the use of rotations and addition of lime, phosphorus, nitrogen and other commercial fertilizers as needed have proved their value.

Much more information is needed on what fertilizer to use and how much. Different crops, rotations, and soils require different answers.

## Action

- Establish rotations which will increase humus and return plant residues to soil.
- Promote returning manure to field.
- Study needs for commercial fertilizers.
- Give farmers more information on needs of nitrogen, phosphorus, and minor elements.
- Develop cheaper source of lime.
- Establish soil-testing laboratory to determine chemical needs of soil.
- Establish manufacturing plant to provide adequate source of nitrogen fertilizers for Pacific Northwest.
- Study crop residue management in Eastern Oregon grainlands.





# IRRIGATION



There are now under irrigation:

62,000 acres in Southern Oregon  
80,000 acres in Willamette Valley  
990,000 acres in Eastern Oregon  
11,000 acres in Coast Area

Further development of storage facilities, dams, canals, etc., would permit irrigation of an additional:

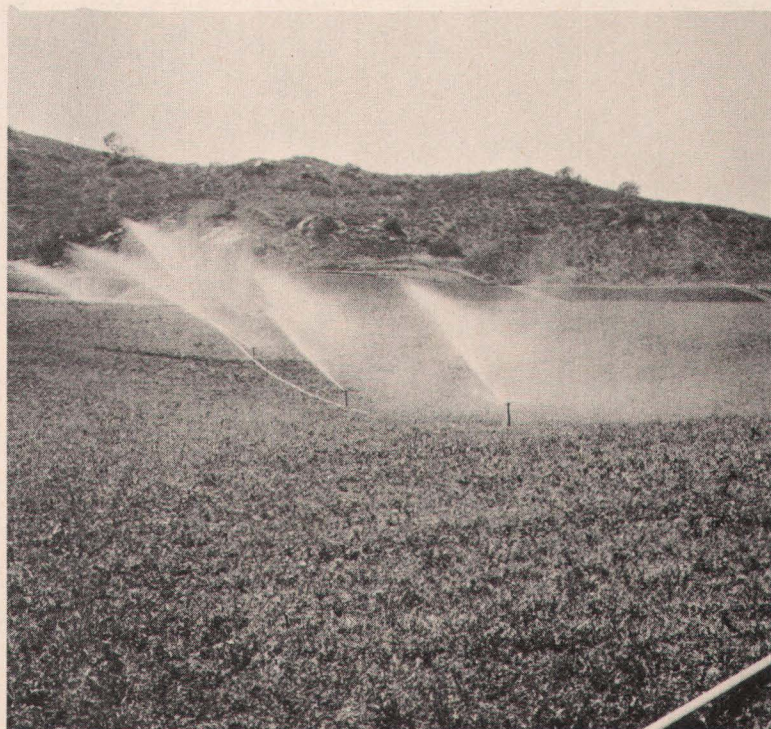
300,000 acres in Eastern Oregon  
300,000 acres in Willamette Valley  
33,000 acres in Southern Oregon



Erosion is not serious on irrigated land because of the high percentage of grasses or legume hay crops that are grown.

Erosion does occur, however, from using too large a head of water and growing row crops on land too steep for cultivation.

Use of sprinklers may reduce damage from irrigation on hill-sides.







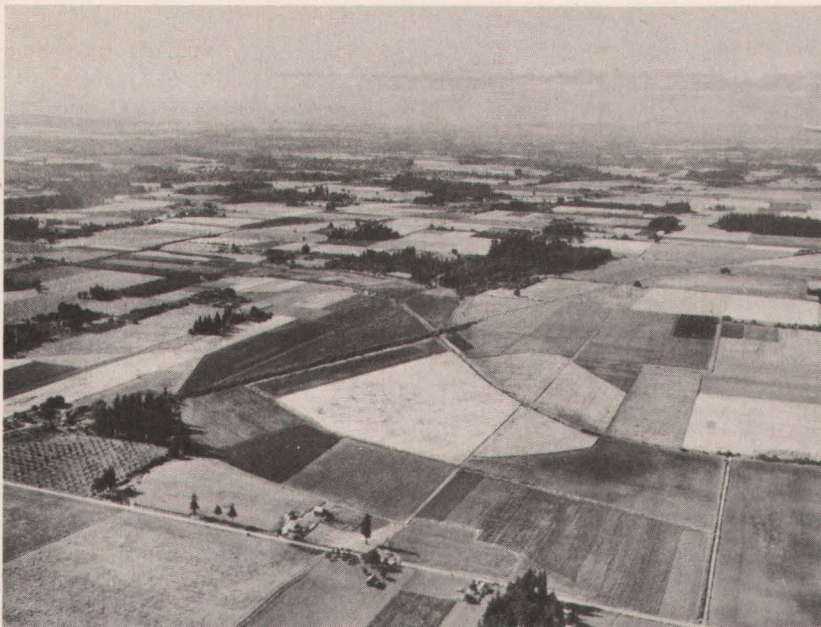
Over irrigation is also a common error. Too much water results in excessive alkaline soil conditions or develops drainage problems.

## Action

- Further development of water resources for irrigation.
- Research to determine:
  - Amounts of water to apply for various crops.
  - When to apply—how often.
- Better distribution systems to reduce erosion, over irrigation and waste of water.
- Continuing research on ground water supplies.



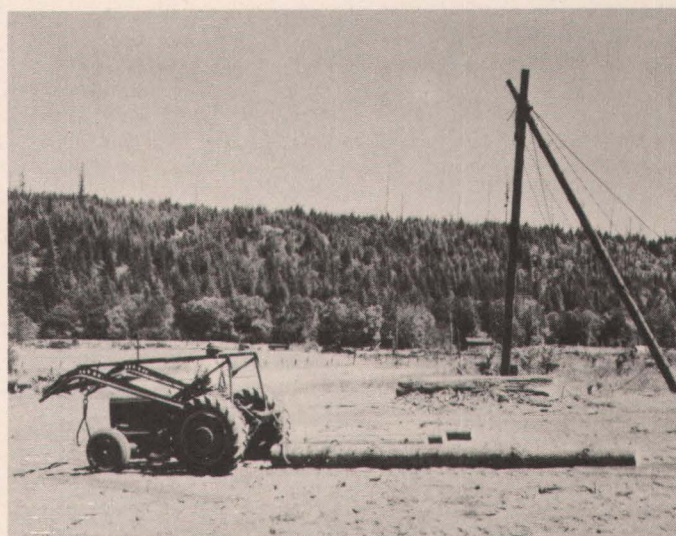
# FARM FORESTRY



Farmers are just beginning to recognize timber as a crop. Yet approximately one-sixth (3,250,000 acres) of the farm lands are in woodlands. Most of this land can grow timber indefinitely at a profit.



Farmers need information on good management practices, and methods of harvesting and marketing on these lands.



## Action

- Promote the fact that timber can be successfully cropped by farmers.
- Demonstrate good management and harvesting methods to farmers.
- Encourage the establishment of woodlots on farm lands best suited to timber production.
- Expand studies on farm woodlot management.



# HILL PASTURES



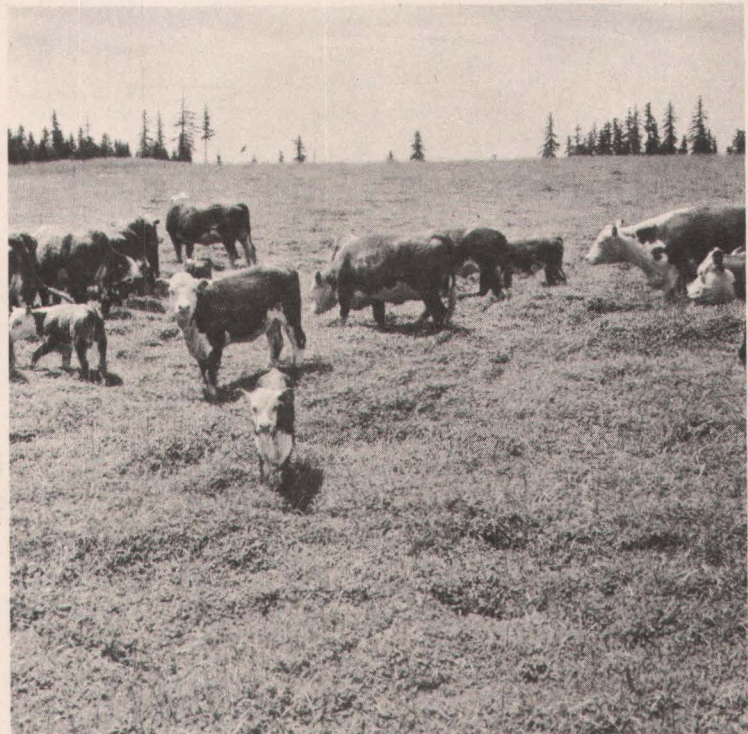
In Western Oregon there are approximately 2,000,000 acres of hill pastureland. Most of this is underdeveloped; clogged with brush, ferns, and other uneconomic plants.



Clearing and seeding to useful pasture grasses and legumes would not only make the land more productive, but also reduce erosion of these hill lands.



Perhaps some of the land would better be returned to timber production.



## Action

- Develop mechanical and chemical methods of clearing brush.
- Study comparative value of use of this land for grass vs. timber.
- Reseed those lands best used for grass.



# RANGELAND IMPROVEMENT



Overgrazing and drought have resulted in the deterioration of 31,000,000 acres of grazing land in Eastern Oregon.

Sagebrush covers most of the non-forested land. Perhaps 10 per cent of this land could be made more productive by removing the sagebrush and replacing it with good forage. The productive capacity of such range could be increased up to 10 times.



Similarly, cheat grass in other places and undesirable brush in forested lands greatly reduce the carrying capacity of the land.

More watering places should be available and more uniformly distributed to assist in grazing management.







About 24,000 miles of additional drift fences are needed to control both time and place of grazing.

## Action

- Promote sound grazing management program.
- Improve grazing lands by:
  - Sound management
  - Removal of brush
  - Seeding
  - Develop better distributed watering places
  - Promote construction of needed drift fences



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