SOME ECONOMIC ASPECTS OF SHIFTING TO CONSERVATION FARMING IN THE COLUMBIA BASIN WHEAT AREA

by

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A THESIS

submitted to

OREGON STATE COLLEGE

in partial fulfillment of
the requirements for the
degree of

MASTER OF SCIENCE

June 1952

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Date thesis is presented May 7, 1952

Typed by Lucille Berger

ACKNOWLEDGMENTS

Thanks are due Dr. G. W. Kuhlman for his guidance in the preparation of this thesis. Appreciation also is tendered the Soil Conservation Service, the Bureau of Agricultural Economics, and staffs of Oregon State College, Washington State College and the University of Idaho for assistance given in providing information for this study. The author is indebted to Lucille Berger for assistance in preparation of copy and final typing. He is especially indebted to his wife, Ruth, and children, Timi and Tami, for their forbearance while this study was being prepared.

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INTRODUCTION

The Columbia Basin embraces one of the world's important wheat producing regions. Even though there is range land in the Oregon wheat-fallow areas, sale of livestock products comprises less than 25 per cent of all farm products sold, while sale of wheat accounts for over 75 per cent. (18, Gilliam, Morrow, and Sherman Counties of Oregon)

Because of steeply rolling topography, lack of proper rotations, and other factors, heavy displacement or erosion of soil occurs on much of this area. A substantial depletion of organic matter in the soil is also reported. (16, pp.9-11)

If soil is to be conserved and organic matter maintained, it appears that conservation systems of farming will be necessary.

Extensive physical research has been carried out regarding the practices required to minimize soil erosion and fertility depletion. By and large, the practices necessary to conserve the soil resources are known. The Soil Conservation Service has expended much effort, and the Agricultural Conservation Program of the Production and Marketing Administration has paid subsidies to encourage the adoption of conservation practices. In spite of the activities of the various federal agencies and the college extension service, the adoption of conservation systems of farming has been relatively slow in the dry land wheat farming areas.

The question of whether conservation farming is profitable to the farmer may be a major deterrent to adoption of conservation systems of farming. There is a need for economic studies to appraise the income potentialities over time of alternative systems of farming that involve different degrees of conservation or exploitation. Such studies would point out problems involved in obtaining adoption of systems of farming that conserve resources. They would suggest programs, inducements and incentives that may be required for establishing and maintaining such systems.

Purpose of Study

The purpose of this study was to determine the effect of various conservation practices and combination of practices upon farm organization, farm capital requirements, labor requirements and utilization, machinery and equipment use, and other inputs in farm production; upon land use, crop yields, and the production of farm products. The comparative income potentialities of conservation systems of farming and exploitive systems was also determined.

Definition of Conservation

The term "conservation" has been given physical and economic connotations. It seems essential for the purpose of economic analysis to limit its use to a purely physical concept.

"Conservation", says Zimmerman, "is any act of reducing the rate of consumption or exhaustion (of natural resources) for the avowed purpose of benefitting posterity." (19, p.791)

Bunce points out that conservation has a different meaning with reference to different types of resources. He distinguishes three types of resources:

(1) Fund resources - such resources as coal, oil, and iron, which are limited in amount. With reference to these resources, "Conservation may be defined as a reduction in the rate of consumption which will leave a larger quantity available for future use."

(2) Flow resources - those which occur periodically over time such as labor, precipitation, and water flow. With reference to these resources, "Conservation means using them in such a way that physical waste (nonuse) is minimized."

(3) Biological resources of plant and animal life such as forests, fisheries, etc. The annual productivity of these resources may be decreased through exploitation, maintained at the present level, or increased by the actions of man. For these resources, "conservation may be defined as the maintenance of the present level of productivity."

Bunce indicates that one of the difficulties in defining conservation with reference to agricultural land lies in the fact that it is partly a fund resource, partly a flow resource, and partly a biological resource. "Conservation of agricultural land", he says, "means the maintenance of the fund resources and the present level of productivity of the soil, assuming a given state of the arts." By improvement Bunce is referring to "Increasing the physical productivity of the soil by amendments, drainage, irrigation, and other

means." (2, pp.4-6)

A distinction between soil conservation and other general production problems cannot be made on the basis of production from the soil alone; otherwise improved varieties and disease control, for example, would qualify equally with soil conserving rotations, crop residue utilization, and contour farming.

Heady and Scoville define soil conservation as the "prevention of diminution in future production on a given area of soil and from a given input of labor and capital (apart from the conservation resource input, and with the technique of production otherwise constant). In other words, the economic problem is one of retaining a given production function over time." (7, p.365)

Ciriacy-Wantrup says "conservation....may increase use of a resource above the present level, may keep it constant, or may slow down the decrease. The important point is that conservation practices change the when of use: they change the time distribution of use.... Conservation (or depletion) always implies comparison of two or more time distributions of use." (4, pp.6-7)

Kellogg affirms "Conservation implies full use on a sustained yield basis.... It certainly does not mean saving or denial of use." (9, p.259)

The popular concept of conservation has been outlined by the Soil Conservation Service, Region VII, as follows:

> "Conservation does not connote nonuse; conservation deals with the productive use of soil and water resources. It deals with systems of use of land and water resources

which will insure a permanent high capacity to produce agricultural products. It recognizes all types of land deterioration that affect productive use of land. This includes deterioration from alkalinity, saline conditions, waterlogging, decline of fertility and soil structure through cropping practices, as well as erosion damage. Conservation includes improvement in the productivity of land to higher levels rather than merely attempting to maintain an existing level. Conservation programs or systems of use are made up of many practices, some of which contribute both to improving productivity and controlling land deterioration." (10, Chap.3)

DESCRIPTION OF STUDY AREA

Location

The Columbia Basin wheat-farming area embraces parts of eastern Washington, northeastern Oregon, and western Idaho. It includes about 9.5 million acres of cropland and produces approximately 9 per cent of the nation's wheat. Areas covered in this study are located in Gilliam, Morrow, Sherman, Umatilla and Wasco counties in northeastern Oregon (Figure 1).

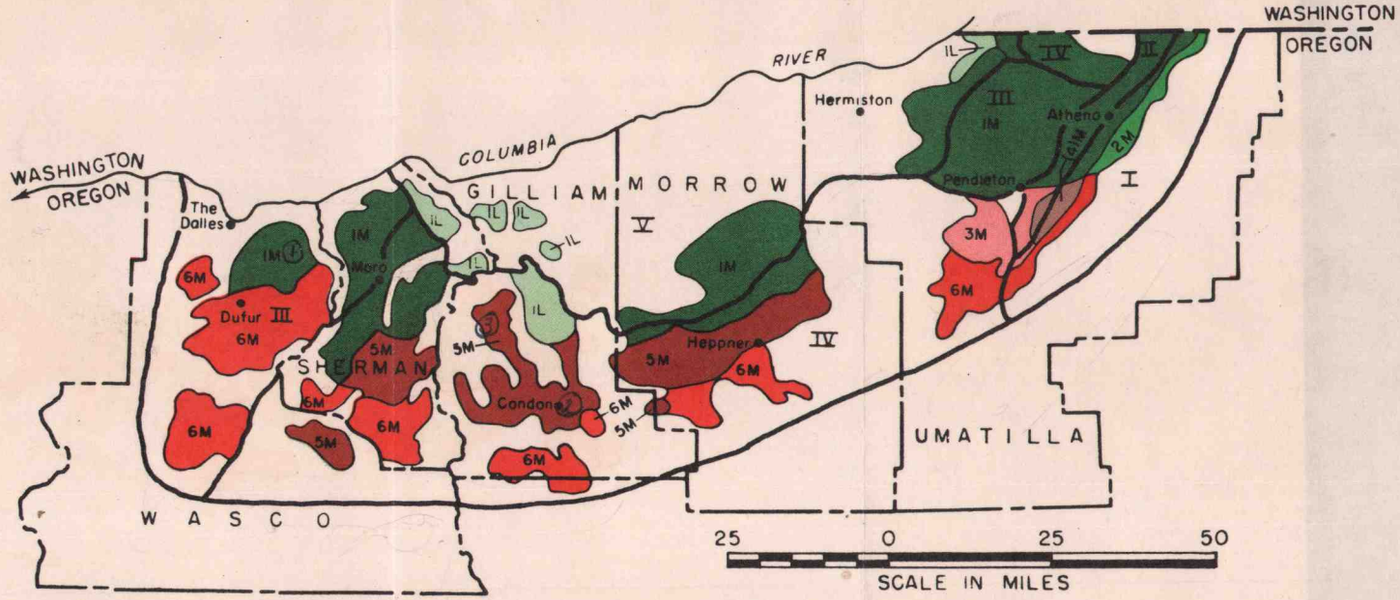
Climate

The elevation of the wheat-farming area ranges from less than 500 feet adjacent to the Columbia River to more than 2500 feet near the foothills of the mountains which mark the southern and eastern boundaries of the area.

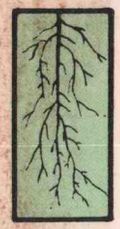
The average annual precipitation in various parts of this area ranges from about eight inches to approximately 25 inches. The differences in precipitation, together with differences in soils, topography, and other factors, give rise to differences in land use patterns, in types of erosion problems involved, in adaptable conservation programs, and their potential economic effects. Five broad climatic zones (Figure 1) have been established for this area. Farms in two of the areas in Oregon have been studied; namely, the wheat-fallow area of high productivity and the wheat-fallow area of low productivity with water erosion problems, as illustrated by areas III and IV in Figure 1.

U.S. DEPARTMENT OF AGRICULTURE, SOIL CONSERVATION SERVICE
ROBERT M. SALTER, Chief

LOCATION MAP



SOIL PROFILE & DESCRIPTIONS



IL SOILS
Deep, light-textured, rapidly permeable soils

IM SOILS
Deep, medium-textured, permeable soils

2M SOILS
Deep soils having medium-textured surface soil underlain with less permeable, heavier subsoil

3M SOILS
Shallow soils having medium-textured surface soil underlain with essentially impermeable subsoil (claypan)

(4)M SOILS
Shallow soils having medium-textured surface soil underlain with impermeable hardpan layer over porous gravels

5M SOILS
Moderately deep, medium textured permeable soil over bedrock

6M SOILS
Shallow soils having medium-textured surface soil underlain with less permeable, heavier subsoil over bedrock

BROAD CLIMATIC ZONES

- Climatic zone boundary
- I Annual cropping area
- II Transition zone
- III Wheat-fallow area of high productivity
- IV Wheat-fallow area of low productivity with water erosion problems
- V Wheat-fallow area of low productivity with wind erosion problems

FIGURE 1 PHYSICAL CHARACTERISTICS OF WHEAT FARMING LANDS, COLUMBIA BASIN COUNTIES, OREGON.

PACIFIC REGION
J.H. CHRIST, Director

ABR-SCS-PORTLAND, ORE. APRIL, 1952

The area designated "Wheat-Fallow Area of High Productivity" lies, for the most part, in the 12 to 16-inch rainfall belt. Where soils are of high productivity, the precipitation may be as low as 10 inches. This is an area of relatively high yields of wheat where moisture-nitrogen relationships are satisfactory for a legume or legume-grass rotation. In years of normal or above normal rainfall, nitrogen fertilizer would probably be effective.

The area designated "Wheat-Fallow Area of Low Productivity with Water Erosion Problem" has a normal precipitation of about 10 to 14 inches. Wheat yields are low in this area and moisture rather than nitrogen is the limiting factor in crop production. Precipitation is inadequate to permit the use of legumes in a crop rotation. At present, grass is the only soil conserving crop that can be grown.

Selected Study Areas

The selected study area comprises the wheat-fallow land of the Columbia Basin counties of northeastern Oregon, where water erosion is a problem. The area is bounded by the Umatilla Range on the south, by the Blue Mountains on the east, and by the Cascade Mountains on the west. The elevations range from less than 500 feet near the Columbia River to more than 2500 feet at the foothills of the mountains.

Elevation, climate and soils are inter-related with soils usually more shallow and heavier in texture going from the Columbia River toward the foothills. The Soil Conservation Service has designated the soils in groups as follows:

Soil groups	Description	Depth of soil	Depth of topsoil
1L soils	Deep, light-textured, rapidly permeable soils	Over 60 inches	10-18 inches
1M soils	Deep, medium-textured, permeable soils	Over 60 inches	10-18 inches
5M soils	Moderately deep, medium-textured, permeable soils over bedrock	24-36 inches	8-14 inches
3M, 4M, 6M soils	Shallow soils having medium-textured surface soil underlain with less permeable, heavier subsoil over bedrock or with claypan or hardpan layer	20-24 inches	8-14 inches

With the exception of some nearly flat lands in central and southern Wasco County, the topography of the wheat farming land is rolling. Many deep canyons and much rough range land is interspersed with the crop lands.

Land capability classes are determined primarily by depth and permeability of soil, slope, and status of erosion. The following general standards are used in classifying crop lands in this area:

Depth of soil over bedrock, substratum, or impermeable layer	Per cent slope; by land capability classes			
	Class II land	Class III land	Class IV land	Class VI land
Over 36 inches	Less than 7	8-20	21-30	Over 30
20-36 inches	Less than 7	8-12	13-20	Over 20

In most of the areas studied the predominant crop land is class III land. A few areas with gently rolling or nearly flat topography

are class II land. The shallow soils, near the foothills, are class IV land, as are the light-textured soils in the wind erosion area. Some class VI land is cultivated, especially in the areas of shallow soils and along the breaks of the canyons.

The crop land in this area varies from 900 to 1600 acres per farm. It is devoted almost exclusively to the production of wheat and other small grains, alternating with summer-fallow. A large proportion of the farm land in this area is rented.

The amount of range land, generally interspersed with crop land, varies widely from farm to farm. A survey of a representative group of wheat farms in Gilliam, Morrow and Sherman counties showed that on approximately half of the farms the range land constituted 20 per cent or less of the total farm acreage; while on the others it comprised from 20 to 75 per cent of the total acreage and averaged one-third of the total land in the wheat farms studied. This survey showed that 85 per cent of the farmers had some beef cattle but very few kept sheep. Dairy cattle, hogs and chickens, were usually kept only to provide food for home consumption. (8)

Crop yields vary in the different areas, depending on soils, precipitation and other factors. In the area of high productivity in northwestern Sherman County, the wheat yields have averaged 26.6 bushels per acre during the period 1928-1947. In the area of low productivity, lying within the belt of "5M" soils in Gilliam, Morrow and Sherman counties, the wheat production has averaged 16.8 bushels per acre during this 20-year period. (10)

Sheet erosion is the principal problem in the selected study areas. A generally even removal of soil in thin layers occurs over an entire segment of sloping land. In some areas, notably in central Morrow and western Umatilla counties, slight wind erosion as well as more serious water erosion is present. No data relative to the rate of soil loss, in tons per acre, are available. A survey by the Soil Conservation Service in 1936 in Gilliam, Sherman, and Umatilla counties indicated that there was an average of 44 per cent of the area with slight erosion (less than 25 per cent of the topsoil removed); 50 per cent with moderate to serious erosion (25 to 75 per cent of the topsoil removed); and 5 per cent with severe erosion (over 75 per cent of the topsoil removed). (3, p.19)

In a study in the Columbia Basin wheat area, it was found that the effect of loss of soil on yields of wheat varied with the depth of soil. On lands with 11-13 inch deep topsoil the loss of one inch of soil caused the reduction of about 2.5 to 3 per cent in the yield of wheat. The reduction in yield was found to be less on deeper soils and more on the shallower soils. Based on the present erosion rate on fairly steep topography, it was estimated that yields would decline 13 to 21 per cent in the next 50 years, and approximately 50 per cent during the next 100 years. (11, pp.12-16)

NATURE OF RECOMMENDED CONSERVATION PLANS

Fundamental Requirements

Lands have varying physical characteristics as to soil texture, depth, permeability, steepness and length of slope, degree of erosion, vegetative cover, and climate. These factors combine to make different physical limitations on the productive use of land. To use lands beyond their physical limitations leads to eroded or run down lands of lowered fertility.

Conservation, according to the Soil Conservation Service, begins with the proper use of land according to its capabilities and/or its limitations. The conservation survey is basic to planning a conservation program. With the land capability classes determined, it is possible to shape a conservation program to fit the need of the land.

Functions of Conservation Practices

Soil conditioning practices are basic to all cultivated land. These soil improving practices help to control erosion and also to maintain or improve soil productivity. These practices include using grass and/or legume crops in rotations, plowing down green manure crops, using crop residues and using fertilizers.

Practices that improve soil conditions and also provide cover protection either yearlong or during hazardous seasons are desirable. Stubble, mulch tillage, strip cropping cover crops, windbreaks, and pasture and range management practices are other examples of cover protection. A heavy fall growth of winter grain is effective in

reducing erosion.

Water impounding practices consist of contour farming, strip cropping, rough tillage, subsoiling, and similar tillage or cultural practices to hold water where it falls. It also slows up the runoff until it can be gradually absorbed by the soil. Rough fall plowing of grain stubble land, for a spring crop, is effective in decreasing winter runoff. Disking or rotary subsoiling which leaves much crop residue in the surface layer aids in avoiding excessive runoff. Contour and cross-slope tillage and seeding are important to impound or retard runoff by leaving furrows that act as miniature dams to hold water. Strip cropping functions to impound runoff as the strips, with good cover or a rough surface, have the capacity to absorb runoff from the strips less well protected.

Terraces or diversion terraces serve on long slopes to reduce the distance over which water may accumulate. They are also used on sloping lands having shallow soils over a hardpan or bedrock, which have a limited water-holding capacity. Properly engineered, terraces or diversion terraces take excess water off a field on a gradual gradient to grass waterways, ponds, stream channels or other water disposal systems.

Requirements of a Conservation Program

The two main requirements in the Pacific Northwest wheat region are to control erosion and to maintain or improve soil fertility. In order to attain the maintenance or improvement of soil fertility, it

is necessary first to control erosion effectively.

Some soil losses will occur in these wheat areas under the most careful system of cultivated use when climatic and other conditions conducive to erosion exist. The Soil Conservation Service has set maximum allowable losses, where the soils are deep, to about five tons per year for any one acre, with more effective control on more shallow soils. An inch of soil over an acre weighs approximately 150 tons. If land is managed in such a manner as to entail an average annual loss of five tons per acre per year, it would take about 30 years to remove one inch of topsoil. To reduce the average annual soil loss to not more than five tons per acre on any part of a farm will call for more intensity of conservation on different land capability classes. The average annual soil loss over most of a farm should be reduced to perhaps one ton or less per acre.

Recommendations on Lands of Differing Capabilities

The lower the land use capability, as established by the soil survey, the greater should be the degree of care and protection given the land. The recommended practices and treatments by land capability classes, as established by the Soil Conservation Service, are guides to the farmer in planning the conservation program for his farm. There is considerable freedom of choice of practices and treatments in developing a conservation program for a farm. Recommended practices and treatments seldom follow the exact boundaries of the land capability classes as mapped. Topographic features that influence the use of equipment and construction of fences, the need to balance

field acreages and other factors usually make some deviation necessary. A small area of a particular land capability lying within a much larger area of another capability is often disregarded for reasons of practical farming operation.

ANALYSIS OF THE ECONOMICS OF CONSERVATION FARMING

The farm budget method has been selected as the tool for evaluating the economics of exploitive and conservation farming. Under this method the effect of a conservation program on such factors as land use, crop yields, livestock numbers and production, various items of farm expense and returns is determined; and compared with that from the present system of farming.

Analytical Procedures

The problem involved in this study was to evaluate the income potentialities of different alternative systems of farming that might be followed on a given farm. Conservation and other improved systems of farming are compared with the present system. The farm budgeting method was used to determine the many aspects of the farm organization and income potential of the various systems of farming.

A representative farm was selected in each area and resource situation to be studied. The Soil Conservation Service prepared a conservation plan with the recommended conservation systems of farming applicable to the selected farm. The expenses and income for conservation systems, as compared with the present system of farming, were estimated by preparing farm budgets. (10)

A farm budget is a plan for the organization and operation of a farm, including a detailed statement of anticipated gross income, expenses, and net income. The income and expense items over a period of years with specified prices for farm products were estimated by the use of "input-output factors".

Output factors are represented by normal crop yields and livestock production rates. These, when applied to the crop acreages and livestock numbers for a given system, indicate the gross farm income that would be applicable to that system over a period of years. Input factors are represented by unit cost items such as labor and power requirements per acre for crop production; seed, feed and fertilizer requirements; tractor operating costs per hour; other machinery costs per work unit, and other unit cost items. From these items the farm expenses for each system of farming are estimated. The net farm income is determined by subtracting the total farm expense from the gross farm income.

The budgetary method has many advantages such as utilizing input-requirements data that are available from numerous published and unpublished studies. Any system of farming, even though not now fully adopted by the farmer, can be analyzed from the standpoint of potential economic returns. With the farm budgeting method all extraneous factors can be held constant, so that the effect of given variables upon income can be determined. In this sense it is like a controlled experiment.

Price Assumptions

The June 15, 1950 (pre-Korean) price level was used for this study as indicated by the following items:

Commodity	Price
Wheat, per bushel	$ 2.00
Barley, per bushel	1.35
Alfalfa-grass hay, baled per ton	27.00
Beef cattle:	
Yearling feeders (700-800 lbs.) per cwt. on July 15	20.00
Feeder calves (400-450 lbs.) per cwt. on October 1	19.50
Cows (1000 lbs.) per cwt. on October 1	15.00

These are not intended to represent the present or a forecast of future prices. They are taken as representative of a peacetime period of full employment, high prices, and price-cost relationships favorable to agriculture, such as the period following World War II. (10)

Organization and Operation of Farms Selected for Study

Each of the farms selected for study was representative of a different area or resource situation. The assumptions made are that each farm is an owner-operated farm managed by a farmer of average ability; that the farm is equipped with farm machinery of the type and size generally found on farms of comparable size in the area; that farming practices under the present system of farming are typical of present practices employed by most farmers in the community; that the present system includes conservation practices that have already become widely adopted in the area. (10)

The actual acreage of land used for permanent pasture and range in the present system of farming was used in this study. The utilization of cropland under the present system of farming, as budgeted, reflects the use of land over a period of years common to the area in which the farm is located.

The prices used in the budget analysis assume a peacetime economy with government price supports on wheat. Because of this a wheat "allotment" or acreage control program was also assumed, thus imposing some restrictions on the acreage of wheat to be planted in the present system of farming. In the recommended conservation systems of farming, the reduction of wheat-fallow area would more than reduce the acreage of wheat sufficient to meet the assumed restrictions.

The livestock numbers assumed for the present system, as budgeted, are the numbers of beef cattle that can be supported by the available feed resources. To simplify the budgeting, chickens, hogs, sheep, milk cows and other livestock kept for the farm family have been excluded.

A complete conservation system of farming cannot usually be adopted in a short period of time. A period of two to four years may be required before the full recommended acreage of soil conserving crops can be established in a rotation on various fields on a farm. During this transition period of changing over to a conservation system, special economic problems may be encountered, which have not been analyzed. The economic analysis in this study deals with the average income potentialities of conservation systems of farming during the first 10 to 12-year period after the recommended crop rotation and other conservation practices have been fully adopted. This is compared to the present system over a similar period. This period covers a complete crop rotation cycle of the long conservation crop rotations applicable to the Oregon wheat-fallow area.

ECONOMICS OF CONSERVATION FARMING IN THE OREGON WHEAT-FALLOW AREA

Areas and Farms Selected for Study

A farm in the "1 M" soil area in the northwestern part of Sherman County--northwest of Moro, Oregon--was selected as representative of the wheat-fallow water erosion area of high productivity. The results of the economic analyses for this farm would be applicable to the area of "1 M" soil in northwestern Sherman County, northeastern Wasco County, and western Umatilla County, Oregon (Figure 1). They are indicative, in a general way, of the situation in the wheat-fallow water erosion area of high productivity in Oregon, Washington and Idaho.

Two farms were selected as representative of different land resource situations in the wheat-fallow water erosion area of low productivity. Both of these farms are located in the area of "5 M" soils in Gilliam County near Condon, Oregon. One farm is a specialized wheat farm consisting largely of cropland. The other farm is a wheat-livestock farm with a substantial acreage of range land operated in conjunction with wheat land. The results of the economic analyses with reference to these farms would be applicable to farms in the belt of "5 M" soils extending through Morrow, Gilliam, and Sherman Counties in Oregon (Figure 1). The results are indicative, in a general way, of the situation in all the wheat-fallow water erosion area of low productivity in the Pacific Northwest.

Farm Budget Analyses of Conservation Systems of Farming for a Typical Specialized Wheat Farm in the Wheat-Fallow Water Erosion Area of High Productivity

The farm selected for study contains 1,280 acres of land, all of which is tillable. This is a deep, fertile, medium-textured soil having uniformly permeable topsoil, subsoil, and substratum (designated by the Soil Conservation Service as "1 M" soil). The distribution of land capability classes, and their relation to the slope of the land, is as follows:

Land capability class	Average slope	Cropland
	Per cent	Per cent
Class II land	8	80
Class III land	15	19
Class IV land	14	1
Average or total	9	100

The average annual precipitation in the area where the farm is located ranges from 11.5 to 13 inches, according to local information.

Virtually all of the land on this farm is presently used for the production of small grain alternating with summer fallow. It is assumed that under a wheat "allotment" program, 90 per cent of the grain would be wheat, the diverted acres being planted to barley.

In common with other farmers in the area, crop residues are utilized under the present system of farming. Grain is sprayed with 2,4-D for weed control. Eighteen acres of land, mostly near the farmstead, have been seeded to permanent pasture. These constitute the only conservation practices presently carried out. Five beef cows are

supported by the available feed resources.[1]

The estimated yields under the present wheat-fallow system--based on average 1928-47 yields in the "1 M" soil area in the northwestern part of Sherman County are 26.7 bushels of wheat or 33.4 bushels of barley per acre.

Description of Conservation Systems of Farming Recommended by the Soil Conservation Service

Seeded Grass Waterway

In addition to the 18 acres of land presently devoted to permanent cropland pasture, 56 acres--consisting principally of the waterway that traverses the farm and steep land adjacent to it--should be seeded permanently to grass. (See farm map showing Conservation Plan on next page). The grass mixture to be used would consist of six pounds crested wheatgrass, and either two pounds bulbous bluegrass or four pounds sheep fescue per acre.

Crop Rotation

A 12-year crop rotation of alfalfa-grass, four years, and alternate wheat-fallow, eight years, would be followed on all of the main cropland. The alfalfa-grass mixture would consist of four pounds Ladak alfalfa and six pounds crested wheatgrass per acre, seeded in alternate rows. The seeding would be made without a nurse crop in

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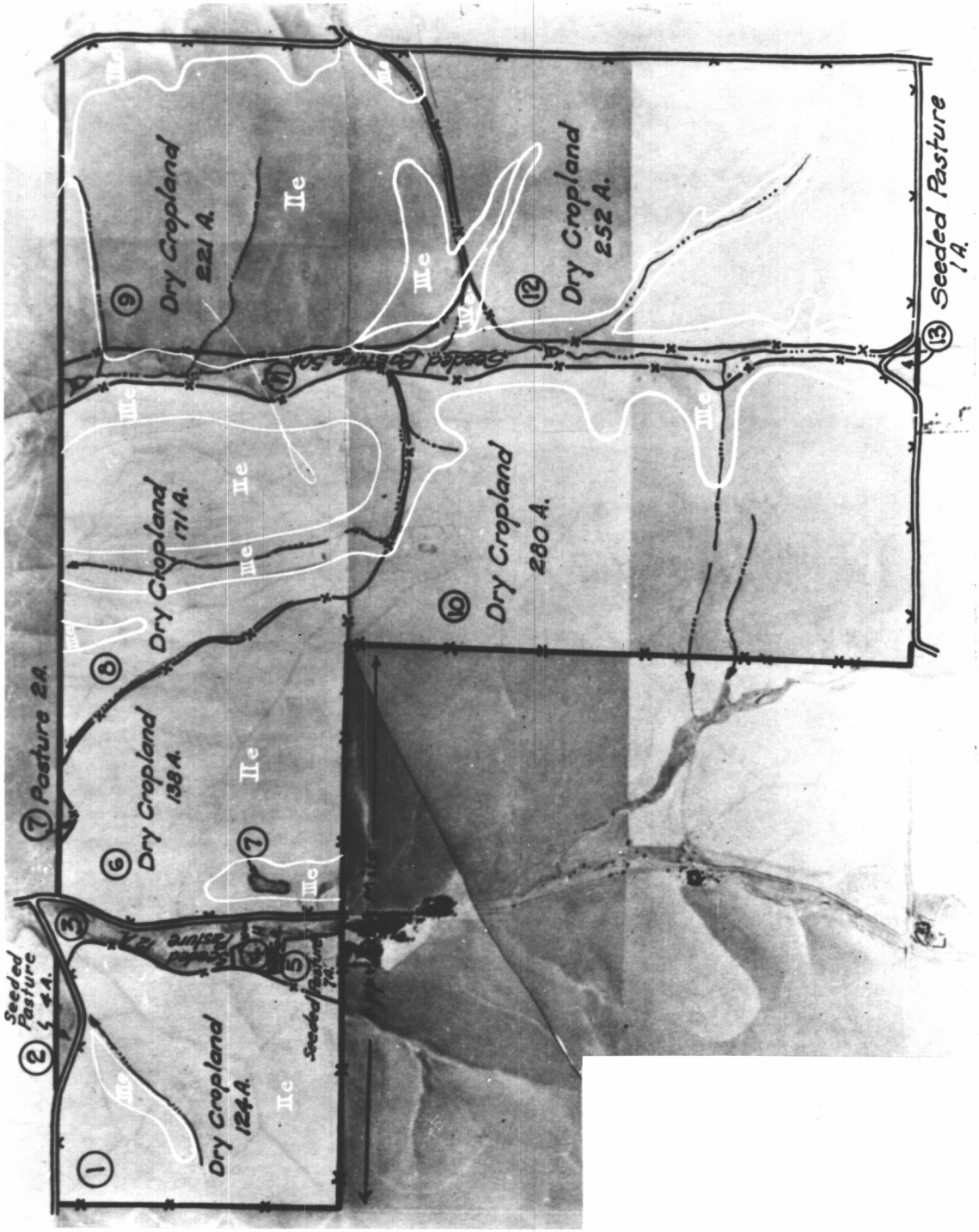
[1] The available stubble pasture would support considerably more livestock, but permanent pasture and hay resources are inadequate to provide a balanced feed supply during the remainder of the year. It is assumed that the excess stubble pasture would be leased to a stockman.



CONSERVATION PLAN OF SPECIALIZED WHEAT FARM
IN THE AREA OF HIGH PRODUCTIVITY

LEGEND FOR CONSERVATION PLAN

LEGEND

	Farm Operations Boundary		Fence to be Removed		Marsh
	Ownership Boundary		Ditch to be Removed		Land Use Tie
	Land Use Boundary		Intermittent Stream	TRAIL	Trail
	Land Use Capability or Site Boundary		Deep Gullies		Building
	Temporary Vegetal Condition Boundary		Perennial Streams		Rock Outcrop
	Temporary Physical Condition Boundary		Natural Barrier		Corral
2A./CM	Acres Required per Cow Month		Important Ridge Top		Stack Yard
EC,GC,FC,PC	Range Condition		Cattle Guard	H	Farmstead
320/160cm or 320/800sm	Surface Acres / Cow or Sheep Months		Wet Spot	2	Field Number
	Improved Road		Pond or Lake		
	Farm Road		Spring		
	Railroad	3	Move Portable Sprinkler Lateral		

Note: When fences are combined with other symbols they may be shown as follows. = Fence along improved road, = Fence along a ditch, etc.

EXISTING	PROPOSED		EXISTING	PROPOSED	
		Fence			Division Box or Turnout
		Electric Fence			Pipe Riser
		Shelterbelt			Diversion Dam
		Stream Bank Protection			Check Dam or Gully Plug
		Dike or Levee			Drop or Overfall
		Pipe Line or Sprinkler Main			Dam and Reservoir
		Permanent Sprinkler Lateral			Stock Pond
		Portable Sprinkler Lateral			Spring Development
		Flume			Spring and Trough
CANAL	CANAL	Canal			Trough
		Irrigation Ditch			Well
		Direction of Irrigation			Windmill
P	P	Pickup Ditch			Windmill and Trough
D	D	Diversion Ditch			Water Tank
		Drainage or Waste Ditch			Pump
		Closed Drain			Salt Ground
T	T	Terrace	R	R	Small Reservoir
		Tide or Flood Gate			

the spring following fall plowing of wheat stubble. The crop rotation would be as follows:

Year	Crop
1st	Alfalfa-grass, new seeding
2nd	Alfalfa-grass
3rd	Alfalfa-grass
4th	Alfalfa-grass
5th	Fallow
6th	Wheat
7th	Fallow
8th	Wheat
9th	Fallow
10th	Wheat
11th	Fallow
12th	Wheat

The same crop rotation would be followed on Class II, III, and IV lands. In applying the crop rotation plan the field layout would be reorganized as shown on the farm map.

In order to maintain a fairly constant acreage of each crop from year to year, the shift to a conservation system of farming would be made over a period of about three years. During this period the acreage in alfalfa-grass would be increased. The cropping sequence of each field year after year and the total acreage of each crop year-by-year throughout a rotation cycle are shown in Table F-1. The preliminary farm budget analyses deal with the average costs and returns during the first 12-year cycle of the rotation after its full establishment on the farm following the transition period.

Strip Cropping

Each field would be contour strip cropped. The strips would be about 200 feet in width. The cropping plan would be so arranged that

in any one year on any given field the alternate strips would represent sequences of cropping following each other one year apart in the rotation (see Table F-1). For example, in field #9 in the first year of the rotation the alternate strips would consist of (a) wheat, and (b) alfalfa-grass, new seeding. In the second year the alternate strips would consist of (a) alfalfa-grass, new seeding, and (b) alfalfa-grass, two years old. During most years the alternate strips would consist of wheat and fallow, respectively.

Use of Fertilizer

To stimulate the growth of the alfalfa, 20 pounds of nitrogen (N) per acre may be applied prior to establishing the stand of alfalfa-grass.

Stubble Utilization and Tillage Practices

In conjunction with the utilization of grain stubble, a subsurface plow instead of a moldboard plow would be used for preparing summer fallow after wheat.[1] This implement would serve to keep the crop residues on the surface as a stubble mulch. In dry years, fall grazing of stubble would be limited to the use of only the chaff dumps and the wheat heads left after harvest.

As cloddy a surface condition as possible on summer-fallow would be maintained by avoiding excessive and fast tillage operations which pulverize the soil.

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[1] For the farm budget analyses, a Graham-Hoeme is assumed to be used.

TABLE F-1. RECOMMENDED CROPPING PLAN FOR REPRESENTATIVE FARM IN NORTHWESTERN SHERMAN COUNTY, OREGON

Field No.	Acres in field	Land use 1/ 2/																
		Present farming system	Transition period			Crop rotation plan, after establishment												
			1st Yr.	2nd Yr.	3rd Yr.	1st Yr.	2nd Yr.	3rd Yr.	4th Yr.	5th Yr.	6th Yr.	7th Yr.	8th Yr.	9th Yr.	10th Yr.	11th Yr.	12th Yr.	Ave.
9	110	F	W	F	W	A-G	A-G	A-G	A-G	F	W	F	W	F	W	F	W	
	111	F	F	W	F	W	A-G	A-G	A-G	A-G	F	W	F	W	F	W	F	
8	86	W	W	F	W	F	W	A-G	A-G	A-G	A-G	F	W	F	W	F	W	
	85	W	F	W	F	W	F	W	A-G	A-G	A-G	A-G	F	W	F	W	F	
12	126	F	W	F	W	F	W	F	W	A-G	A-G	A-G	A-G	F	W	F	W	
	126	F	F	W	F	W	F	W	F	W	A-G	A-G	A-G	A-G	F	W	F	
6	69	W	W	F	W	F	W	F	W	F	W	A-G	A-G	A-G	A-G	F	W	
	69	W	F	W	F	W	F	W	F	W	F	W	A-G	A-G	A-G	A-G	F	
10	140	W	A-G	A-G	A-G	F	W	F	W	F	W	F	W	A-G	A-G	A-G	A-G	
	140	W	A-G	A-G	A-G	A-G	F	W	F	W	F	W	F	W	A-G	A-G	A-G	
1	62	F	W	A-G	A-G	A-G	A-G	F	W	F	W	F	W	F	W	A-G	A-G	
	62	F	F	W	A-G	A-G	A-G	A-G	F	W	F	W	F	W	F	W	A-G	
Total acreage:																		
Wheat --------		3/ 621	453	453	391	391	421	420	397	397	381	382	398	398	384	384	391	395
Fallow --------		621	453	391	391	421	420	397	397	381	382	398	398	384	384	391	391	395
Alfalfa grass:																		
New seeding		-	280	62	62	110	111	86	85	126	126	69	69	140	140	62	62	99
Mature stands		-	-	280	342	264	234	283	307	282	297	337	321	264	278	349	342	297
Permanent grass seeding ---		18	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74	74
Farmstead, roads		20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Total -----		1280	1280	1280	1280	1280	1280	1280	1280	1280	1280	1280	1280	1280	1280	1280	1280	1280

1/ A-G = Alfalfa-grass, new seeding
A-G = Alfalfa-grass, 2,3, or 4 yrs, old.
F = Fallow
W = Wheat

2/ Each field is to be divided into contour strips alternating between the two uses indicated for each field.
3/ Includes barley.
Source of data: Prepared by Soil Conservation Service.

In the fall the wheat stubble would be subsoiled with the use of a rotary subsoiler, a chisel, or a Graham-Hoeme set for deep tillage.

Alfalfa-grass sod would not be plowed until fairly late in the spring, and the fallow would be given minimum tillage (only such rod weedings as necessary to prevent weed seeds from forming), aiming to avoid excess nitrification.[1]

Early Seeding of Winter Wheat

Winter wheat would be seeded early (normally September 10 to 20) to obtain a maximum fall growth for winter cover. To accomplish this a deep-furrow drill, instead of a conventional drill, would be used.

Weed Control

Weeds in small grain would be controlled by spraying with 2,4-D as heretofore, with perhaps a higher proportion of the grain acreage requiring this treatment.

Use of Forage Resources

New seedings of alfalfa-grass or grass should neither be grazed nor cut for hay during the first year. During the second year hay may be cut. To avoid injury to the plants, stock should not be allowed to graze until late the second year, after hay has been cut. During the third and succeeding years, the stand might be grazed or cut for hay.

Grazing should not begin in the spring until the grass is 4 to 6

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[1] The sod would be plowed with a moldboard plow.

inches high and the soil is dry and firm enough to prevent trampling damage (normally about April 15).

A rotation-deferred system of use should be applied to all pasture lands. Pasture fields would be divided into three categories, according to season of use. On any field into which stock are turned early in the spring, not more than about half of the available forage would be grazed; then, after a period of regrowth, the field may again be grazed. Other fields will be grazed in late spring. Still other fields would not be grazed until late in the season, to allow for reseeding once every three years.

At the end of the season about four inches of ungrazed stubble should be left on both the permanent grass seeding and the rotation alfalfa-grass seeding.

Salt should be placed away from water in order to distribute the stock and to obtain uniform utilization of forage.

Fencing and Stock Water Development

Fields should be fenced as shown on the farm map. During years when the larger fields are in grass, it would be desirable to divide the field by means of electric fence into three units in order to obtain proper utilization of forage.

Stock water ponds would be developed in field #11 as indicated on the farm map.

Conservation Systems of Farming

Depending upon the method of utilizing the forage resources, several conservation systems of farming, each embodying the above

described conservation practices, have been set up for the farm budget analyses. These systems are as follows:

(a) Conservation system of farming with cow-calf outfit.
(b) Conservation system of farming with cow-yearling outfit.
(c) Conservation system of farming with feeder cattle outfit.
(d) Conservation system of farming with sale of hay.
(e) Conservation system of farming with sale of pasturage and hay.
(f) Conservation system of farming involving only nominal use of forage.

Certain other improved systems of farming have also been tested by farm budget analysis. These will be discussed subsequently, under the section entitled, "Income Potentialities of Other Improved Systems of Farming."

Income Potentialities of Conservation Systems of Farming

Estimated economic returns from the present system are compared with those from the recommended conservation systems for this farm by means of preliminary farm budget analyses (Table F-2). Adoption of the various conservation systems affects the farm organization, capital and labor requirements, production, gross farm income, farm expenses, and net returns.

Adjustments in Farm Organization Under Conservation Systems of Farming

On this farm the adoption of any of the recommended conservation systems would reduce the acreage of small grains--and likewise of fallow--by 36 per cent (Table F-2). Inasmuch as this reduction in grain acreage is much more drastic than that assumed to be required under an "allotment" program, all the grain acreage could be planted to wheat.

TABLE F-2. COMPARISON OF ESTIMATED ECONOMIC RETURNS FROM PRESENT SYSTEM OF FARMING AND RECOMMENDED CONSERVATION SYSTEMS OF FARMING AND OTHER IMPROVED SYSTEMS OF FARMING 1/

For a Typical Specialized Wheat Farm in the Water Erosion Area of High Productivity, Oregon Wheat-Fallow Area
(June 1950 Price Level)

Item	Unit	Present System of Farming	Conservation Systems of Farming: With Cow-Calf Farming	With Cow-Yearling Outfit	With Feeder Outfit 2/	With Sale of Hay	With Sale of Pasturage and Hay	With Nominal Use of Forage	Improved Wheat Fallow System	Pea Fallow System
Farm organization										
Land use										
Wheat	Ac	547	395	395	395	395	395	395	547	547
Wheat hay	Ac	12	-	-	-	-	-	-	12	12
Barley	Ac	62	-	-	-	-	-	-	34	34
Summer fallow	Ac	621	395	395	395	395	395	395	593	593
Alfalfa grass 3/	Ac	4/ 18	5/ 470	5/ 470	5/ 470	5/ 470	5/ 470	5/ 470	4/ 74	4/ 74
Used for pasture	Ac	(18)	(272)	(272)	(267.5)	(38)	(272)	(38)	(38)	(18)
Cut for hay	Ac	-	(99)	(99)	(103.5)	(333)	(99)	(9)	(36)	(56)
New seeding (not utilized)	Ac	-	(99)	(99)	(99.0)	(99)	(99)	(99)	-	-
Total cropland	Ac	1,260	1,260	1,260	1,260	1,260	1,260	1,260	1,260	1,260
Farmstead, roads, etc.	Ac	20	20	20	20	20	20	20	20	20
Total farm acreage	Ac	1,280	1,280	1,280	1,280	1,280	1,280	1,280	1,280	1,280
Livestock										
Beef cows	No.	5	41	33	-	5	5	5	5	5
Purchased feeder cattle 2/	No.	-	-	-	161	-	-	-	-	-
Other cattle	No.	1	9	30	-	1	1	1	1	1
Saddle horse	No.	-	2	2	2	-	-	-	-	-
Total animal units 6/	A.U.	6	48	48	52	6	6	6	6	6
Farm capital										
Land	Dol.	125,000	125,000	125,000	125,000	125,000	125,000	125,000	125,000	125,000
Buildings and other improvements	Dol.	15,800	17,700	17,700	17,700	15,800	15,800	15,800	15,800	15,800
Machinery and equipment	Dol.	14,000	17,100	17,100	17,100	18,500	15,600	15,600	14,700	15,200
Livestock	Dol.	900	7,900	8,200	7/ 9,200	900	900	900	900	900
Feeds	Dol.	200	1,700	2,000	3,000	200	200	200	200	200
Total capital	Dol.	155,900	169,400	170,000	172,000	160,400	157,500	157,500	156,600	157,100
Labor requirements										
Crops	Hrs.	1,573	1,449	1,447	1,570	1,939	1,460	1,278	1,871	1,981
Livestock 8/	Hrs.	147	586	586	672	147	147	147	147	147
Repair machinery, buildings, fences	Hrs.	429	470	470	470	429	429	429	429	429
Total labor	Hrs.	2,149	2,505	2,503	2,710	2,515	2,036	1,854	2,447	2,557
Work by hired day labor	Hrs.	691	527	522	684	987	570	461	735	765
Work by custom labor	Hrs.	-	13	8	-	-	40	-	16	25
Work by operator	Hrs.	1,458	1,965	1,973	2,026	1,528	1,426	1,393	1,696	1,767
Crop yields per acre										
Wheat	Bu.	26.7	9/ 26.6	9/ 26.6	9/ 26.6	9/26.6	9/ 26.6	9/26.6	24.6	24.6
Barley	Bu.	33.4	-	-	-	-	-	-	30.7	30.7
Alfalfa grass pasture 3/	A.U.M.	1.125	1.125	1.125	1.125	1.125	1.125	1.125	1.125	1.125
Alfalfa grass hay 3/	Tons	-	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9
Production										
Wheat	Bu.	14,605	10,507	10,507	10,507	10,507	10,507	10,507	13,456	13,456
Barley	Bu.	2,071	-	-	-	-	-	-	1,044	1,044
Hay	Tons	10/ 16	89	89	11/ 132.5	299	89	8	10/ 48	10/ 66
Pasture	A.U.M.	12/ 144	13/ 385	13/ 385	801	13/ 122	13/ 385	43	14/ 162	14/ 139
Beef cattle	Lbs.	2,275	17,900	21,720	15/ 39,580	2,275	2,275	2,275	2,275	2,275
Gross farm income										
Cash receipts from sales										
Wheat	Dol.	27,902	20,090	20,090	20,090	20,090	20,090	20,090	25,604	25,604
Barley	Dol.	2,677	-	-	-	-	-	-	1,328	1,328
Total small grain	Dol.	30,579	20,090	20,090	20,090	20,090	20,090	20,090	26,932	26,932
Hay	Dol.	176	675	405	-	7,857	2,187	-	1,018	1,526
Pasture 16/	Dol.	101	-	-	-	79	17/ 934	-	119	96
Beef cattle	Dol.	233	3,055	3,942	23,864	233	233	233	233	233
Total cash receipts	Dol.	31,089	23,820	24,437	43,954	28,259	23,444	20,323	28,302	28,787
Family living from farm	Dol.	846	946	932	932	846	846	846	846	846
Total gross farm income	Dol.	31,935	24,766	25,369	44,886	29,105	24,290	21,169	29,148	29,633
Farm expenses										
Hired labor	Dol.	709	541	536	701	1,013	585	473	754	785
Custom baling of hay	Dol.	-	238	105	-	-	567	-	224	350
Crop expense										
Seed	Dol.	9	469	469	469	469	469	469	31	1,546
Crop insurance	Dol.	354	225	225	225	225	225	225	338	338
Weed spray	Dol.	171	115	115	115	115	115	115	201	201
Fertilizer	Dol.	-	279	279	279	279	279	279	18	18
Baling wire	Dol.	-	-	-	-	233	-	-	-	-
Livestock expense										
Purchase of feeder cattle	Dol.	-	-	-	15,496	-	-	-	-	-
Barley	Dol.	-	142	269	1,073	16	16	16	-	-
Miscellaneous livestock expense 18/	Dol.	20	88	78	63	20	20	20	20	20
Farm machinery and equipment										
Depreciation	Dol.	2,135	2,433	2,433	2,433	2,698	2,214	2,214	2,337	2,419
Operating expenses 19/	Dol.	2,249	2,235	2,242	2,256	2,437	2,107	2,091	2,472	2,514
Depreciation, repair and insurance on improvements	Dol.	1,234	1,417	1,417	1,417	1,234	1,234	1,234	1,234	1,234
Property taxes	Dol.	1,265	1,372	1,375	1,448	1,319	1,284	1,284	1,274	1,279
Miscellaneous farm expense	Dol.	275	275	275	275	275	275	275	275	275
Total farm expense	Dol.	8,421	9,829	9,818	26,250	10,333	9,390	8,695	9,178	10,999
Net returns before income taxes										
Net farm income 20/	Dol.	23,514	14,937	15,551	18,636	18,772	14,900	12,474	19,970	18,634
Farm capital earnings 21/	Dol.	19,914	11,337	11,951	15,036	15,172	11,300	8,874	16,370	15,034
Percent earnings on farm capital	Pct.	12.8	6.7	7.0	8.2	9.5	7.2	5.6	10.4	9.6
Operator's earnings 22/	Dol.	15,719	6,467	7,051	10,036	10,752	7,025	4,599	12,140	10,779
Return to management 23/	Dol.	14,261	4,502	5,075	8,010	9,223	5,598	3,206	10,443	9,012
Net returns after income taxes 24/										
Net farm income	Dol.	18,740	12,603	13,065	15,310	15,408	12,576	10,722	16,258	15,282

For footnotes see following page.

Footnotes, Table F-2

1 Data represent average for first 12-year cycle of the recommended crop rotation.

2 Feeder calves purchased at beginning of winter feeding period; marketed July 15 as yearling feeders.

3 Includes grass waterways and other permanent grass seedings, as well as alfalfa-grass.

4 Represents permanent grass seedings, including grass waterways.

5 Includes 396 acres of alfalfa-grass in rotation, and 74 acres of permanent grass seedings.

6 The number of animal units is expressed on a year-long basis.

7 Represents capital for purchase of feeder cattle, $15,496 for 7-month period, expressed on an annual equivalent basis.

8 Includes hauling manure.

9 Wheat yields per acre are estimated as follows:

1st wheat crop after alfalfa-grass	21.6 bu.
2nd, 3rd, & 4th wheat crops after alfalfa-grass	28.3 bu.
Average	26.6 bu.

10 Includes 16 tons of wheat hay.

11 Includes 39.5 tons of wheat chaff.

12 Includes 124 AUM of grazing from grain stubble.

13 Includes 79 AUM of grazing from grain stubble.

14 Includes 119 AUM of grazing from grain stubble.

15 Represents gross production of 120,080 lbs. of beef, less 80,500 lbs. of feeder calves purchased.

16 Represents income from rental of grain stubble pasture, except as otherwise noted.

17 Includes $855 for rental of alfalfa-grass and grass pasture.

18 Miscellaneous livestock expenses include veterinary expense, vaccine, salt, and bull service fees or depreciation charge.

19 Machinery operating expenses include fuel, lubricants, repairs, tires, license fees, and insurance.

20 Net farm income is the compensation for farm capital and for the operator's labor and management. It is derived by deducting farm expenses from gross farm income.

21 Farm capital earnings is the compensation for farm capital. It is derived by deducting the value of the operator's labor and management, at $3,600 per year, from net farm income.

22 Operator's earnings is the compensation for the operator's labor and management. It is derived by deducting 5 per cent interest on farm capital from net farm income.

23 Return to management is the compensation for the operator's management. It is derived by deducting the value of the work by the operator, at $1.00 per hour, from operator's earnings.

24 Income taxes on net farm income are calculated from 1950 tax rates, assuming a standard deduction (10 per cent or $1,000 whichever is least) and a family of four.

Under each of the conservation systems there would be a total of 470 acres of land seeded to grass or alfalfa-grass, including grass waterways. Of this acreage, 99 acres would represent first-year seedings (not utilized). A minimum of 99 acres of alfalfa-grass representing the second-year stands would be cut for hay. In most cases the remaining grass and alfalfa-grass acreage, about 272 acres, would be used for pasture. In the case of the "conservation system of farming with sale of hay" virtually all the mature stands of grass or alfalfa-grass would be cut for hay.

Livestock numbers would vary with the system of farming. From 48 to 52 animal units of livestock (yearlong) could be maintained under the recommended conservation systems.[1] A cow-calf outfit would consist of 41 beef cows plus yearling heifers, bulls, and saddle horses. A cow-yearling outfit of 33 beef cows plus associated stock could be maintained, or 161 feeder calves purchased in the late fall would be wintered over and marketed about July 15 off pasture.

Under the "conservation system of farming with sale of hay", only the present numbers of livestock--five beef cows plus offspring --would be maintained. The alfalfa-grass and the grass waterways

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[1] Somewhat larger numbers of cattle could be kept if pasture were available, but the first year alfalfa-grass seeding should not be utilized and second year growth should be cut for hay. With a cow-calf or cow-yearling outfit the second-year stand of alfalfa-grass would produce more hay than required for the livestock supported by the pasture resources. The excess hay is assumed to be sold.

would be cut as hay for sale.

Under the "conservation system of farming with sale of pasturage and hay", the grass waterways and the alfalfa-grass fields, exclusive of the second year stands which must be cut for hay, are assumed to be leased to a range livestock operator for pasture during the spring months. The hay from the second year stand would be sold.

Under the "conservation system of farming with only nominal use of forage", the forage resources are utilized only to the extent needed by the few beef cows presently on the farm.

Capital Requirements for Conservation Farming

The present system of farming involves a capital investment of $155,900. Under conservation farming the additional capital required ranges from $1,600 where the pasture is leased to $16,000 where the livestock is owned (Table F-2).

Effect of Conservation Farming on Labor Requirements

The effect of conservation farming on the amount of man labor required per acre for producing various crops is summarized in Table F-3. Substantially more labor per acre would be required for the care of summer fallow under conservation farming because of the added subsoiling operation in the fall and the increased weed problems encountered with subsurface tillage. The labor requirements for other crops and sequences of cropping would be increased slightly over those for the present system. The harvesting of alfalfa-grass hay would require more labor per acre than the production of wheat under the present system. Pasture would require little or no direct

TABLE F-3

MAN LABOR REQUIREMENTS PER ACRE FOR THE PRODUCTION OF CROPS[1]
Oregon Wheat-Fallow Area

Item	Present system of farming	Conservation systems of farming
	Hours	Hours
Summer fallow following wheat	.85	1.21
Summer fallow following grass	-	1.42
Summer fallow following alfalfa-grass	-	.91
Pea fallow following wheat	-	1.47
Winter wheat following summer fallow	1.59	1.70
Spring grain following summer fallow	1.78	2.23
Winter wheat as nurse crop with grass, following summer fallow	-	1.55
New seeding of alfalfa-grass, following wheat	-	1.32
Grain hay (1.0-1.3 T/ac)	4.1-5.0	-
Alfalfa-grass hay, harvested with buckrake (0.9 T/ac)	-	1.86
Alfalfa-grass hay, harvested with pickup baler (0.9 T/ac)	-	2.04
Grass hay, harvested with buckrake (0.63 T/ac)	-	1.39
Grass hay, harvested with pickup baler (0.63 T/ac)	-	1.52

[1] Includes only direct field labor such as plowing, seeding, harvesting, etc. Does not include indirect labor for repairing machinery, fences, etc.

labor, but the labor for livestock would more than make up for this. The total labor requirements for the farm as a whole would vary with each system of farming.

Under a conservation system of farming with a cow-calf outfit, a cow-yearling outfit, or feeder cattle, total labor requirements would be increased about 17 to 26 per cent over that for the present system. The seasonal distribution of this labor would be different, however, than with the present system--involving lower peak-labor requirements during wheat harvest season and materially higher labor requirements during the winter. Because of the lower peak-labor requirements during the harvest season, less cash expense would be involved for hired labor than under the present system; the labor performed by the farm operator, however, would be increased from less than 1500 hours per year to approximately 2000 hours per year (Table F-2).

Under a "conservation system of farming with sale of hay" the total labor requirements would be comparable to that with a beef breeding herd. Peak labor requirements during hay harvest would exceed those during the wheat harvest season, entailing considerably more hired labor than under the present system. In fact there is some question whether the hay from 333 acres of alfalfa-grass seedings and grass waterways could be put up within the optimum period for haying without requiring duplicate sets of hay harvesting equipment.

Under a "conservation system of farming with sale of pasturage and hay" the total labor requirements would be less than under the

present system.

Effect of Conservation Farming on Crop Yields

The various conservation practices would have varied effects on the yields of grain crops. Subsurface tillage would cause an estimated drop of 8 per cent in yields, due to the limited nitrification, poorer tilth, and increased weed competition. The effect of the adoption of the recommended crop rotation would vary for successive wheat crops. The first crop of wheat after alfalfa-grass would likely "burn", especially in dry years, resulting, on the average, in an additional estimated reduction of 12 per cent in the yield of the first wheat crop. The yield of the second, third, and fourth wheat crops after alfalfa-grass would be rather markedly increased. (Yields are estimated to be 15 per cent higher than under a straight wheat-fallow rotation with subsurface tillage). Considering both the beneficial and the adverse effects which various conservation practices would have on yields, it was estimated that the average yield of wheat during the first cycle of the recommended crop rotation would be about 26.6 bushels per acre, or just about the same as under the present system.

Farm Income, Present System of Farming

The estimated gross farm income under the present system of farming was $31,935, derived almost entirely from the sale of wheat and barley. Deducting farm expenses of $8,421, leaves a net farm income of $23,514 (Table F-2).

Income Potentialities of Conservation System of Farming With Cow-Calf Outfit

Gross Farm Income

Because the acreage of grain would be cut 36 per cent under conservation farming, the average annual cash receipts from the sale of grain would be reduced from $30,579 to $20,090--a reduction of nearly $10,500. Increased sales of livestock and hay under a cow-calf system are estimated to replace only about $3,300 (Table F-2). The net effect of adopting the recommended conservation system with a cow-calf outfit, according to the preliminary figures, would be to reduce the total value of agricultural products by 23 per cent. Estimated gross farm income would be cut from $31,935 per year to $24,766 or $7,169 (Table F-2).

Farm Expenses

In changing from the present system to a conservation system with a cow-calf outfit, estimated farm expenses would be increased from $8,421 to $9,829 or $1,408. Increased expenses would be incurred principally for (a) custom baling of hay, (b) alfalfa and grass seed, (c) fertilizer, (d) machinery and equipment costs, and (e) costs for buildings, fences, and stock water facilities (Table F-2). The expenses for hired labor, crop insurance, and weed spray would be somewhat less than under the present system.

Net Returns

The indications are that the adoption of this conservation system would entail a cut in net farm income of 36 per cent from

$23,514 to $14,937 or nearly $8,600 (Table F-2). Other measures of net returns, such as operator's earnings, reflect an even more drastic cut.

Income Potentialities of Conservation System of Farming With Cow-Yearling Outfit

The income and expenses under this system are estimated to be very similar to those with a cow-calf outfit, except that gross farm income, and therefore net farm income, would be about $600 higher because of a larger turnoff of beef and the advantage of the July 15 market as against the October market.

Income Potentialities of Conservation System of Farming With Feeder Cattle Outfit

This system, while more speculative, appears to have the highest income potentiality of any of the conservation systems with beef cattle. This is accounted for primarily by a much larger net production of beef than with a cow-calf or cow-yearling outfit.[1]

The estimated gross income from sale of feeder cattle ($23,864) less the cost of feeder cattle purchased ($15,496) was $8,368. This net value of beef produced ($8,368) is approximately twice the estimated gross income from the sale of livestock and hay with a beef breeding herd. Nevertheless, this would offset only 80 per cent of the reduction in the value of grain available for sale under the

1 With a feeder cattle outfit, the net production of beef on this farm (total weight of cattle at time of sale less weight of feeder cattle purchased) is estimated at 39,580 lbs., compared with 21,720 lbs. with a cow-yearling outfit, or 17,900 lbs. with a cow-calf outfit (Table F-2).

present system.

The farm expenses under this system, aside from the expenses for purchase of feeder cattle, would be about $900 higher than with a beef breeding herd, due chiefly to requirements for more barley (fed to promote rapid growth of calves during the winter).

The estimated potential net farm income with this conservation system was $18,636 or 21 per cent less than the present income (Table F-2).

A system of farming with feeder cattle appears to have limited possibilities with reference to its widespread adoption by large numbers of farmers, due to the limited availability of feeder calves and the risk involved in this type of enterprise. Where winter feed supplies are available and where feeder cattle can be purchased in the fall, the risk would be much less than with spring-purchased feeder cattle.

Income Potentialities of Conservation System of Farming With Sale of Hay

Gross Farm Income

Under this system, with virtually all of the mature alfalfa-grass fields and the grass waterways being cut for hay, the estimated production would be 299 tons. A pickup baler, owned by the operator, would be used for harvesting the hay. The value of hay produced for sale, $7,857, would offset about 75 per cent of the $10,500 reduction in the value of grain available for sale. Gross farm income was estimated at $29,105 compared with $31,935 under the present system.

Farm Expenses

Estimated farm expenses are $10,333 compared with $8,421 under the present farming system. Increased expenses for hired labor, seed, fertilizer, baling wire, and machinery and equipment are primarily responsible for the $1,912 differential in costs.

Net Returns

Estimated net farm income under this system was $18,772 compared with the present income of $23,514.

The preliminary farm budget analyses indicate that the net farm income would be about the same or a little higher than under the conservation system with feeder cattle--and some 20 to 25 per cent higher than with a cow-calf or cow-yearling outfit. It is questionable, however, whether this is a realistic comparison. The relatively high return with sale of hay, as compared with a beef breeding herd, is a reflection of the fact that the yield of alfalfa-grass when cut for hay was assumed to provide twice as many animal unit months of feed per acre as when utilized for pasture. This assumption appears questionable.

It is unlikely that a conservation system with sale of hay could be adopted by a large number of farmers throughout an area. By and large, the forage resources produced under a conservation system would probably have to be utilized on the farms where produced. Some farmers, perhaps, could find a market for hay in nearby ranch areas or by shipping to the western Oregon dairy section.

Income Potentialities of Conservation System of Farming With Sale of Pasturage and Hay

Gross Farm Income

Except for the second-year alfalfa-grass stands, which would be cut as hay and sold for cash, the available forage resources are assumed to be leased to a range livestock operator under a share rental arrangement wherein the farm operator would receive a quarter of the net gain in weight of stock while on pasture, or an equivalent cash rental, estimated to provide a gross income of about $3.25 per animal unit month of pasture.

The $855 income from the rental of pasture, together with somewhat more than $2,000 income from hay, would offset only a fourth of the $10,500 reduction of income from sale of grain. The estimated gross farm income under this system was $24,290, compared with $31,935 under the present system.

Farm Expenses

Estimated farm expenses are $9,390 or nearly $1,000 more than under the present system. Custom baling of hay would entail an expense of more than $500. (It would not be economical to own a pickup baler for baling 89 tons of hay).

Net Returns

The estimated net farm income under this system was $14,900 or 37 per cent less than the present net income of $23,514. The estimated potential net farm income is about on a par with that of a cow-calf outfit. However, it would not involve as much labor on the

part of the operator nor as large a capital investment. Estimated returns to management under this system are, therefore, greater than with a cow-calf outfit.

Income Potentialities of Conservation System of Farming With Only Nominal Use of Forage

Under this system the full impact of the reduction in grain acreage would be felt. Estimated gross farm income was estimated as only $21,169 compared with $31,935 under the present system.

This system would require only a nominal capital outlay. It would involve less labor than the present system. Farm expenses would be less than under any other conservation system. Even so, total farm expenses would be increased $274 over the present system because of increased outlays for seed and fertilizer. Estimated net farm income was only $12,474 or slightly more than half the present income of $23,514.

Other Improved Systems of Farming

In addition to the conservation systems recommended by the Soil Conservation Service, certain other improved systems have been tested by farm budget analysis.

Improved Wheat-Fallow System of Farming

This system embraces all of the elements of the conservation program recommended by the Soil Conservation Service except crop rotation. For example, stubble mulch farming would be carried out with the use of subsurface tillage implements, contour strip cropping would be adopted, winter wheat would be seeded early with a deep-furrow

drill, and grass waterways would be established. A straight wheat-fallow rotation, however, would be followed.

Conservation practices such as the maintenance of the crop residues on the surface of the soil by means of subsurface tillage, the early seeding of grain, and the establishment of grass waterways, would provide some effective control of erosion, at lease for many years. However, this system of farming would not permanently maintain the productivity of the land because the organic matter content and fertility level of the soil would gradually decline. Nevertheless, this system would represent a distinct improvement over the present system with respect to the application of conservation practices.

Capital Requirements

Only a nominal amount of additional capital would be required to carry out this system of farming.

Labor Requirements

About 14 per cent more labor would be required than with the present system.

Crop Yields

Wheat yields would be lower than under either the present system or the conservation systems recommended by the Soil Conservation Service. It was estimated that wheat yields would be about 8 per cent lower than under the present system due to the adverse effects of subsurface tillage.

Gross Farm Income

Estimated gross income was $29,148 compared with $31,935 under the present system.

Farm Expenses

Estimated farm expenses would be $9,178 compared with $8,421 under the present system. The increase of $757 in farm expenses is principally machinery and equipment cost and custom hay baling.

Net Returns

The estimated net potential income was $19,970 or 15 per cent less than the net income of $23,414 under the present system. This reduction in income is less drastic than that under any of the recommended conservation systems.

By comparing the returns with those from the recommended conservation systems the effects which the adoption of an alfalfa-grass rotation would have on farm income during the first cycle of the rotation can be clearly seen.

Pea Fallow System of Farming

Under this system half of the regular summer fallow would be replaced with pea fallow. Peas would be turned under for green manure early in June and the land then fallowed until time for seeding of fall grain. The following crop rotation, with legumes occupying the land once every four years, would be used:

Year	Crop
1st	Peas for green manure (pea fallow)
2nd	Wheat
3rd	Summer fallow
4th	Wheat

All of the other conservation practices embodied in the conservation systems, such as crop residue utilization, subsurface tillage, grass waterways, and contour strip cropping, would be followed.

This system involves a more intensive application of conservation practices than does the "improved wheat-fallow system of farming."

Crop Yields

It was estimated that during the first 12 years after establishment of this crop rotation, the average crop yields would be about the same as under the "improved wheat-fallow system of farming." The turning under of the highly nitrogenous pea vines would likely have a depressing effect on the yield of the wheat crop immediately following, because of "burning", especially in dry years. The second crop of wheat after the pea fallow (the fourth year of the crop rotation) should be considerably benefited. It is likely, however, that the depressing effect of the pea vines on the first wheat crop would offset the beneficial effect which they would have on the second wheat crop.

Income Potentialities

Gross farm income with this system would be similar to the "improved wheat-fallow system of farming." Farm expenses, however,

would be considerably higher, due to the outlay of about $1,500 for pea seed. The estimated net farm income under the "pea fallow system of farming" would be $18,634 or 21 per cent less than the present system.

This system appears to have considerably higher income potentiality than any of the recommended conservation systems except those involving feeder cattle or sale of hay, both of which appear to have rather limited possibilities for adoption on a large scale by many farmers. It is doubtful, however, whether this crop rotation would maintain or improve the organic matter content of the soil to the same degree as would the recommended conservation systems of farming.

Farm Budget Analysis of Conservation Systems of Farming for a Typical Specialized Wheat Farm in the Wheat-Fallow Water Erosion Area of Low Productivity

The farm selected for study contains 1,484 acres of land. There are 1,285 acres of tillable cropland; 134 acres of rangeland of very low productivity; and 65 acres of farmstead, roads and other uses. The soil is moderately deep, fertile, medium-textured and permeable over bedrock (designated by the Soil Conservation Service as a "5 M" soil). The distribution of land capability classes, and their relation to the slope of cropland acreage are as follows:

Land capability class	Average slope Per cent	Cropland Per cent
Class II	4.9	68
Class III	7.9	29
Class IV	14.0	1
Class VI and VII	14.3	2
Average or total	6.1	100

The average annual precipitation in the area ranges from 10 to 13 inches, according to local information.

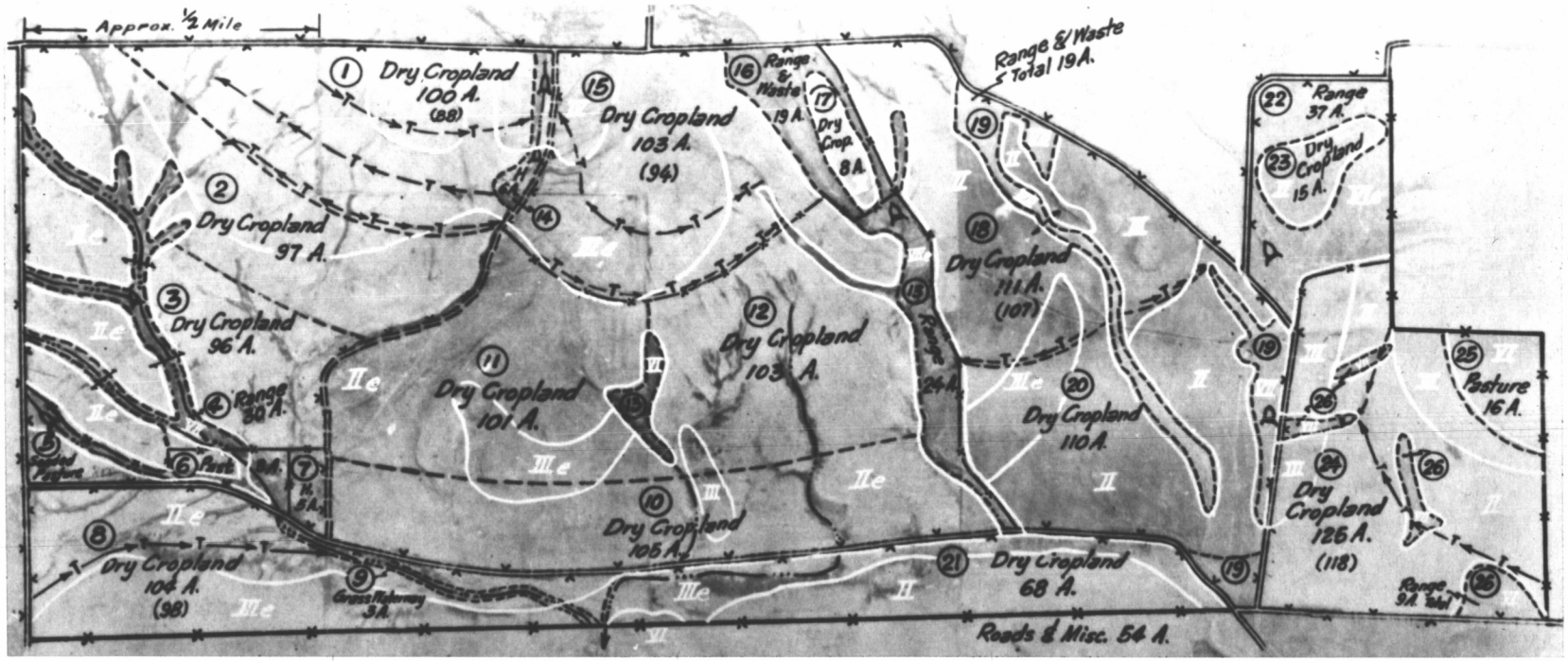
The farm organization is very similar to the farm in the area of high productivity--that is, the growing of grains and a few head of beef cattle for local consumption.

The estimated yields under the present system--based on average 1928-47 yields in the "5 M" soil area in the south central part of Gilliam County--are 17.1 bushels of wheat or 21.4 bushels of barley per acre on land classes II, III and IV and 12.9 bushels of barley on land classes VI and VII.

Description of Conservation Systems of Farming Recommended by the Soil Conservation Service

Permanent Grass Seeding

In addition to the 14 acres of land presently devoted to permanent cropland pasture, 46 acres would be seeded permanently to grass--a total of 60 acres. There would be three acres of seeded waterways, 21 acres of terraces and diversions and 14 acres in odd-sized fields in class II, III and IV land. There would be 21 acres of class VI and VII land permanently seeded. (See farm map showing Conservation Plan, on next page). The grass mixture to be used would consist of the following:



CONSERVATION PLAN OF SPECIALIZED WHEAT FARM IN THE AREA OF LOW PRODUCTIVITY

For fields adjacent to rotation cropland

Crested wheatgrass	6 lbs. per acre
Bulbous bluegrass	2 lbs. per acre

For fields adjacent to rangeland

Crested wheatgrass	8 lbs. per acre
Bulbous bluegrass	2 lbs. per acre

For permanent sod waterways

Pubescent wheatgrass	12 lbs. per acre
Sheep fescue	4 lbs. per acre

For diversion terraces

Crested wheatgrass	12 lbs. per acre
Sheep fescue	4 lbs. per acre

Crop Rotation

A 12-year crop rotation of crested wheatgrass four years, with alternate wheat-fallow eight years, would be followed on the main cropland. Crested wheatgrass would be seeded at the rate of six pounds per acre with 47 pounds of wheat as a nurse crop. The seeding would be made in the fall, following normal tillage of fallow. The crop rotation would be as follows:

Year	Crop
1st	Fallow
2nd	Crested wheatgrass with nurse crop
3rd	Crested wheatgrass
4th	Crested wheatgrass
5th	Crested wheatgrass
6th	Crested wheatgrass
7th	Fallow
8th	Wheat
9th	Fallow
10th	Wheat
11th	Fallow
12th	Wheat

The establishment of the rotation is similar to that referred to for the farm in the area of high productivity (Table F-1).

Diversion Terraces

Fields 1, 8, 15, 18 and 24 would contain one or more diversions taking up a total of 21 acres. These diversions will be constructed across the slope and with a capacity to remove excess water from a field with minimum damage. These should also serve as permanent guides for contour operations. Cross slope seeding, or seeding as nearly to the contour as possible should be a regular practice.

Use of Fertiliser

It is assumed that fertiliser will not be used on this land due to the danger of "burning" the crop during dry seasons or dry years.

Stubble Utilisation and Tillage Practices

This will be similar to the farm budget analysis on the farm in the area of high productivity. The main differences is that the crested wheatgrass would be early fall plowed and the fallow will receive the same tillage as it would after wheat.

Early Seeding of Winter Wheat and Weed Control

These would be essentially the same as in the area of high productivity.

Use of Forage Resources

The first year of grass (after the year of planting with wheat as a nurse crop) should be cut for hay, as grazing would damage the stand. The second, third and fourth years the grass might be cut for hay or used as pasture according to which is needed to balance out feed requirements. The methods of grazing would be the same as in the area of high productivity.

Conservation Systems of Farming

Several conservation systems varying according to the method of utilizing the forage resources, each embodying the above described conservation practices, have been set up for farm budget analyses as follows:

(a) Conservation system of farming with cow-calf outfit.
(b) Conservation system of farming with cow-yearling outfit.
(c) Conservation system of farming with feeder cattle outfit.
(d) Conservation system of farming involving only nominal use of forage.

One other improved system has been tested by farm budget analysis. This will be discussed under the section entitled "Income Potentialities of an Improved System of Farming."

Income Potentialities of Conservation Systems of Farming

The estimated economic returns from the present system are compared with those from the recommended conservation systems for this farm, by means of preliminary farm budget analyses (Table F-4). Adoption of various conservation systems effect the farm organization, capital and labor requirements, production, gross farm income, farm expenses, and net returns.

Adjustments in Farm Organization Under Conservation Systems of Farming

On this farm the adoption of any of the recommended conservation systems of farming would reduce the acreage of small grains--and likewise of fallow--by 36 per cent (Table F-4). Inasmuch as this reduction in grain acreage would be more drastic than that assumed to be required under an "allotment" program, all the grain acreage could be planted to wheat.

Under each of the conservation systems there would be a total of 469 acres of land seeded to grasses, including grass waterways (three acres), terraces and diversions (21 acres) and other permanent seedings (36 acres). Approximately 102 acres of grass is seeded annually with wheat as a nurse crop. This grass is used the following year as hay. (Cows would injure the new stand).

Livestock numbers would vary with the system of farming. About 47 to 48 animal units of livestock (yearlong) could be maintained under the recommended conservation systems. A cow-calf outfit would consist of 41 beef cows plus 35 calves (seven for replacement and 28 for market), 7 yearling heifers, 2 bulls, and 2 saddle horses. A cow-yearling outfit would be a herd of 33 beef cows plus 28 calves, 26 yearling heifers (six for replacement stock and 20 for market), one bull, and two saddle horses. With a feeder cattle operation 143 calves might be purchased in the late fall, wintered over, and marketed about July 15 off pasture.

Under the "conservation system of farming with only nominal use of forage", the forage resources are utilized only to the extent needed by the few beef cows presently on the farm.

There is no system of farming with sale of hay or rental of pasture. Crested wheatgrass hay is not of sufficient quality to sell in commercial channels while pasture is good only during certain growing periods and by itself has little yearlong rental value. One-fourth of the grassland acreage must be cut for hay, further limiting possible pasture use.

Capital Requirements for Conservation Farming

The present system of farming involves a capital investment of $98,100 (Table F-4). Under conservation farming additional capital would be required, ranging from $1,600 to $15,000. With a cow-calf outfit, a cow-yearling outfit, or a feeder outfit, approximately $12,000 to $13,000 of additional capital would be required.

Effect of Conservation Farming on Labor Requirements

The effects of types of farming on the amount and distribution of man labor would be similar to that described for the area of high productivity (also refer to Table F-3).

Effect of Conservation Farming on Crop Yields

The various conservation practices would have varied effects on the yields of grain crops. Subsurface tillage would cause an estimated drop of 5 per cent in yields, due to the limited nitrification, poorer tilth, and increased weed competition. The effect of the adoption of the recommended crop rotation would differ with successive wheat crops. The first crop of wheat after crested wheatgrass would likely "burn" especially during dry years, resulting on the average in an additional estimated reduction of 5 per cent in the yield. The yield of the second and third crops of wheat after grass would be increased slightly (7 per cent higher than under the straight wheat-fallow rotation). Seeding grass with the fourth wheat crop used as a nurse crop reduces the yield of wheat about 10 per cent. Considering both the beneficial and the adverse effects which various conservation practices have on yields, it is estimated that the

TABLE F-4. COMPARISON OF ESTIMATED ECONOMIC RETURNS FROM PRESENT SYSTEM OF FARMING AND RECOMMENDED CONSERVATION SYSTEMS OF FARMING AND OTHER IMPROVED SYSTEMS OF FARMING 1/

For a Typical Specialized Wheat Farm in the Water Erosion Area of Low Productivity, Oregon Wheat-Fallow Area
(June 1950 Price Level)

Item	Unit	Present system of farming	Conservation systems of farming: With cow-calf outfit	With cow-yearling outfit	With feeder outfit 2/	With nominal use of forage	Improved wheat-fallow system
Farm organization							
Land use							
Wheat	Ac.	561	408	408	408	408	561
Wheat hay	Ac.	12	-	-	-	-	12
Barley	Ac.	63	-	-	-	-	17
Summer fallow	Ac.	635	408	408	408	408	635
Crested wheatgrass 3/	Ac.	14	4/ 469	4/ 469	4/ 469	4/ 469	5/ 60
Used for pasture	Ac.	(14)	(366)	(360)	(342)	(37)	-
Cut for hay	Ac.	-	(103)	(109)	(127)	(13)	(60)
Not utilized	Ac.	-	-	-	-	(419)	-
Total cropland	Ac.	1,285	1,285	1,285	1,285	1,285	1,285
Rangeland	Ac.	134	134	134	134	134	134
Farmstead, roads, etc.	Ac.	65	65	65	65	65	65
Total farm acreage	Ac.	1,484	1,484	1,484	1,484	1,484	1,484
Livestock							
Beef cows	No.	5	41	33	-	5	5
Purchased feeder cattle 2/	No.	-	-	-	144	-	-
Other cattle	No.	1	9	30	-	1	1
Saddle horse	No.	-	2	2	2	-	-
Total animal units 6/	A.U.	6	48	48	47	6	6
Farm capital							
Land	Dol.	65,800	65,800	65,800	65,800	65,800	65,800
Buildings and other improvements	Dol.	17,200	18,500	18,500	18,500	17,200	17,200
Machinery and equipment	Dol.	14,000	16,500	16,500	16,500	15,600	14,700
Livestock	Dol.	900	7,800	8,400	7/8,200	900	900
Feeds	Dol.	200	1,600	1,600	2,400	200	200
Total capital	Dol.	98,100	110,200	110,800	111,400	99,700	98,800
Labor requirements							
Crops	Hrs.	1,598	1,427	1,436	1,554	1,274	1,958
Livestock 8/	Hrs.	147	525	610	605	147	147
Repair machinery, buildings, fences	Hrs.	492	519	519	519	492	492
Total labor	Hrs.	2,237	2,471	2,565	2,678	1,913	2,597
Work by hired day labor	Hrs.	695	529	533	608	452	669
Work by custom labor	Hrs.	-	-	-	-	-	17
Work by operator	Hrs.	1,542	1,942	2,032	2,070	1,461	1,911
Crop yields per acre							
Wheat 9/	Bu.	17.1	10/16.3	10/ 16.3	10/16.3	10/16.3	11/16.3
Barley	Bu.	12/19.9					13/20.4
Crested wheatgrass pasture 3/	A.U.M.	.78	.78	.78	.78	.78	-
Crested wheatgrass hay 3/	Tons	.625	.625	.625	.625	.625	.625
Production							
Wheat	Bu.	9,593	6,650	6,650	6,650	6,650	9,144
Barley	Bu.	1,255	-	-	-	-	347
Hay	Tons	14/ 12	15/ 74	15/ 78	16/ 120	8	14/ 46
Pasture	A.U.M.	17/ 153	18/ 387	18/ 382	270	44	19/ 133
Beef cattle	Lbs.	2,275	17,900	21,720	20/35,160	2,275	2,275
Gross farm income							
Cash receipts from sales							
Wheat	Dol.	17,846	12,424	12,424	12,424	12,424	16,948
Barley	Dol.	1,554	-	-	-	-	416
Total small grain	Dol.	19,400	12,424	12,424	12,424	12,424	17,364
Hay	Dol.	88	-	-	-	-	836
Stubble pasture	Dol.	109	-	-	-	-	88
Beef cattle	Dol.	233	3,055	3,942	21,280	233	233
Total cash receipts	Dol.	19,830	15,479	16,366	33,704	12,657	18,521
Family living from farm	Dol.	846	946	932	932	846	846
Total gross farm income	Dol.	20,676	16,425	17,298	34,636	13,503	19,367
Farm expense							
Hired labor	Dol.	713	543	547	624	464	717
Custom baling of hay	Dol.	-	-	-	-	-	238
Crop expense							
Seed	Dol.	4	248	248	248	248	16
Crop insurance	Dol.	362	232	232	232	232	337
Weed spray	Dol.	176	106	106	106	106	203
Livestock expense							
Purchase of feeder cattle	Dol.	-	-	-	13,860	-	-
Barley	Dol.	-	142	230	963	20	-
Cottonseed cake	Dol.	76	1,633	1,595	1,195	76	76
Miscellaneous livestock expense 21/	Dol.	20	85	84	96	20	20
Farm machinery and equipment							
Depreciation	Dol.	2,154	2,469	2,469	2,456	2,335	2,381
Operating expenses 22/	Dol.	2,280	2,230	2,237	2,253	2,090	2,568
Depreciation, repair, and insurance on improvements	Dol.	1,476	1,595	1,595	1,595	1,476	1,476
Property taxes	Dol.	807	906	912	968	795	816
Miscellaneous farm expense	Dol.	275	275	275	275	275	275
Total farm expense	Dol.	8,343	10,464	10,530	24,871	8,137	9,123
Net returns before income taxes							
Net farm income 23/	Dol.	12,333	5,961	6,768	9,765	5,366	10,244
Farm capital earnings 24/	Dol.	8,733	2,361	3,168	6,165	1,766	6,644
Per cent earnings on farm capital	Pct.	8.9	2.1	2.8	5.5	1.8	6.7
Operator's earnings 25/	Dol.	7,428	451	1,228	4,195	381	5,304
Return to management 26/	Dol.	5,888	-1,491	-804	2,125	-1,080	3,393
Net returns after income taxes 27/							
Net farm income	Dol.	10,615	5,445	6,127	8,837	4,944	8,978

For footnotes see following page.

Footnotes, Table F-4

1 Data represent average for first 12-year cycle of recommended crop rotation.

2 Feeder calves purchased at beginning of winter feeding period; marketed July 15 as yearling feeders.

3 Includes grass waterways and other permanent grass seeding, as well as rotation grassland. This does not include first year seeding of grass with nurse crop.

4 Includes 409 acres of crested wheatgrass in rotation, and 60 acres of permanent grass seedings.

5 Includes 3 acres of seeded waterways, 35 acres of terraces and 22 acres in fields with odd sizes and shapes.

6 The number of animal units is expressed on a yearlong basis.

7 Represents capital for purchase of feeder cattle, $13,860 for seven-month period, expressed on an annual-equivalent basis.

8 Includes hauling manure.

9 Wheat is grown only on class II, III, and IV lands.

10 Represents 5 per cent decrease in average yields on class II, III, and IV lands (17.1 bu. per acre) due to subsurface tillage. The effect on yields due to crop rotation is as follows:

Wheat as nurse crop with crested wheatgrass .	14.7 bu. per acre
First wheat crop after soil-conserving crop .	15.5 bu. per acre
Second and third wheat crops after soil-conserving crop	17.5 bu. per acre
Average for all four wheat crops	16.3 bu. per acre

11 Represents 5 per cent decrease in yield dur to subsurface tillage, as compared to yield under present system.

12 Represents average of the following yields per acre by land capability classes:

Class II, III, and IV lands	52 acres @ 21.4 bu. per acre
Class VI and VII lands	11 acres @ 12.9 bu. per acre

13 Only class II, III, and IV lands would be used for barley under this system; therefore, yields are higher than under present system because of elimination of class VI land, despite the fact that subsurface tillage would reduce yields 5 per cent on the land remaining in production.

14 Includes 12 tons of wheat hay.

15 Includes 10 tons of wheat chaff.

16 Includes 41 tons of wheat chaff.

17 Includes 127 A.U.M. of grazing from grain stubble.

18 Includes 61 A.U.M. of grazing from grain stubble.

19 Includes 118 A.U.M. of grazing from grain stubble.

20 Represents gross production of 107,160 lbs. of beef, less 72,000 lbs. of feeder calves purchased.

21 Miscellaneous livestock expense includes veterinary expense, vaccine, salt, and bull service fees or depreciation charge.

22 Machinery operating expenses include fuel, lubricants, repairs, tires, license fees, and insurance.

Footnotes, Table F-4 (Continued)

23 Net farm income is the compensation for farm capital and for the operator's labor and management. It is derived by deducting farm expense from gross farm income.

24 Farm capital earnings is the compensation for farm capital. It is derived by deducting the value of the operator's labor and management, at $3,600 per year, from net farm income.

25 Operator's earnings is the compensation for the operator's labor and management. It is derived by deducting 5 per cent interest on farm capital from net farm income.

26 Return to management is the compensation for the operator's management. It is derived by deducting the value of the work by the operator, at $1.00 per hour, from operator's earnings.

27 Income taxes on net farm income are calculated from 1950 tax rates, assuming a standard deduction (10 per cent or $1,000 whichever is least) and a family of four.

average yield of wheat during the first cycle of the recommended crop rotation would be about 16.3 bushels per acre, or just about one bushel per acre lower than under the present system of farming.

Farm Income, Present System of Farming

The estimated gross farm income under the present system was $20,676, derived almost entirely from the sale of wheat and barley. Deducting farm expenses of $8,343, leaves a net farm income of $12,333 (Table F-4).

Income Potentialities of Conservation System of Farming With Cow-Calf Outfit

Gross Farm Income

Because the acreage of grain would be cut 36 per cent under conservation farming, the average annual cash receipts from the sale of grain would be reduced from $19,400 to $12,424 or nearly $7,000. Increased sales of livestock under this system are estimated to replace less than $3,000 of this reduction (Table F-4). The net effect of adopting the recommended conservation system with a cow-calf outfit, according to preliminary figures, would be to reduce the total value of agricultural products by 21 per cent. Estimated gross farm income would be cut from $20,676 per year to $16,425 or $4,251 (Table F-4).

Farm Expenses

In changing from the present system to a conservation system with a cow-calf outfit, the estimated farm expenses would be increased from $8,343 to $10,464 or $2,121. Increased expenses would be

incurred principally for (a) cottonseed cake (which accounts for over 75 per cent of this increase), (b) grass seed, (c) purchase of barley for cattle feed, (d) livestock expenses, (e) machinery and equipment costs, and (f) costs for buildings, fences, and stock water facilities (Table F-4). The expenses for hired labor, crop insurance, weed spray, and operating expense of farm machinery and equipment would be somewhat less than under the present system.

Net Returns

The indications are that the adoption of this system would entail a cut in net farm income of 49 per cent from $10,615 to $5,445 or $5,170 (Table F-4). Other measures of net returns, such as operators' earnings, reflect an even more drastic cut.

Income Potentialities of Conservation System of Farming With Cow-Yearling Outfit

The estimated income and expenses under this system are estimated to be very similar to those with a cow-calf outfit, except that gross farm income, and therefore net farm income, would be about $807 greater because of a larger turnoff of beef and the advantage of the July 15 market over the October market.

Potential net farm income is $6,768 or 45 per cent less than the present system (Table F-4).

Income Potentialities of Conservation System of Farming With Feeder Cattle Outfit

This system, while more speculative, appears to have the highest income potentiality of any of the conservation systems with beef cattle. This is accounted for primarily by a much larger net

production of beef than with a cow-calf or cow-yearling outfit.[1]

The estimated gross income from sale of feeder cattle ($21,280) less the cost of feeder cattle purchased ($13,860) would be $7,420. This net sale value of beef ($7,420) is approximately twice the estimated gross income from the sale of livestock with a beef breeding herd. This would more than offset the reduction in the value of grain available for sale under the present system.

The other cattle expenses under this system, aside from the expenses for purchase of feeder cattle, would be about $500 more than with a beef breeding herd, due chiefly to requirements for more barley (fed to promote rapid growth of calves during the winter).

The potential net farm income with this system of farming would be $9,765 or 21 per cent less than the present system (Table F-4). The speculative aspects of this system has been discussed previously.

Income Potentialities of Conservation System of Farming With Only Nominal Use of Forage

Under this system the full impact of the reduction in grain acreage under conservation farming would make itself felt. Estimated gross farm income would be only $5,366 compared with $12,333 under the present system.

This system would require only a limited capital outlay, less

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[1] With a feeder cattle outfit the estimated net production of beef on this farm (total weight of cattle at time of sale less weight of feeder cattle purchased) is 35,160 pounds, compared with 17,900 pounds with a cow-calf outfit, or 21,720 pounds with a cow-yearling outfit (Table F-4).

labor, and lower farm expenses than any other conservation system, or the present system. The potential net farm income would be $5,366 or 57 per cent less than the present system (Table F-4).

Improved Wheat-Fallow System of Farming

This system would be the same as in the area of high productivity except that there will be diversion terraces instead of strip cropping.

The estimated gross income would be $19,367 compared with $20,676 under the present system.

The estimated farm expenses are $9,123 compared with $8,343 under the present system. The increase of $780 farm expenses would be principally due to machinery and equipment costs and custom hay baling.

The potential net farm income would be $10,244 or 17 per cent less than the present system (Table F-4).

By comparing the returns from this system with those of the recommended conservation systems the effects which the adoption of the crested wheatgrass rotation would have on farm income during the first cycle of the rotation can be clearly seen.

Farm Budget Analysis of Conservation Systems of Farming for a Typical Wheat-Livestock Farm in the Wheat-Fallow Water Erosion Area of Low Productivity

The farm selected for study contains 2,701 acres of land. There are 1,599 acres of tillable cropland; 1,086 acres of rangeland of very low productivity; and 16 acres in farmstead, roads and other

uses. The areas used for crops have a soil that is moderately deep, fertile, and medium textured and permeable over bedrock (designated by the Soil Conservation Service as a "5 M" soil). The areas used for rangeland have shallow stony soil (designated as "9 M" soil) and scabland (designated as "9 S" soil). The distribution of land capability classes, and their relation to the slope of cropland and rangeland acreage are as follows:

Land capability class	Average slope Per cent	Cropland Per cent
Cropland		
Class II	4.1	61
Class III	8.6	15
Class IV	15.8	8
Class VI and VII	24.4	16
Average or total	8.9	100
Rangeland		
Class VI and VII	33.1	100

The average annual precipitation in the area ranges from 10 to 13 inches, according to local information.

The farm organization will be similar to the previous farms mentioned with the exception that with 1,086 acres of rangeland, some type of cattle outfit must be assumed. Under the present (or nonconservation) systems of farming the available feed resources would support 59 head under a cow-calf outfit, 48 head under a cow-yearling outfit, or 172 head under a seven-month feeder cattle outfit.[1]

The estimated yields under the present (or nonconservation) systems--based on average 1928-47 yields for the "5 M" soil area of

[1] About 155 A.U.M. of rangeland pasture could not be utilized with a balance of other feed resources by the feeder cattle.

the west central part of Gilliam County--are 17.1 bushels of wheat per acre on land classes II, III, and IV and 10.3 bushels of wheat or 12.9 bushels of barley per acre on land class VI.

Description of Conservation Systems of Farming Recommended by the Soil Conservation Service

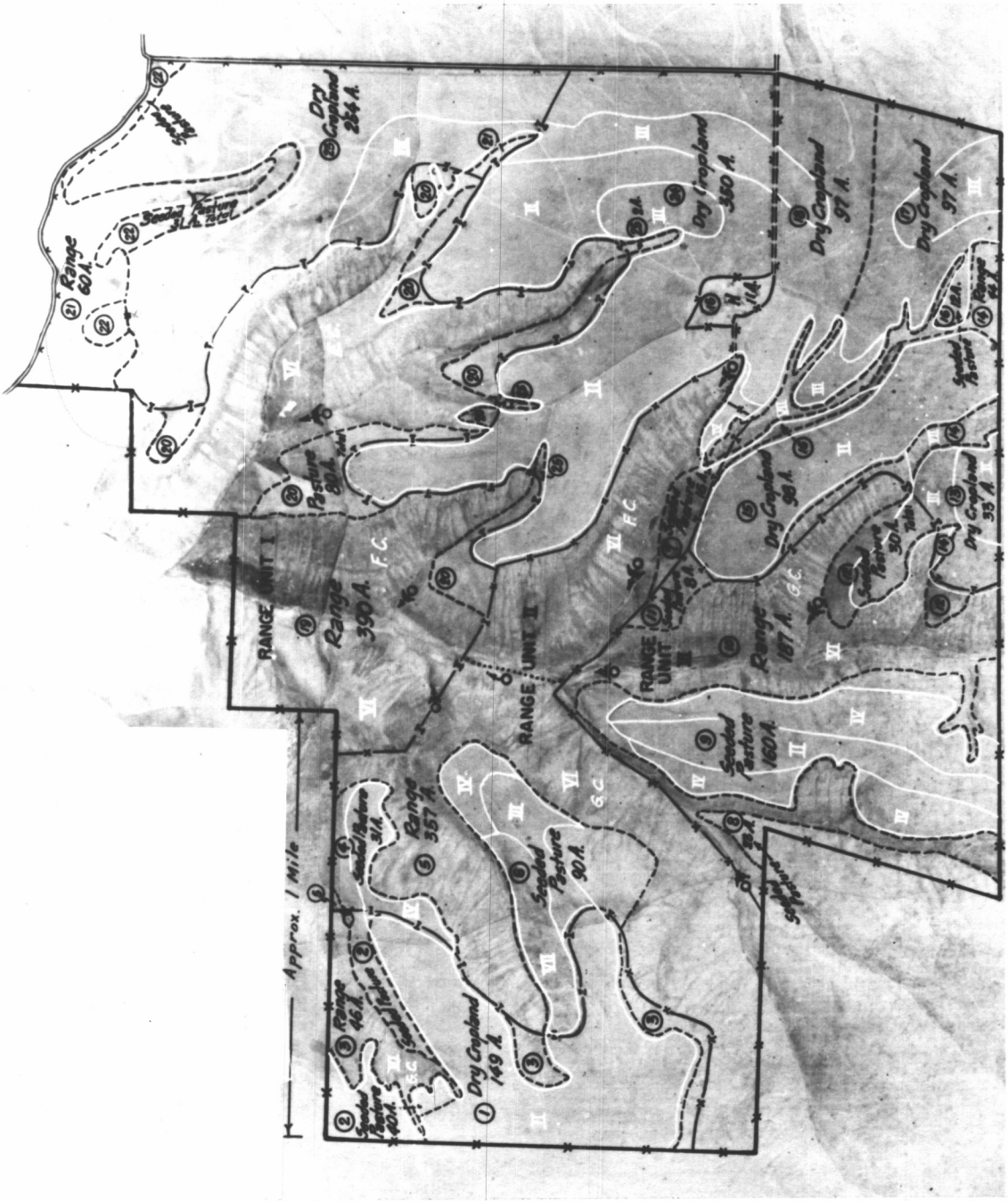
Grass Seedings

In addition to the 134 acres presently devoted to permanent cropland pasture, an additional 387 acres would be seeded permanently to grass or a total of 521 acres. Fields 2, 4, 6, 7, 8, 9, 11, 12, 16, 20 and 22 would be permanently seeded to grass. This would retire all class VI and VII land from the growing of grains on this farm along with some class II, III, and IV land in odd-sized and odd-shaped fields. (See farm map showing Conservation Plan, on next page). The grass mixture to be used would consist of Whitmar beardless wheatgrass, eight pounds per acre, and bulbous bluegrass, two pounds per acre.

For details of crop rotation, use of fertilizer, utilization of stubble, seeding of wheat, weed control and use of forage resources refer to the discussions under the specialized wheat-fallow farms in the area of high or low productivity.

Systems of Farming

Three nonconservation and three conservation systems varying with the method of utilizing forage resources have been set up for budget analyses as follows:



CONSERVATION PLAN OF WHEAT-LIVESTOCK FARM
IN THE AREA OF LOW PRODUCTIVITY

(a) Nonconservation system of farming with cow-calf outfit.
(b) Conservation system of farming with cow-calf outfit.
(c) Nonconservation system of farming with cow-yearling outfit.
(d) Conservation system of farming with cow-yearling outfit.
(e) Nonconservation system of farming with feeder cattle outfit.
(f) Conservation system of farming with feeder cattle outfit.

Income Potentialities of Conservation Systems of Farming

A comparison of the estimated economic returns from the nonconservation systems are compared with those from the recommended conservation systems for this farm by means of the preliminary farm budget analyses (Table F-5). Adoption of conservation systems effect the farm organization, capital and labor requirements, production, gross farm income, farm expenses, and net returns.

Adjustments in Farm Organization Under Conservation Systems of Farming

On this farm the adoption of any of the recommended conservation systems would reduce the acreage of small grains--and likewise of fallow--by 51 per cent (Table F-5). Inasmuch as this reduction in grain acreage would be much more drastic than that assumed to be required under an "allotment" program, all the grain acreage could be planted to wheat.

Under each of the conservation systems there would be a total of 881 acres of land seeded to grasses (521 acres of permanent seedings and 360 acres of grass in rotation with wheat and fallow). Approximately 90 acres of grass would be seeded annually with wheat as a nurse crop. This grass would be used the following year as hay instead of pasture in order to prevent cows from injuring the stand by pulling it up or trampling. Approximately 52 acres (one-tenth of the

TABLE F-5. COMPARISON OF ESTIMATED ECONOMIC RETURNS FROM NONCONSERVATION SYSTEMS OF FARMING AND RECOMMENDED CONSERVATION SYSTEMS OF FARMING 1/

For a Typical Wheat-Livestock Farm in the Water Erosion Area of Low Productivity, Oregon Wheat-Fallow Area
(June 1950 Price Level)

Item	Unit	Cow-calf outfit		Cow-yearling outfit		Feeder cattle outfit 2/	
		Nonconservation system of farming	Conservation system of farming	Nonconservation system of farming	Conservation system of farming	Nonconservation system of farming	Conservation system of farming
Farm organization							
Land use							
Wheat	Ac.	645	359	645	359	645	359
Wheat hay	Ac.	15	-	15	-	41	-
Barley	Ac.	73	-	73	-	73	-
Summer fallow	Ac.	732	359	732	359	732	359
Crested wheatgrass 3/	Ac.	4/ 134	5/ 881	4/ 134	5/ 881	4/ 134	5/ 881
Used for pasture	Ac.	(84)	(613)	(75)	(598)	(80)	(450)
Cut for hay	Ac.	(50)	(268)	(59)	(283)	(54)	(431)
Total cropland	Ac.	1,599	1,599	1,599	1,599	1,599	1,599
Rangeland	Ac.	1,086	1,086	1,086	1,086	1,086	1,086
Farmstead, roads, etc.	Ac.	16	16	16	16	16	16
Total farm acreage	Ac.	2,701	2,701	2,701	2,701	2,701	2,701
Livestock							
Beef cows	No.	59	103	48	83	-	-
Purchased feeder cattle 2/	No.	-	-	-	-	172	394
Other cattle	No.	12	22	43	74	-	-
Saddle horse	No.	2	2	2	2	2	2
Total animal units 6/	A.U.	68	117	69	117	57	129
Farm capital							
Land	Dol.	95,400	95,400	95,400	95,400	95,400	95,400
Buildings and other improvements	Dol.	17,800	18,300	17,800	18,300	17,800	18,300
Machinery and equipment	Dol.	14,200	16,400	14,200	16,400	14,200	16,400
Livestock	Dol.	11,000	19,200	12,000	20,600	7/ 9,800	8/ 22,300
Feeds	Dol.	2,300	3,800	2,500	4,000	3,500	6,500
Total capital	Dol.	140,700	153,100	141,900	154,700	140,700	158,900
Labor requirements							
Crops	Hrs.	2,134	1,461	2,146	1,482	2,214	1,769
Livestock 9/	Hrs.	728	1,252	738	1,273	662	1,517
Repair machinery, buildings, fences	Hrs.	463	489	463	489	463	489
Total labor	Hrs.	3,325	3,202	3,347	3,244	3,339	3,775
Work by hired day labor	Hrs.	993	598	1,000	609	1,039	1,043
Work by operator	Hrs.	2,332	2,604	2,347	2,635	2,300	2,732
Crop yields per acre							
Wheat	Bu.	10/ 16.7	11/16.3	10/ 16.7	11/16.3	10/ 16.7	11/ 16.3
Barley 12/	Bu.	12.9	-	12.9	-	12.9	-
Crested wheatgrass pasture 3/	A.U.M.	.78	.78	.78	.78	.78	.78
Crested wheatgrass hay 3/	Tons	.625	.625	.625	.625	.625	.625
Rangeland pasture	A.U.M.	.38	.38	.38	.38	.38	.38
Production							
Wheat	Bu.	10,765	5,852	10,765	5,852	10,765	5,852
Barley	Bu.	942	-	942	-	942	-
Hay	Tons	13/ 118	14/ 177	15/ 124	16/ 186	17/ 147	18/ 305
Pasture	A.U.M.	19/ 551	20/ 944	21/ 543	22/ 932	23/ 474	24/ 713
Beef cattle	Lbs.	26,000	44,750	31,320	53,800	25/ 44,200	26/ 96,360
Gross farm income							
Cash receipts from sales							
Wheat	Dol.	19,986	10,934	19,986	10,934	19,986	10,934
Barley	Dol.	929	-	744	-	-	-
Total small grain	Dol.	20,915	10,934	20,730	10,934	19,986	10,934
Pasture (rangeland)	Dol.	-	-	-	-	27/ 155	-
Beef cattle	Dol.	4,499	7,886	5,762	10,008	25,688	58,520
Total cash receipts	Dol.	25,414	18,820	26,492	20,942	45,829	69,454
Family living from farm	Dol.	946	946	932	932	932	932
Total gross farm income	Dol.	26,360	19,766	27,424	21,874	46,761	70,386
Farm expense							
Hired labor	Dol.	1,019	614	1,026	625	1,066	1,070
Crop expense							
Seed	Dol.	35	298	35	298	35	298
Crop insurance	Dol.	418	204	418	204	418	204
Weed spray	Dol.	201	93	201	93	201	93
Livestock expense							
Purchase of feeder cattle	Dol.	-	-	-	-	16,555	37,922
Barley	Dol.	-	355	-	668	19	2,632
Cottonseed cake	Dol.	2,212	3,885	2,157	3,708	1,700	3,152
Miscellaneous livestock expense 28/	Dol.	109	181	110	173	79	149
Farm machinery and equipment							
Depreciation	Dol.	2,308	2,404	2,308	2,404	2,287	2,430
Operating expenses 29/	Dol.	2,580	2,190	2,585	2,200	2,564	2,287
Depreciation, repair, and insurance on improvements	Dol.	1,463	1,549	1,463	1,549	1,463	1,549
Property taxes	Dol.	1,132	1,240	1,142	1,254	1,188	1,429
Miscellaneous farm expense	Dol.	275	275	275	275	275	275
Total farm expense	Dol.	11,752	13,288	11,720	13,451	27,850	53,490
Net returns before income taxes							
Net farm income 30/	Dol.	14,608	6,478	15,704	8,423	18,911	16,896
Farm capital earnings 31/	Dol.	11,008	2,878	12,104	4,823	15,311	13,296
Per cent earnings on farm capital	Pct.	7.8	1.9	8.5	3.1	10.9	8.4
Operator's earnings 32/	Dol.	7,573	-1,177	8,609	688	11,876	8,951
Return to management 33/	Dol.	5,241	-3,781	6,262	-1,947	9,576	6,219
Net returns after income taxes 34/							
Net farm income	Dol.	12,325	5,880	13,184	7,701	15,509	14,044

For footnotes see following page.

Footnotes, Table F-5

1 Data represent average for first 12-year cycle of recommended crop rotation.

2 Feeder calves purchased at beginning of winter feeding period; marketed July 15 as yearling feeders.

3 Includes grass waterways and other permanent grass seeding, as well as rotation grassland. This does not include first year seeding of grass with nurse crop.

4 Represents permanent grass seedings, including grass waterways.

5 Includes 360 acres of crested wheatgrass in rotation, and 521 acres of permanent grass seedings.

6 The number of animal units is expressed on a yearlong basis.

7 Represents capital for purchase of feeder cattle, $16,555 for seven-month period, expressed on an annual-equivalent basis.

8 Represents capital for purchase of feeder cattle, $37,922 for seven-month period, expressed on an annual-equivalent basis.

9 Includes hauling manure.

10 Represents average of the following yields per acre by land capability classes:

Class II, III, and IV lands	606 acres @	17.1 bu. per acre
Class VI land	39 acres @	10.3 bu. per acre

11 Represents 5 per cent decrease in average yields on class II, III, and IV lands (17.1 bu. per acre) due to subsurface tillage. The effect on yields due to crop rotation is as follows:

Wheat as nurse crop with crested wheatgrass ..	14.7 bu. per acre
First wheat crop after soil-conserving crop ..	15.5 bu. per acre
Second and third wheat crops after soil-conserving crop	17.5 bu. per acre
Average for all four wheat crops	16.3 bu. per acre

12 Represents average yields in class VI land.

13 Includes 15 tons of wheat hay, 31 tons of crested wheatgrass hay, and 72 tons of wheat chaff.

14 Includes 168 tons of crested wheatgrass hay and 9 tons of wheat chaff hay.

15 Includes 15 tons of wheat hay, 37 tons of crested wheatgrass hay, and 72 tons of wheat chaff.

16 Includes 177 tons of crested wheatgrass hay and 9 tons of wheat chaff hay.

17 Includes 41 tons of wheat hay, 34 tons of crested wheatgrass hay, and 72 tons of wheat chaff.

18 Includes 269 tons of crested wheatgrass hay and 36 tons of wheat chaff.

19 Includes 66 A.U.M. of crested wheatgrass pasture, 73 A.U.M. of volunteer pasture, and 412 A.U.M. of rangeland pasture.

20 Includes 478 A.U.M. crested wheatgrass pasture, 54 A.U.M. of stubble pasture, and 412 A.U.M. of rangeland pasture.

21 Includes 58 A.U.M. of crested wheatgrass pasture, 73 A.U.M. of volunteer pasture, and 412 A.U.M. of rangeland pasture.

Footnotes, Table F-5 (Continued)

22 Includes 466 A.U.M. of crested wheatgrass pasture, 54 A.U.M. of stubble pasture, and 412 A.U.M. of rangeland pasture.

23 Includes 62 A.U.M. of crested wheatgrass pasture and 412 A.U.M. of rangeland pasture.

24 Includes 351 A.U.M. of crested wheatgrass pasture and 362 A.U.M. of rangeland pasture (50 A.U.M. of rangeland pasture would be in some fields with wheat and could not be utilized between winter feeding period and July 15).

25 Represents gross production of 129,200 lbs. of beef, less 86,000 lbs. of feeder calves purchased.

26 Represents gross production of 293,360 lbs. of beef, less 197,000 lbs. of feeder calves purchased.

27 With a feeder cattle outfit, 155 A.U.M. of rangeland pasture, which under present fencing arrangements lie within the same fenced areas as wheat, could not be utilized prior to wheat harvest, and would therefore not be available for use by the operator's livestock.

28 Miscellaneous livestock expense includes veterinary expense, vaccine, salt, and bull service fees or depreciation charge.

29 Machinery operating expenses include fuel, lubricants, repairs, tires, license fees, and insurance.

30 Net farm income is the compensation for farm capital and for the operator's labor and management. It is derived by deducting farm expense from gross farm income.

31 Farm capital earnings is the compensation for farm capital. It is derived by deducting the value of the operator's labor and management, at $3,600 per year, from net farm income.

32 Operator's earnings is the compensation for the operator's labor and management. It is derived by deducting 5 per cent interest on farm capital from net farm income.

33 Return to management is the compensation for the operator's management. It is derived by deducting the value of the work by the operator, at $1.00 per hour, from operator's earnings.

34 Income taxes on net farm income are calculated from 1950 tax rates, assuming a standard deduction (10 per cent or $1,000 whichever is least) and a family of four.

total) of permanent grassland acreage will be seeded (or reseeded) each year. Livestock numbers would vary with the system of farming as follows:

System	A.U. (yearlong)	Cows	Calves	Heifers	Bulls	Horses
Nonconservation with cow-calf	68	59	10	10	2	2
Conservation with cow-calf..	117	103	18	18	4	2
Nonconservation with cow-yearling	69	48	41	40	2	2
Conservation with cow-yearling	117	83	71	69	3	2
Nonconservation with feeders	57	-	172	-	-	2
Conservation with feeders ..	129	-	394	-	-	2

Capital Requirements for Conservation Farming

The nonconservation systems involve capital investment of $140,700 (Table F-5). Under conservation systems the additional capital required for a cow-calf outfit would be $12,400, a cow-yearling outfit $12,800 and a feeder outfit $18,200.

Effect of Conservation Farming on Labor Requirements

Labor requirements of the various systems have been described under the area of high productivity, Table F-3. A conservation livestock outfit will require the additional labor of taking care of the larger number of livestock. In the case of cow-calf and cow-yearling outfits, conservation farming will require less total labor. With a feeder cattle outfit the increase in the number (222 head) greatly increases total labor.

Effect of Conservation Farming on Crop Yields

This has been discussed under the specialized wheat-fallow farm in the area of low productivity.

Income Potentialities of a Cow-Calf Outfit

Gross Farm Income

Because the grain acreage under conservation farming would be 51 per cent less, the average cash receipts from the sale of grain would be reduced from $20,915 to $10,934 or nearly $10,000. Increased livestock sales are estimated at $3,387 (Table F-5). Thus the net effect of adopting the recommended conservation system would be a 26 per cent reduction in value of all agricultural products. Estimated gross farm income falls from $26,360 to $19,766 or $6,594.

Farm Expenses

In changing to the conservation system, farm expenses would rise from $11,752 to $13,288 or $1,536. Increased expenses would be principally for (a) grass seed, (b) purchase of barley for cattle feed, (c) cottonseed cake (which accounts for most of the extra cost), (d) livestock expenses, (e) costs for buildings, fences, and stock water facilities and (f) taxes. The expenses for hired labor, crop insurance, weed spray and operating expense of farm machinery and equipment would be somewhat less than under the nonconservation system (Table F-5).

Net Returns

The adoption of a conservation system would entail a reduction of 56 per cent in net farm income from $14,608 to $6,478 or $8,130 (Table F-5). Other measures of net returns, such as operator's earnings, reflect even more drastic reductions.

Income Potentialities of a Cow-Yearling Outfit

Gross Farm Income

This system shows a larger turnoff of beef and the advantage of marketing during peak prices (July 15) which account for a higher gross and therefore higher net farm income than from a cow-calf outfit. The gross farm income would be reduced from $27,424 to $21,874 or $5,550 (Table F-5).

Farm Expenses

There would be an increase in farm expenses under the conservation system from $11,720 to $13,451 or $1,731 (Table F-5).

Net Returns

The indications are that this conservation system would reduce net farm income 46 per cent from $15,704 to $8,423--or $7,281 (Table F-5).

Income Potentialities of a Feeder Cattle Outfit

Gross Farm Income

This system, while more speculative, appears to have the highest potentiality of any of the conservation systems and shows returns comparable to the nonconservation system. The estimated gross income of the latter is $46,761 less a cost of $16,555 for feeder cattle purchased or $30,206, while the gross income for this system is $70,386 less a cost of $37,922 for feeder cattle purchased or $32,464. Thus with the adoption of the conservation system the gross farm income would be increased by $2,258 (Table F-5).

Farm Expenses

Farm expenses under the conservation system would increase from $11,295 to $15,568 or $4,273 (exclusive of purchase of feeder cattle). This additional expense is due chiefly to the requirements for barley and cottonseed cake, fed to promote rapid growth of calves during the winter (Table F-5).

Net Returns

The indications are that the adoption of a conservation system would reduce the net farm income 11 per cent from $18,911 to $16,896 or $2,015 (Table F-5).

ANALYSIS OF COSTS AND RETURNS OF VARIOUS CONSERVATION PRACTICES

In order to point out the effect of specific conservation practices on income and returns in the several budgets, another series of analyses have been developed to show causes for the drastic reductions in income under the various conservation systems of farming. Most of the information is taken from Tables F-2, F-4 and F-5.

Effect of Subsurface Tillage on Costs and Returns in Wheat Production Area of High Productivity

In this area with moldboard plowing, the yield of wheat averages 26.7 bushels per acre; with subsurface tillage 24.6 bushels or a reduction of 2.1 bushels per acre.

The gross income per acre of wheat and stubble pasture would be $53.60 with moldboard plowing, and $49.40 with subsurface tillage or a reduction of $4.20 per acre.

The cost of production would be $28.78 for the land plowed, and $30.53 with subsurface tillage or an increase of $1.75 per acre.

The net returns to management would be $24.82 per acre of wheat ($12.41 per acre of wheat and fallow) with moldboard plowing and $18.87 per acre of wheat ($9.44 per acre of wheat and fallow) with subsurface tillage. Because of the lower yields, lower gross income, and higher cost of production there is a reduction of $5.95 per acre of wheat, or $2.97 per acre of wheat and fallow, due to subsurface tillage (Table F-6).

TABLE F-6. EFFECT OF SUBSURFACE TILLAGE ON COSTS AND RETURNS IN WHEAT PRODUCTION, Oregon Wheat-Fallow Area (June 1950 Price Level)

Item	Area of high productivity			Area of low productivity		
	With moldboard plowing	With subsurface tillage	Differential	With moldboard plowing	With subsurface tillage	Differential
	Bushel	Bushel	Bushel	Bushel	Bushel	Bushel
Yield of wheat per acre	26.7	24.6	-2.1	17.1	16.3	-0.8
	Dollars	Dollars	Dollars	Dollars	Dollars	Dollars
Gross income per acre of wheat						
Wheat @ $2.00 per bushel	53.40	49.20	-4.20	34.20	32.60	-1.60
Stubble pasture	.20	.20	-	.20	.20	-
Total gross income	53.60	49.40	-4.20	34.40	32.80	-1.60
Cost of production per acre of wheat						
Fallow year	12.32	13.59	1.27	9.73	10.88	1.15
Wheat year	16.46	16.94	.48	13.88	14.25	.37
Total cost per acre of wheat	28.78	30.53	1.75	23.61	25.13	1.52
Net returns to management						
Per acre of wheat	24.82	18.87	-5.95	10.79	7.67	-3.12
Per acre of wheat-fallow land	12.41	9.44	-2.97	5.40	3.84	-1.56

Area of Low Productivity

In this area with moldboard plowing, the yield of wheat averages 17.1 bushels per acre; with subsurface tillage 16.3 bushels or a reduction of .8 bushels per acre.

The gross income per acre of wheat and stubble pasture was reduced from $34.40 to $32.80 or $1.60 per acre. The cost of production is increased from $23.61 to $25.13 or $1.52 per acre of wheat and fallow with the adoption of subsurface tillage over moldboard plowing.

The net returns to management would be $10.79 per acre of wheat ($5.40 per acre of wheat and fallow) with moldboard plowing and $7.67 per acre of wheat ($3.84 per acre of wheat and fallow) with subsurface tillage. Because of the lower yields, lower gross income, and higher cost of production there was a reduction of $3.12 per acre of wheat, or $1.56 per acre of wheat and fallow, due to subsurface tillage (Table F-6).

Costs Per Acre for Production of Wheat, Fallow, Grass or Legume-Grass Seeding and Establishing Grass Waterway

Area of High Productivity

The cost of producing wheat in this area with the present system of farming is $16.46 per acre. With the "improved wheat-fallow system" the costs are slightly increased to $16.94 per acre, due mainly to costs associated with farm machinery and equipment. With the conservation systems the costs are increased to $17.57 per acre, also due to increased machinery and equipment costs (Table F-7).

TABLE F-7. CROPS: ESTIMATED COST OF PRODUCTION PER ACRE AS RELATED TO SYSTEM OF FARMING AND FARMING PRACTICES
Oregon Wheat-Fallow Area
(June 1950 Price Level)

Item	Wheat			Summer fallow			Grass or legume-grass seeding 1/						
									Hay		Pasture		
	Present system of farming	Improved wheat-fallow system	Conservation farming systems	Present system of farming	Improved wheat-fallow system	Conservation farming systems	Establishing new seeding	Harvested with buckrake stacker 2/	Harvested with pickup baler: Limited hay acreage 2/	Harvested with pickup baler: Large hay acreage 2/	With rental of pasture	Used by operator's livestock	Establishing grass waterway
	Dol.	Dol.	Dol.	Dol.	Dol.	Dol.	Dol.	Dol.	Dol.	Dol.	Dol.	Dol.	Dol.
Wheat-fallow area of high productivity													
Labor costs													
Direct labor on specified crop	1.59	1.70	1.70	.85	1.21	1.14	1.32	1.86	4/ 1.59	2.04	-	-	7.50
Repair (machinery, etc.); hauling manure	.35	.35	.42	.35	.35	.42	.51	.51	.35	.35	.44	.51	.51
Total labor 5/	1.94	2.05	2.12	1.20	1.56	1.56	1.83	2.37	4/ 1.94	2.39	.44	.51	8.01
Miscellaneous crop expense													
Seed	2.34	2.34	2.34	-	-	-	4.42	-	-	-	-	-	12.47
Fertilizer	-	-	-	-	-	-	2.64	-	-	-	-	-	-
Weed spray materials	.29	.35	.35	-	-	-	-	-	-	-	-	-	-
Crop insurance	.57	.57	.57	-	-	-	-	-	-	-	-	-	-
Baling wire	-	-	-	-	-	-	-	-	-	.70	-	-	-
Custom hay baling	-	-	-	-	-	-	-	-	6.30	-	-	-	-
Total miscellaneous crop expense	3.20	3.26	3.26	-	-	-	7.06	-	6.30	.70	-	-	12.47
Farm machinery and equipment costs 6/													
Tractor	.70	.85	.88	1.32	1.88	1.79	1.61	1.26	.55	.92	.02	.05	7.60
Combine harvester	1.41	1.41	1.73	-	-	-	-	-	-	-	-	-	-
Hay harvesting machinery	-	-	-	-	-	-	-	1.85	2/ 2.42	3/ 1.77	-	-	-
Regular tillage and seeding equipment	.13	.21	.33	.72	.99	1.47	1.12	-	-	-	-	-	1.93
Equipment for establishing alfalfa-grass	-	-	-	-	-	-	1.31	-	-	-	-	-	-
Other machinery (truck, auto, misc.)	1.27	1.27	1.29	1.27	1.27	1.29	1.29	1.29	1.27	1.27	1.27	1.29	1.29
Rental of grader	-	-	-	-	-	-	-	-	-	-	-	-	3.75
Total machinery and equipment costs	3.51	3.74	4.23	3.31	4.14	4.55	5.33	4.40	4.24	3.96	1.29	1.34	14.57
Depreciation, repair, insurance on improvements	.98	.98	.98	.98	.98	.98	1.37	1.37	1.37	.98	1.23	1.37	1.37
Taxes on real estate and machinery	1.00	1.02	1.03	1.00	1.02	1.03	1.03	1.03	1.03	1.08	1.01	1.03	1.03
Interest on investment in real estate	5.59	5.59	5.59	5.59	5.59	5.59	5.79	5.79	5.79	5.59	5.68	5.79	5.79
Interest on investment in farm machinery	.56	.62	.68	.56	.62	.68	.68	.68	.68	.89	.62	.68	.68
Miscellaneous farm expenses	.22	.22	.22	.22	.22	.22	.22	.22	.22	.22	.22	.22	.22
Credit: rental value of house 7/	-.54	-.54	-.54	-.54	-.54	-.54	-.54	-.54	-.54	-.54	-.54	-.54	-.54
Total cost of production 5/	16.46	16.94	17.57	12.32	13.59	14.07	22.77	15.32	21.03	15.27	9.95	10.40	43.60
Wheat-fallow area of low productivity													
Labor costs							8/						
Direct labor on specified crop	1.59	1.70	1.70	.85	1.21	1.26	-	1.39	-	-	-	-	7.50
Repair (machinery, etc.); hauling manure	.39	.39	.46	.39	.39	.46	-	.48	-	-	-	.48	.48
Total labor 5/	1.98	2.09	2.16	1.24	1.60	1.72	-	1.87	-	-	-	.48	7.98
Miscellaneous crop expense													
Seed	2.34	2.34	2.34	-	-	-	2.10	-	-	-	-	-	21.75
Weed spray materials	.29	.29	.29	-	-	-	-	-	-	-	-	-	-
Crop insurance	.57	.57	.57	-	-	-	-	-	-	-	-	-	-
Total miscellaneous crop expense	3.20	3.20	3.20	-	-	-	2.10	-	-	-	-	-	21.75
Farm machinery and equipment costs 6/													
Tractor	.70	.85	.88	1.32	1.88	1.79	-	1.03	-	-	-	.02	7.60
Combine harvester	1.41	1.42	1.70	-	-	-	-	-	-	-	-	-	-
Hay harvesting machinery	-	-	-	-	-	-	-	1.68	-	-	-	-	-
Regular tillage and seeding equipment	.13	.19	.32	.71	.90	1.41	-	-	-	-	-	-	1.93
Other machinery (truck, auto, misc.)	1.24	1.23	1.26	1.24	1.23	1.26	-	1.26	-	-	-	1.26	1.26
Rental of grader	-	-	-	-	-	-	-	-	-	-	-	-	3.75
Total machinery and equipment costs	3.48	3.69	4.16	3.27	4.01	4.46	-	3.97	-	-	-	1.28	14.54
Depreciation, repair, insurance on improvements	1.15	1.15	1.15	1.15	1.15	1.15	-	1.24	-	-	-	1.24	1.24
Taxes on real estate and machinery	.62	.63	.64	.62	.63	.64	-	.64	-	-	-	.64	.64
Interest on investment in real estate	3.23	3.23	3.23	3.23	3.23	3.23	-	3.28	-	-	-	3.28	3.28
Interest on investment in farm machinery	.54	.58	.64	.54	.58	.64	-	.64	-	-	-	.64	.64
Miscellaneous farm expenses	.21	.21	.21	.21	.21	.21	-	.21	-	-	-	.21	.21
Credit: rental value of house 7/	-.53	-.53	-.53	-.53	-.53	-.53	-	-.53	-	-	-	-.53	-.53
Total cost of production 5/	13.88	14.25	14.86	9.73	10.88	11.52	2.10	11.32	-	-	-	7.26	49.75

1/ In wheat-fallow area of high productivity this item is represented by alfalfa-grass, in the wheat-fallow area of low productivity by crested wheatgrass.
2/ These costs are applicable to size of enterprise involving harvesting of approximately 80-110 acres of grass or legume-grass hay.
3/ These costs are applicable to size of enterprise involving harvesting of approximately 300-350 acres of grass or legume-grass hay.
4/ Excluding custom hay baling.
5/ Does not include allowance for managerial services.
6/ Includes depreciation, fuel, lubricants, repairs, tires, license fees, and insurance.
7/ Depreciation, repairs, taxes, interest, and other costs applicable to dwelling have been included in total costs. These costs are therefore offset by crediting the rental value of the house against total cost.
8/ Inasmuch as crested wheatgrass is seeded with a nurse crop of wheat, only the cost of grass seed is charged against establishing the new seeding of grass.

Summer fallow shows the same cost relationships: $12.32 per acre for the present system; $13.59 per acre for the improved system; and $14.07 per acre for the conservation systems.

Grass and legume-grass seeding show the following costs: establishing a new seeding, $22.77 per acre; grass harvested with a buck-rake stacker, $15.32 per acre; hay harvested with a pickup baler with a limited acreage, $21.03 per acre; hay harvested with a pickup baler with a large acreage, $15.27 per acre; pasture rented, $9.95 per acre; and pasture utilized by operator's livestock, $10.40 per acre. The major expense items are labor, grass seed (in establishing a new seeding), farm machinery and equipment costs, depreciation, taxes, interest, and custom baling on large hay acreage (Table F-7).

Establishing grass waterways cost $43.60 per acre, the major items being seed, labor, equipment, depreciation, taxes and interest (Table F-7).

Other major cost items in all systems are labor, grass seed, machinery and equipment costs, taxes, and interest on investment in real estate and farm machinery.

Area of Low Productivity

The costs of production in this area vary in the same relationship as in the area of high productivity. As crested wheatgrass is seeded with wheat as a nurse crop only the cost of grass seed ($2.10 per acre) was charged against the new seeding of grass.

The cost of establishing grass waterways was $49.75 per acre.

This is the only item that was higher ($6.15 per acre) in the area of low productivity than in the area of high productivity. The cost of seed was $21.75 per acre in this area as against $12.47 in the area of high productivity, or a difference of $9.28 per acre (Table F-7).

Comparison of Returns Per Acre From Wheat-Fallow Rotation and 12-Year Legume-Grass or Grass Rotations

Area of High Productivity

In the improved wheat-fallow system all the costs and returns are from the wheat and fallow lands. The gross annual income was $24.70 per acre, the cost of production $15.26 per acre, giving an average annual net return to management of $9.44 per acre (Table F-8).

With the various conservation systems two-thirds of the land was devoted to wheat and fallow with average annual gross income of $26.70 or $27.00, average cost of $15.82, and an annual net return to management of $10.88 or $11.18 per acre.[1]

There would be 48 animal units (yearlong basis) with a cow-yearling outfit, and 52 animal units (yearlong basis) with a feeder cattle outfit. The capital invested in livestock and feed would be $10,200 for the cow-yearling outfit ($211 per A.U.), and $12,200 for a feeder cattle outfit ($233 per A.U.).

The feed requirements of pasture and hay would be 581 A.U.M. for the cow-yearling, and 629 A.U.M. for the feeder cattle outfit or 12

[1] The reason for the difference in gross and net returns depends on the return from stubble pasture: With sale of hay and rental of pasture, 20 cents per acre; with cow-yearling outfit, 50 cents per acre; and with feeder outfit, 80 cents per acre.

TABLE F-8. COMPARISON OF RETURNS PER ACRE FROM WHEAT-FALLOW ROTATION AND 12-YEAR LEGUME-GRASS OR GRASS ROTATIONS, OREGON WHEAT-FALLOW AREA
(June 1950 Price Level)

Item	Unit	Wheat-fallow area of high productivity					Wheat-fallow area of low productivity		
		Wheat-fallow rotation with improved practices	Recommended 12-year alfalfa-grass rotation				Wheat-fallow rotation with improved practices	Recommended 12-year crested wheatgrass rotation	
			With cow-yearling outfit	With feeder outfit	With sale of hay	With rental of pasture		With cow-yearling outfit	With feeder outfit
Use of rotation cropland									
Wheat	Pct.	50.0	33.3	33.3	33.3	33.3	50.0	33.3	33.3
Fallow	Pct.	50.0	33.4	33.4	33.4	33.4	50.0	33.3	33.3
Total rotation cropland	Pct.	100.0	66.7	66.7	66.7	66.7	100.0	66.6	66.6
Legume-grass or grass pasture	Pct.	-	20.1	16.3	-	25.0	-	24.5	23.0
Legume-grass or grass hay	Pct.	-	4.9	8.7	25.0	-	-	8.9	10.4
Legume-grass, new seeding	Pct.	-	8.3	8.3	8.3	8.3	-	-	-
Total rotation grassland	Pct.	-	33.3	33.3	33.3	33.3	-	33.4	33.4
Total rotation cropland	Pct.	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Land devoted to wheat and fallow									
Yield of wheat per acre, alternate years	Bu.	24.6	1/ 26.6	1/26.6	1/ 26.6	1/ 26.6	16.3	2/ 16.3	2/ 16.3
Gross income per acre									
Wheat, at $2.00 per bushel	Dol.	49.20	53.20	53.20	53.20	53.20	32.60	32.60	32.60
Stubble pasture or chaff	Dol.	.20	.50	.80	.20	.20	.20	.34	.80
Total gross income per acre, alternate years	Dol.	49.40	53.70	54.00	53.40	53.40	32.80	32.94	33.40
Average gross income, yearly basis	Dol.	24.70	26.85	27.00	26.70	26.70	16.40	16.47	16.70
Cost of production per acre									
Wheat	Dol.	16.94	17.57	17.57	17.57	17.57	14.25	14.86	14.86
Fallow	Dol.	13.59	14.07	14.07	14.07	14.07	10.88	11.52	11.52
Average cost, yearly basis	Dol.	15.26	15.82	15.82	15.82	15.82	12.56	13.19	13.19
Net annual returns to management per acre	Dol.	9.44	11.03	11.18	10.88	10.88	3.84	3.28	3.51
Land devoted to legume-grass or grass (mature stand)									
Proportion utilized as pasture	Pct.	-	80.4	65.2	-	100.0	-	73.3	69.0
Proportion utilized as hay	Pct.	-	19.6	34.8	100.0	-	-	26.7	31.0
Total pasture and hay	Pct.	-	100.0	100.0	100.0	100.0	-	100.0	100.0
Pasture yield per acre	A.U.M.	-	1.125	1.125	-	1.125	-	.78	.78
Hay yield per acre	Tons	-	.9	.9	.9	-	-	.625	.625
Pasture required per animal unit	A.U.M.	-	7.87	5.76	-	-	-	7.87	5.76
Hay required per animal unit	Tons	-	1.54	2.33	-	-	-	1.54	2.33
Pasture acreage required per animal unit	Ac.	-	7.00	5.12	-	-	-	10.09	7.38
Hay acreage required per animal unit	Ac.	-	1.71	2.59	-	-	-	2.46	3.73
Total acreage per animal unit	Ac.	-	8.71	7.71	-	-	-	12.55	11.11
Animal units of livestock supported per acre	A.U.	-	.115	.13	-	-	-	.0797	.09
Net beef produced per animal unit	Lbs.	-	448	755	-	-	-	449	746
Net beef produced per acre	Lbs.	-	51.5	98.2	-	-	-	35.8	67.1
Price per unit of beef, hay, or pasture	Dol.	-	.19	3/	27.00	3.25	-	.19	3/
Gross income per acre of legume-grass or grass	Dol.	-	9.71	21.16	24.30	3.66	-	6.75	14.43
Cost of production per acre									
Livestock expenses exclusive of forage 4/	Dol.	-	3.39	6.00	-	-	-	4.97	6.41
Pasture 5/	Dol.	-	8.36	6.78	-	5/ 9.95	-	5.37	5.01
Hay, loose 6/	Dol.	-	3.00	5.33	-	-	-	3.02	3.51
Hay, baled 7/	Dol.	-	-	-	15.27	-	-	-	-
Cost of new seeding 8/	Dol.	-	7.59	7.59	7.59	7.59	-	.70	.70
Total cost of production per acre	Dol.	-	22.34	25.70	22.86	17.54	-	14.01	15.63
Net returns to management per acre	Dol.	-	-12.63	-4.54	1.44	-13.88	-	-7.26	-1.20
Average returns for rotation cropland									
Gross income per acre	Dol.	24.70	20.33	23.29	23.87	18.71	16.40	13.22	15.94
Cost of production per acre	Dol.	15.26	16.13	16.97	16.26	14.93	12.56	13.46	14.00
Average net returns to management per acre	Dol.	9.44	4.20	6.32	7.61	3.78	3.84	-.24	1.94

1/ Yield of wheat in area of high productivity:
- First crop after alfalfa-grass ..... 21.6 bushels per acre
- Second crop after alfalfa-grass ..... 28.3 bushels per acre
- Third crop after alfalfa-grass ..... 28.3 bushels per acre
- Fourth crop after alfalfa-grass ..... 28.3 bushels per acre
- Average of the four crops after alfalfa-grass.. 26.6 bushels per acre

2/ Yield of wheat in area of low productivity:
- Wheat as nurse crop with grass ..... 14.7 bushels per acre
- First crop after grass ..... 15.5 bushels per acre
- Second crop after grass ..... 17.5 bushels per acre
- Third crop after grass ..... 17.5 bushels per acre
- Average of the four crops with and after grass. 16.3 bushels per acre

3/ Feeder calves are purchased December 1 weighing 500 pounds at $19.25 per cwt., and are sold July 15 weighing 760 pounds at $20.00 per cwt. With the margin of .75 cent per pound on the weight of feeder cattle purchased, the selling price of the net amount of beef produced is equivalent to 21.5 cents per pound.

4/ Livestock expenses exclusive of forage for a cow-yearling outfit is based on $29.52 per A.U. in the area of high productivity and $66.23 per A.U. in the area of low productivity: For a feeder cattle outfit expenses are based on $46.24 per A.U. in the area of high productivity and $71.24 per A.U. in the area of low productivity.

5/ Cost of pasture is based on $10.40 per acre in the area of high productivity, except that where pasture is rented it is based on $9.95 per acre. In the area of low productivity, pasture is based on $7.26 per acre.

6/ Cost of loose hay is based on $15.32 per acre in the area of high productivity, and $11.32 per acre in the area of low productivity.

7/ Cost of baled hay is based on $15.27 per acre in the area of high productivity.

8/ Cost of new seeding is based on $22.77 per acre in the area of high productivity and $2.10 per acre in the area of low productivity. This cost is charged over the 3-year life of the mature stand of legume-grass or grass.

A.U.M. of feed per A.U. in both systems. It would require 199 bushels of barley for a cow-yearling outfit (four bushels per A.U.) and 795 bushels for a feeder-cattle outfit (15 bushels per A.U.). The larger amount of barley would be required for feeder cattle to get maximum gains during the winter feeding period.

The net amount of beef produced by the cow-yearling outfit would be 21,720 pounds (448 pounds per A.U.), selling at 18.85 cents per pound for a net sale of $4,094 ($84.58 per A.U.). With a feeder cattle outfit 39,580 (net) pounds of beef would be produced, selling at the equivalent of 21.5 cents per pound for a net sale of $8,520 ($162.59 per A.U.).

The livestock expenses, exclusive of forage, for a cow-yearling outfit would be $1,429 ($29.52 per A.U.). The major expense items would be interest on livestock and feed, labor, and barley purchased for feed. With a feeder cattle outfit the livestock expenses would be $2,425 ($46.24 per A.U.), with barley purchased for feed accounting for $20.48 per A.U. or approximately half the total expense.

The net returns for the forage utilized under conservation farming would be $2,665 per farm ($55.06 per A.U) for a cow-yearling outfit and $6,097 per farm ($116.35 per A.U.) for a feeder cattle outfit or more than twice as much net return for forage utilized in the feeder cattle outfit as in a cow-yearling outfit (Table F-9).

One-third of the cropland would be devoted to alfalfa-grass in the conservation systems. With a cow-yearling outfit the gross income would be $9.71; the cost of production, $22.34; and net return to

TABLE F-9. BEEF CATTLE: ESTIMATED COSTS AND RETURNS UNDER CONSERVATION FARMING ON TYPICAL MEDIUM-SIZED FARMS, OREGON WHEAT-FALLOW AREA
(June 1950 Price Level)

Item	Unit	Amount per farm				Amount per animal unit, yearlong basis			
		Wheat-fallow area of high productivity		Wheat-fallow area of low productivity		Wheat-fallow area of high productivity		Wheat-fallow area of low productivity	
		Cow-yearling outfit	Feeder outfit	Cow-yearling outfit	Feeder outfit	Cow-yearling outfit	Feeder outfit	Cow-yearling outfit	Feeder outfit
Livestock inventory									
Cows, 2 years and older	No.	33	-	33	-				
Other cattle	No.	-	161	-	144				
Saddle horse	No.	2	2	2	2				
Total animal units, yearlong basis	No.	48.4	52.4	48.8	47.1				
Livestock capital (yearlong basis)	Dol.	8,200	1/ 9,200	8,400	2/ 8,200	170	1/ 176	172	2/ 174
Feed	Dol.	2,000	3,000	1,600	2,400	41	57	33	51
Total 3/	Dol.	10,200	12,200	10,000	10,600	211	233	205	225
Feed requirements									
Pasture	A.U.M.	381	302	384	271	7.87	5.76	7.87	5.75
Hay	Tons	74.3	122	75.4	110	1.54	2.33	1.54	2.34
Total forage 4/	A.U.M.	581	629	585	565	12.00	12.00	12.00	12.00
Barley	Bu.	199	795	199	713	4.11	15.17	4.08	15.14
Cottonseed cake	Cwt.	-	-	332	249	-	-	6.80	5.29
Beef produced annually									
Gross production	Lbs.	21,720	120,080	21,720	107,160	448	2,292	445	2,275
Less feeders purchased	Lbs.	-	80,500	-	72,000	-	1,537	-	1,529
Net amount of beef produced	Lbs.	21,720	39,580	21,720	35,160	448	755	445	746
Price received per pound	Cents	18.85	5/	18.85	5/	18.85	5/	18.85	5/
Gross returns from beef cattle									
Total value of beef sold	Dol.	4,094	24,016	4,094	21,432	84.58	458.32	83.89	455.00
Less cost of feeders purchased	Dol.	-	15,496	-	13,860	-	295.73	-	294.25
Net sales	Dol.	4,094	8,520	4,094	7,572	84.58	162.59	83.89	160.75
Livestock expenses exclusive of forage									
Cost of purchased feed									
Barley at $1.35 per bushel	Dol.	269	1,073	269	963	5.56	20.48	5.51	20.44
Cottonseed cake at $4.80 per cwt	Dol.	-	-	1,595	1,195	-	-	32.68	25.37
Total cost of purchased feed	Dol.	269	1,073	1,864	2,158	5.56	20.48	38.19	45.81
Labor, care of cattle at $1.00 per hour	Dol.	490	522	510	461	10.12	9.96	10.45	9.79
Veterinary, salt, bull depreciation, etc.	Dol.	78	63	84	67	1.61	1.20	1.72	1.42
Annual cost of buildings, fences, etc. 3/	Dol.	-	-	-	-	-	-	-	-
Taxes on livestock	Dol.	82	155	84	140	1.69	2.96	1.72	2.97
Interest (livestock and feed) at 5% 3/	Dol.	510	610	500	530	10.54	11.64	10.25	11.25
Total exclusive of forage 3/	Dol.	1,429	2,423	3,042	3,356	29.52	46.24	62.33	71.24
Net returns for forage utilized 3/6/	Dol.	2,665	6,097	1,052	4,216	55.06	116.35	21.56	89.51

1/ Represents capital for purchase of feeder cattle, $15,496 for 7-month period, expressed on an annual-equivalent basis.
2/ Represents capital for purchase of feeder cattle, $13,860 for 7-month period, expressed on an annual-equivalent basis.
3/ The investment in buildings, fences, and other facilities and the annual cost in terms of depreciation, repair, interest, etc., have not been allocated but have been charged to the land.
4/ Hay is converted to A.U.M. on the basis of 750 pounds of hay per animal unit per month, or one ton of hay equals 2.67 A.U.M.
5/ Feeder calves are purchased December 1 weighing 500 pounds at $19.25 per cwt., and are sold July 15 weighing 760 pounds at $20.00 per cwt. With the margin of .75 cent per pound on the weight of feeder cattle purchased, the selling price of the net amount of beef produced is equivalent to 21.5 cents per pound.
6/ Represents the net returns for all forage utilized by an animal unit on a yearlong basis, including hay as well as pasture.

management, $-12.63 per acre. With a feeder outfit the gross income would be $21.16; the cost of production, $25.70; and net return to management $-4.54 per acre. With sale of hay the gross income would be $24.30; the cost of production, $22.86; and net return to management, $1.44 per acre. With rental of pasture the gross income would be $3.66; the cost of production, $17.54; and net return to management, $-13.88 per acre.

The average net returns to management for rotation cropland were determined by weighting the net returns to management of the land devoted to wheat-fallow and to alfalfa-grass by the percentage in each use. The improved system (without alfalfa-grass in the rotation) shows an average net return to management of $9.44 per acre. The cow-yearling outfit shows a return of $4.20 per acre, a 56 per cent reduction for the rotation using alfalfa-grass. The feeder cattle outfit shows a return of $6.32 per acre, a reduction of 33 per cent. With sale of hay the return was $7.61 per acre, a reduction of 19 per cent. With rental of pasture there was a return of $3.78 per acre, a 60 per cent reduction from the adoption of alfalfa-grass in a recommended 12-year rotation (Table F-8).

Area of Low Productivity

There would be 49 animal units (yearlong basis) with a cow-yearling outfit and 47 animal units (yearlong basis) with a feeder cattle outfit. The capital invested in livestock and feed would be $10,000 for the cow-yearling outfit ($205 per A.U.), and $10,600 for a feeder cattle outfit ($225 per A.U.).

The feed requirements of pasture and hay would be 585 A.U.M. for the cow-yearling, and 565 A.U.M. for the feeder cattle outfit or 12 A.U.M. of feed per A.U. in both systems. The cow-yearling outfit would require 199 bushels of barley (four bushels per A.U.), and 332 cwt. of cottonseed cake (6.8 cwt. per A.U.). The feeder cattle outfit would require 713 bushels of barley (four bushels per A.U.), and 249 cwt. of cottonseed cake (5.3 cwt. per A.U.). The cottonseed cake was needed to supplement the low-quality crested wheatgrass hay.

The net amount of beef produced by the cow-yearling outfit would be 21,720 pounds (445 pounds per A.U.), selling at 18.85 cents per pound for a net sale of $4,094 ($83.89 per A.U.). With a feeder cattle outfit 35,160 pounds (net) of beef would be produced, selling at the equivalent of 21.5 cents per pound for $7,572 ($160.75 per A.U.).

The livestock expenses, exclusive of forage, for a cow-yearling outfit would be $3,042 ($62.33 per A.U.). The major expense items would be cottonseed cake (about 50 per cent of total expense), barley, labor, and interest on livestock and feed. With a feeder cattle outfit the livestock expenses would be $3,356 ($71.24 per A.U.) with cottonseed cake accounting for approximately 29 per cent and barley 36 per cent of the total livestock expense.

The net returns for the forage utilized under conservation farming would be $1,052 per farm ($21.56 per A.U.) for a cow-yearling outfit, and $4,216 per farm ($89.51 per A.U.) for a feeder cattle outfit or more than four times as much net return for forage utilized

in the feeder cattle outfit as in a cow-yearling outfit (Table F-9).

These analyses show the same variations in costs and returns as those in the area of high productivity. Because of lower yields the costs, returns and net returns to management are considerably reduced in this area. The improved system (without crested wheatgrass in the rotation shows an average net return to management of $5.84 per acre. The cow-yearling outfit shows a return of $-.24 per acre, a 106 per cent reduction. The feeder cattle outfit shows a return of $1.94, a 50 per cent reduction due to the adoption of crested wheatgrass in a recommended 12-year rotation (Table F-8).

Effect Upon Income of Retiring Wheat Land to Permanent Grass Seeding Area of High Productivity: Class II, III and IV Land

In this area 26.7 bushels of wheat produced per acre during alternate years with a wheat-fallow (present) system, selling at $2.00 per bushel, gives a gross annual income of $26.70 per cropland acre. On land permanently retired to grass, 51.5 pounds of beef produced per cropland acre, selling at approximately 19 cents per pound, would bring a gross annual income of only $9.71 per acre. This would be a reduction in income of $16.99 per acre.

The cost of production for wheat-fallow would be $14.39 per cropland acre, and for permanent grass seeding, $16.97, an increase of $2.58.

The net returns to management per cropland acre would be $12.41 for wheat-fallow, and $-7.26 for permanent grass seeding. This means a net decrease of $19.67 per cropland acre in net returns to

management by the retirement of wheat-fallow land to a permanent grass seeding (Table F-10).

Area of Low Productivity: Class II, III and IV Land

In this area 17.1 bushels of wheat produced per acre during alternate years with a wheat-fallow system, selling at $2.00 per bushel, gives a gross annual income of $17.10 per cropland acre. With land permanently retired to grass, 35.8 pounds of beef produced per cropland acre, selling at approximately 19 cents per pound, would bring a gross annual income of only $6.75 per acre. This would be a reduction in income of $10.35 per acre.

The cost of production for wheat-fallow would be $11.80 per cropland acre, and for permanent grass seeding, $13.18, an increase of $1.38.

The net returns to management per cropland acre would be $5.30 for wheat-fallow and $-6.43 for permanent grass seeding. This means a net decrease of $11.73 per cropland acre in net returns to management by the retirement of wheat-fallow land to a permanent grass seeding (Table F-10).

Area of Low Productivity: Class VI Land

In this area on the poorer soils the wheat yield of 10.3 bushels per acre (alternate years) at $2.00 per bushel gives a gross annual income of $10.30 per cropland acre. On this land retired to grass, 35.8 pounds of beef per acre sold at approximately 19 cents per pound would bring a gross annual income of $6.75 per acre of grassland, a reduction of $3.55 due to retirement from wheat production.

TABLE F-10. EFFECT UPON INCOME OF RETIRING WHEAT LAND TO PERMANENT GRASS SEEDING OREGON WHEAT-FALLOW AREA (June 1950 Price Level)

Item	Wheat-fallow (present system)	Permanent grass seeding 1/	Differential
AREA OF HIGH PRODUCTIVITY: Class II,III,&IV land			
Gross production per acre			
Bushels of wheat per acre (alternate years).....	26.7		
Pounds of beef per acre (annually)		51.5	
Gross annual income per cropland acre 2/	$26.70	$ 9.71	$-16.99
Cost of production per acre			
Wheat-fallow rotation			
Fallow year	$12.32		
Wheat-crop year	16.46		
Permanent grass seeding			
Livestock expenses, except forage		$ 3.39	
Cost of producing pasture and hay		11.36	
Cost of new seeding, over 10 year life		2.22	
Total cost per cropland acre	3/$14.39	$16.97	$ 2.58
Net returns to management per cropland acre	$12.41	$-7.26	$-19.67
AREA OF LOW PRODUCTIVITY: Class II,III,&IV land			
Gross production per acre			
Bushels of wheat per acre (alternative years) ..	17.1		
Pounds of beef per acre (annually		35.8	
Gross income per cropland acre 2/	$17.10	$ 6.75	$-10.35
Cost of production per acre			
Wheat-fallow rotation			
Fallow year	$ 9.73		
Wheat-crop year	13.88		
Permanent grass seeding			
Livestock expenses, except forage		$ 4.97	
Cost of producing pasture and hay		8.00	
Cost of new seeding, over 10 year life		.21	
Total cost per cropland acre	3/$11.80	$13.18	$ 1.38
Net returns to management per cropland acre	$ 5.30	$-6.43	$-11.73
AREA OF LOW PRODUCTIVITY: Class VI land			
Gross production per acre			
Bushels of wheat per acre (alternate years)	10.3		
Pounds of beef per acre (annually).....		35.8	
Gross income per cropland acre 2/	$10.30	$ 6.75	$ -3.55
Cost of production per acre			
Wheat-fallow rotation			
Fallow year	$ 9.73		
Wheat-crop year	13.88		
Permanent grass seeding			
Livestock expenses, except forage		$ 4.97	
Cost of producing pasture and hay		8.00	
Cost of new seeding, over 10 year life		.21	
Total cost per cropland acre	3/$11.80	$13.18	$ 1.38
Net returns to management per cropland acre	$-1.50	$-6.43	$ -4.93

1/ Assuming utilization of grass by cow-yearling outfit.
2/ Wheat price, $2.00 a bushel; beef, 19¢ a pound
3/ Average cost per acre of wheat-fallow land.

The cost of production for wheat-fallow would be $11.80 per cropland acre and for permanent grass seeding, $13.18, or an increase of $1.38.

The net returns to management per cropland acre would be $-1.50 per acre for wheat-fallow and $-6.43 for permanent grass seeding. This means a net decrease of $4.93 per cropland acre in net returns to management by the retirement of wheat-fallow land to a permanent grass seeding (Table F-10).

The results show that in both areas and with land classes I through VI, there would be a reduction in returns when land is permanently retired to grass. The reduction would be greatest in the area of higher productivity but is still marked in the area of low productivity. Even on class VI land where the production of wheat results in a minus return to management, there would be a still greater loss when put into permanent grass for beef cattle (Table F-10).

CONCLUSIONS

The use of the budgetary method indicates that adoption of conservation plans, recommended by the Soil Conservation Service, would prove to be less profitable to the farmer than the present system of farming. The reduction in net farm income, due to the adoption of the various recommended conservation plans, ranges from 11 to 56 per cent.

With the relatively high returns from wheat compared to the returns from grass or legume-grass, there is little incentive for the farmers in the dry-land wheat area to shift to a conservation program. They have increased yields--in spite of soil erosion--by better tillage methods and better yielding varieties of wheat. As long as there is no drastic decline in wheat yields, farmers are not likely to become alarmed about soil erosion, especially if it is sheet erosion which will not interfere with tillage operations. On the steeper slopes where gully erosion is apt to occur, such conservation practices as strip cropping, contour farming, cross-slope planting, and grass waterways, are more likely to be adopted. Where gully erosion or stream bank erosion is serious, the more costly practices, such as terracing, rip-rap, tree and shrub planting, check dams, and other more costly measures of control, also may be adopted with reluctance.

When conservation is deemed to be necessary for society, but is not economic for the individual, as has been shown by this study, then

other means are needed by which conservation practices can be established. If, for example, a rotation of grasses or legumes were necessary to control erosion and/or maintain or increase soil fertility, the cost could be met by some type of subsidization such as is done by the Agriculture Conservation Program of the Production and Marketing Administration. A substantial subsidy would be needed in these study areas ($2000-$8000) to maintain a net farm income equivalent to that of the present system of farming.

Production controls on wheat and small grains might force effectively the growing of grass as an alternative crop on cropland acreage withdrawn from exploitive crops. However, this might bring hardship to farmers, especially during the period of readjustment and perhaps over a longer period, unless wheat or livestock prices were exceptionally high or farmers were subsidized to compensate for decreased net farm income under conservation cropping.

The most drastic method of effecting soil erosion control would be to withdraw the entire area from the growing of wheat and small grains. There would have to be a grass seeding program of tremendous scope and perhaps a readjustment of ownership into large acreages required of a livestock economy. This would create the additional problems of relocation of displaced people from the area, readjustment of taxes, public services, and other social and economic problems.

Perhaps the situation is not as bleak as it has been pictured in this study. There may be new technological developments that will permit continuous small-grain growing without the loss of soil organic

matter or fertility. New soil amendments, new fertilizers, new tillage methods and equipment, successful rainmaking for adequate moisture at the right times, or other unforeseen developments may change present concepts of a soil conservation program.

Many unanswered problems remain for further research. Better varieties of grasses and legumes are needed for this area that will be drought resistant, hardy, and still high in protein content and palatability.

A field survey is needed, comparing detailed records of farmers following a recommended conservation plan with those not following a conservation plan. This type of study might bring out social, economic, or other blocks to the adoption of conservation that are not apparent at the present time.

During a trip into the Washington dry-land wheat area a number of farmers were interviewed regarding their interest in conservation farming. One thing stood out in their views; they valued their leisure time highly, and did not want to be tied down with tending cattle. Several families took extended vacations along with short vacations during the year, which would not have been possible if a livestock enterprise had co-existed with dry-land wheat farming.

Another problem presented was that of hired labor. Many farmers were operating without any hired labor except during seeding and harvesting. Often these jobs were done by a school-age son or daughter, the farmer's wife, or by trading labor with a neighbor. These farmers were very busy during certain seasons and felt that if

they had livestock to care for, hay to cut, bale, haul and stack, and other extra chores, they would need one or more hired men during these peak work periods. They felt that during other seasons this extra hired help would not be justified, yet in order to have a reliable hired hand they would have to keep him the full year.

While these views of farmers may not be fully justified, especially that conservation farming would require more hired help, they may represent what farmers are thinking and doing and will continue to think and do until proved otherwise.

Farmers also stressed their need for more research to help them with their problems, especially on tillage, better crop varieties, weed control, fertilization, as well as conservation rotations, and the whole problem of farming in the dry-land areas of the Columbia Basin. It was also noted that farmers considered soil erosion a minor problem, but were concerned with better moisture holding capacity of the soils.

It was interesting to find that farmers were aware of their problems and were seeking assistance in solving them. Without exception, they were in favor of more research by the state and federal agencies and were willing to try out new methods on a limited scale on their own farms.

The results of this study have shown that at the present time the practices recommended by the Soil Conservation Service are uneconomic to the individual farmer in the dry-land wheat area of Oregon. The social costs of soil erosion and loss of organic matter and soil

fertility have not been determined. Further research may show that in the long run conservation may be economic, or that for the good of the nation, society should bear the cost of conservation in this area by some means of social or economic controls. To an ardent conservationist the results are disturbing but with the scientific advancement of the present time, there should be solutions to the problems of loss of soil, fertilizer, and organic matter soon forthcoming. Perhaps in a very few years technological changes may make this study obsolete, and that is as it should be in our rapidly changing economy.

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