

A STUDY OF FARM ORGANIZATION AND SOIL MANAGEMENT PRACTICES  
IN COLORADO

in relation to agricultural conservation and adjustment  
with special reference to formulation of programs under the  
Soil Conservation and Domestic Allotment Act

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## Areas Studied

Two sections of Colorado were selected. The first was located in the Yampa River drainage basin, including chiefly Routt and Moffat counties in northwestern Colorado. The second was located in northeastern Colorado where work was confined to the three counties of Logan, Phillips and Washington.

Limitations as to personnel for field work made it necessary to work these areas in sequence.

Yampa area.-- The Yampa watershed in northwestern Colorado was studied first. This area included 4,288,261 acres of which 151,187 acres, or 3.5 percent, were in crops, according to data assembled by the National Forest Service. (In the two counties of Moffat and Routt the 1930 census reported 75,054 acres dry crops harvested and 56,767 acres irrigated crops harvested.)

Some of the dry land crops, especially in Moffat County, were on lands with a low average rainfall. These were good grazing lands before being homesteaded. Many dryland farmers have lost their land through tax sale and foreclosure. Such lands have largely reverted to grazing.

The problems of soil conservation in the Yampa area center around a proper control of the grazing land. The National Forest Service, the Grazing Administration and the Soil Conservation Service cooperated in analyzing the grazing problems. The following conclusions are adapted from reports prepared by these cooperating agencies. (A special economic report on this area was prepared in October 1936 by the Colorado Experiment Station.)

1. The Soil Conservation Service estimated that from 25 to 75 percent of the surface had been injured by erosion over a major portion of the area. Some sub-areas were over 75 percent damaged by erosion.
2. The National Forest Service estimated that summer ranges were overstocked 31 percent, spring-fall ranges 43 percent and winter ranges 63 percent. In order to correct this condition it would be necessary to reduce the number of sheep and cattle in the Yampa area as a whole by 23.5 percent. This reduction would relieve the pressure of overgrazing and permit nature to restore the vegetation.
3. The problem of restoring the vegetation is a serious one as lands are low in value, and the cost of reseeding exceeds the value of the land. For this reason stockmen welcome the soil conservation and domestic allotment program which will offer payment for doing certain things to improve the range. No information was available as to the costs of or results from any

specific practice. Individual stockmen favored such practices as railing sagebrush, water hole development, contour furrowing and water spreading. In the eastern part of the valley reseeding was favored by some. Critical students of the range fear that water hole development will result in stock going into hitherto lightly grazed sub-areas and may end in further damage to the vegetation rather than acting as an aid in improvement.

4. Conditions in northwestern Colorado are fairly representative of the grazing area in the western counties of Colorado, especially in Rio Blanco, Garfield and Mesa counties, although the winter-grazed lands decrease in relative importance as one goes south in the state.

Northeastern Colorado area.-- The second area selected for study was in northeastern Colorado. Economic data for 65 farms and soil conservation service maps for 22 farms were secured in the three counties of Logan, Phillips and Washington. These farms were within Colorado type of farming areas 12, 13 and 14. Brief extracts from Colo. Sta. Bul. 418 will indicate the general farm organization within these three areas. 1/

Area 12, Northeastern Colorado plains.-- Cash grain (wheat, corn, barley), some swine and range cattle. This area is the most highly developed dry farming area in Colorado. Roughly estimated, 89 percent of all land in area 12 in 1929 was in farms, with 73 percent of farm land in crops.

Area 13, South Platte-Arikaree Rivers Sand Hills.-- Range cattle, swine, cash grain, general, feed crops. For the most part area 13 consists of gently undulating to rolling sand hills, mainly composed of dune-sand deposits. Roughly estimated 90 percent of the total in area 13 was in farms with 30 percent of the farm land in crops.

Area 14, East Central Colorado Plains.-- Cash grain, range cattle and some sheep, swine, dairy, dry beans and feed crops. Much of area 14 has a level to slightly undulating surface. Approximately 67 percent of the land in area 14 was in farms, with 34 percent of the farm land in crops.

#### Analysis of Northeastern Area

Table 1.-- Average size of farm visited in 1936.

Item	Logan County	Phillips County	Washington County	All farms
Number farms	18	24	23	65
Acres in crops	563	541	539	547
Acres in fallow	68	88	91	83
All other acres	218	125	440	262
Total area operated	849	754	1,070	892
Percent of total area in crop land	74	83	59	71

The farms visited were selected in cooperation with the county agents, and represented men whom they regarded as reliable and better-than-average farmers. Most of them were on soil conservation committees or

1/ Colo. Sta. Bul. 418, Type of Farming Areas in Colorado.

cooperating on the program. While the average area of crops per farm is similar in the three counties, individual farms in each county were selected to show differences in size and the resultant effect upon farm organization.

Economic data requested from farmers dealt with "normal crop areas and yields" and "customary" items of expense and methods of operation, rather than actual data for any specific year's operation. This was done to avoid securing data that over-emphasized drouth conditions.

The average "normal" yields reported by farmers in 1936 are tabulated in table 2 in contrast to the 10-year dry land county averages as reported by the Bureau of Crops and Livestock Estimates. In the last two columns are listed the estimated yields used in preparing budgets for type of farming areas 12 and for 13 or 14.

Table 2.- Average yield per acre.

	"Normal yields"				Dryland averages				Yields used in budgets	
	1936 averages		1924-33 B. A. E.		1924-33 B. A. E.		1924-33 B. A. E.		type of farming areas	
	Logan	Phil- lips	Washing- ton	Logan	Phil- lips	Washing- ton	Logan	Phil- lips	12	13-14
Corn	18.2	18.8	15.0	11.7	15.5	11.4	11.7	15.5	17	15
All winter wheat	16.2	14.2	12.5	11.5	12.8	7.7	11.5	12.8	12 1/2	9 1/2
Winter wheat fallowed		not reported	not reported	7.6	7.0	5.5	7.6	7.0	20	15
Spring wheat	8.8	9.3	8.8	12.9	13.6	10.2	12.9	13.6	8	6
Barley	25.6	19.2	15.6	15.7	16.4	12.0	15.7	16.4	18	14
Oats	21.5	21.8	18.1	8.4 2/2	8.4 2/2	6.1 2/2	8.4 2/2	8.4 2/2	20	16
Rye	10.0	11.8	8.6	3.3 2/2	3.0 2/2	2.7 2/2	3.3 2/2	3.0 2/2	9	7
Beans	4.6	—	3.9	no data	no data		no data	no data	4	3.5
Millet grain	24.2	18.2	17.2	10 2/2	11 2/2	10 2/2	10 2/2	11 2/2	17	14
Sorghum grain	—	10.0	9.6	no data	no data		no data	no data	10	10
Sudan seed	8.0	10.0	8.0	no data	no data		no data	no data	8	7
Millet hay	1.67	1.46	1.0	1.6 2/2	1.3 2/2	1.2 2/2	1.6 2/2	1.3 2/2	1.5	1
Sorghum roughage	2.0	2.0	1.5	no data	no data		no data	no data	1.75	1.25
Sudan hay	1.75	1.0	1.25	no data	no data		no data	no data	1.5	1.25

1/ Not fallowed

2/ 1929-1933 Bur. Agr. Econ.

In the following table are listed the average "customary" items of cash expense as reported by farmers within the three counties.

Table 3.- Customary farm cash expenses (average for all farms).

Item	Logan County	Phillips County	Washington County
All paid labor	\$340.38	\$283.18	\$191.56
Threshing	13.32	9.23	61.72
Shredding and silo filling	1.94	8.33	1.96
Fuel	237.25	378.36	168.27
Oil	35.57	56.40	31.70
Grease	13.30	13.78	7.47
Cash rent	-----	41.10	16.28
Electricity	9.67	.58	.42
Telephone	7.60	5.75	6.80
Repairs	184.89	267.16	222.72
Veterinary	2.56	11.17	1.46
Dips	2.78	4.21	1.41
Poison	10.00	5.96	6.67
Hauling to market	30.14	26.04	53.16
Fire insurance	15.19	10.02	13.01
Feeds	73.41	63.49	61.06
Miscellaneous	-----	3.02	8.69
Total	978.00	1,187.78	854.36
Months of labor			
Family	3.8	7.1	9.2
Operator	12.0	11.4	10.7

These expenses do not include taxes, interest payments nor depreciation. For the three counties these listed cash expenses amount to \$1.85 per acre of harvested crops.

Soil Conserving Practices. Farmers interviewed were asked to list the special practices which they were using to help check soil erosion. An increase in amount of fallowing was reported by 34 percent of the men. Strip cropping was reported by 9 percent. Other practices were seldom followed. Only four men reported terracing, seven used contour planting, three used green manure crops, and two used a winter cover crop - out of sixty-five farmers.

In fallowing, the most commonly reported operations were based upon listing, with ridges broken in and out, followed by either harrowing or discing. Next in frequency were operations starting with either plowing or cylinder plowing, followed by discing or harrowing or the rod weeder.

The cost of fallowing varied from 65 cents per acre to \$2.04 per acre, depending upon the methods used, the power used and the width of implements. These costs were based upon reported amounts of fuel, oil

and grease for tractors at average cost rates, time required to work one acre, man labor at \$2.50 per day, depreciation, and repair charges as found from this or other similar studies. <sup>1/</sup>

The average cost of individual operations based upon the above items was as follows for the width of implement and size of tractor listed.

Table 4.- Average cost per acre once over for following practices.

Implement	Width	Cost per acre with	
		10-20 tractor	15-30 tractor
Listing	88"	\$0.51	\$0.57
Break ridges in	88"	.51	---
Break ridges out	132"	---	.43
Harrowing	20'	.12	.14
Discing	10'	.30	.33
Rod weeder	12'	.22	.25
Cylinder plow (one way)	10'	.31	.33
Plow, moldboard	42"	1.07	1.21

Carrying Capacity of Pasture.- Farmers reported that during the period of use, which varied from <sup>4</sup> to 7 months, native pastures were stocked at the rate of 1.46 acres per cow month (the average for all farmers interviewed) and that sudan annual pastures were stocked at the rate of .35 acre per cow month (all livestock reduced to the equivalent of a mature cow in making these estimates).

Students of range management <sup>2/</sup> estimate that pasture on first grade dry farming land should have 2.5 acres per cow month, on second and third grade or grazing lands 3.5 acres per cow month, and 4.5 acres per cow month for sand hill areas. For example, it would require 15 acres of pasture per mature cow for a period of 6 months on first grade dry farming land.

Ranchers in the sand hill area report no overgrazing when approximately 2 acres are used per cow month as an average for their normal grazing period, their experience being that the taller growth of sand hill vegetation permits the carrying of more livestock than on the shorter-growing buffalo grass. The actual use reported by seven operators within the sand hill type of farming area <sup>13</sup> gave a simple average of 1.25 acres native pasture per cow month. A simple average for four ranches in type of farming area <sup>14</sup> resulted in 1.83 acres native pasture per cow month actual use.

<sup>1/</sup> Montana Sta. Bul. 278 was used as a source of some depreciation data for individual machines.

<sup>2/</sup> E. W. Nelson.



Experimental work with annual pastures indicates that sudan grass can carry stock at the rate of 0.5 acre per cow month for approximately two months while winter rye can carry stock at the rate of one acre per cow month for two and two-thirds months. These rates are subject to variation in weather.

These differences indicate the highly variable nature of the evidence as to carrying capacity. This study did not result in data that justify "taking sides" in the controversy. Ranchers should watch the effect of their individual methods and modify their use of pasture accordingly.

Use of Land (census data).— The 1930 census record for Logan, Phillips and Washington counties shows the extent of crop land and crop failure as summarized in table 5. This is a county total including both dry and irrigated lands. Although irrigated lands are not important in Phillips and Washington counties, Phillips has the largest percentage of farm land in crops and Washington County has the largest percentage of crop land reported as failure. These data are for the crop year 1929, which was at the start of both the drouth and the depression. They indicate that farmers were using a high percentage of their land for crops.

Table 5.— Percentage of farm land in crop land, 1930 census.

	Logan pct.	Phillips pct.	Washington pct.
Percentage of farm area in crop harvested, crop failure and fallow	49.9	73.2	45.4
Percentage of above land in crop failure	16.6	5.6	24.7

(See table 23 in the appendix for a summary of the 1930 census for Logan, Phillips and Washington counties showing the dry land area of each crop, and the recommended dry land areas based upon 1935 regional adjustment study.)

Drouth and Its Relation to Land Use.— The 1935 census took crop data for 1934 which was the year of most severe drouth in the dryland area of Colorado. Certain minor civil divisions from the 1935 census have been selected as a sample of Colorado type of farming areas 12, 13 and 14. The experience in 1934 on the farms in these sample areas is shown below.

Table 6. — 1935 Census for selected precincts in Colorado type of farming areas 12, 13 and 14.

Type area	12	13	14
Number farms	1,329	742	683
Percentage of farm area in crops harvested and crop failure and fallow	75.9%	26.8%	43.2%
Percentage of above land in crop failure	48.7	38.7	71.6

Area 12 is the "best" dry land area of the state. Here 76 percent of the farm land was in crop. The regional adjustment recommendation in 1935 was for 75 percent of first grade land and 50 percent of second grade land in this area to be used for crop.<sup>1/</sup> In 1934 approximately 49 percent of these crops failed for lack of moisture.

Area 13 is the sand hill area. From 5 to 25 percent of the lands in this section were recommended in the 1935 study as suitable for crops. The 1934 record from these sample precincts shows 26.8 percent of the farm land in crop land. Of this amount approximately 39 percent failed for lack of moisture.

Area 14 is a mixed livestock and crop type of farming area. In general the lands within this area were recommended in 1935 as being from 5 to 50 percent adapted to crops. This sample showed 43.2 percent in crop land of which 71.6 percent failed in 1934 from lack of moisture. This heavy loss is an indication that these lands were less well adapted to crops or that the 1934 drouth was more severe in this area. The farmers in this area should study the possibilities of reducing the risks in farming by a shift to grazing and livestock production for some of the lands now used for cash crops. This is in line with the regional adjustment study.

Needed Adjustments.-- Some farmers reported on changes which they had made and reasons therefor. The most frequently reported changes were as follows: 44 percent decreased the acreage of winter wheat; 15 percent increased the acreage of corn; 9 percent increased the acreage of forage sorghums; 15 percent increased the number of cattle and 15 percent decreased the number of hogs; 11 percent reduced the number of horses; 34 percent increased the use of fallow; 9 percent increased the use of strip cropping; and 12 percent increased "livestock."

The reasons assigned for these changes were various. Wheat failure and low wheat prices during the drouth years largely accounted for the shift from wheat to corn, millet and sorghum. Improvements in tractors and power machinery and the relatively slower working speed of horses were listed as reasons for shifting to power machinery. The attempt to save moisture, to reduce erosion, and to comply with government contracts were given as prime reasons for the increased fallowing. In some cases where soil did not admit of fallowing, wheat was replaced by corn, cane or rye. Livestock shifts were due to a search for more income or a discovery that one kind of stock "did better" than another kind.

Some farmers reported changes that they wished to make in the future. An increase in the use of fallow and the use of power machinery were most commonly listed, although several men stated their intentions to increase winter wheat, number of cattle, or to seed more land to pasture.

Changes indicated by the Soil Conservation Service.-- The farm maps prepared by the Soil Conservation Service field men listed 36 soil types which were distinguishable. Table 7 was prepared by the Soil Conservation Service<sup>2/</sup> to indicate the suitability of these different soils for crop production. A few of

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<sup>1/</sup> See table 9 later in report for these percentages.

<sup>2/</sup> Done at a conference between John Spencer of the Soil Conservation Service and the writers.

**Table 7.-** The suitability of given types of soil with indicated slope characteristics for the production of crops, Colorado, 1936.\*

Soil types 1/	Suitability of the indicated types of soil for crop land according to				
	Slope groups				
	A (0-2%)	B (2-4%)	BB (4-8%)	C (8-15%)	D (over 15%)
1	2/	---	---	---	---
2	---	---	---	---	---
5	x 3/	---	---	---	---
10	x	x	---	---	---
11	x	x	x	---	---
13	x	x	x	---	---
20	---	---	---	---	---
31	---	---	---	---	---
32	x	x	---	---	---
36	x	x	x	---	---
37	---	---	---	---	---
38	x	x	---	---	---
39	x	---	---	---	---
40	x	x	---	---	---
41	x	x	---	---	---
42	---	---	---	---	---
43	x	x	x	---	---
47	---	---	---	---	---
50	x	x	x	---	---
51	x	x	x	---	---
52	x	x	x	---	---
56	x	x	x	---	---
60	x	x	---	---	---
64	x	x	---	---	---
70	x	x	---	---	---
71	x	x	x	---	---
80	x	x	---	---	---
81	x	x	x	---	---
82	x	x	---	---	---
83	x	x	---	---	---
90	x	x	x	---	---
91	x	x	x	---	---
93	x	x	x	---	---
96	x	x	x	---	---
100	---	---	---	---	---
0	---	---	---	---	---

\* These soil types constitute the different types of soil found on the 22 farms surveyed in type of farming areas 12, 13 and 14, Colorado.

1/ Most of these types of soil do not have the five different groupings of slopes as given in this table.

2/ --- Not suited for crop land; should be in pasture and grazing land.

3/ x Suitable for the production of crops.

these soils could be cropped on slopes of 4 to 8 percent. None were recommended for crops where slopes were over 8 percent. Some were not adapted to crop under any condition. This table was used as a guide in changing the organization of individual farms selected from the three type of farming areas.

Table 8 shows for a few farms mapped within the three type of farming areas, the use of land as mapped and the reduced amount of crop land if the Soil Conservation Service recommended use of soils is applied.

Table 8.-- Effect of Soil Conservation Service recommendation upon use of land on mapped farms.

Area	12	13	14
Number of farms	12	2	3
Farms as mapped			
Percentage of farm land in crop land	83.0	28.1	45.2
Recommended by S. C. S.			
Percentage of farm land in crop land	77.3	9.4	37.4

Actual farms within these three type of farming areas contain many conditions of soil and slope. Naturally the use of land upon specific farms would differ from a general recommended use for wider areas.

Changes advised by agronomy workers.-- Experienced Colorado research and extension workers cooperated both in this study and in the 1935 study by furnishing recommendations as to the proper ratio between crop and pasture land and desirable use of land in the dryland area.<sup>1/</sup> These recommendations for first, second and third grade dry farming lands are given in table 9.

Table 9.-- 1935 Recommendations as to percentage of land to be used for crop.

County	1. Percent of land to be in crop land		
	Logan	Phillips	Washington
Dry farm land			
First grade	75	75	50
Second grade	50	50	25
Third grade	5	5	5
	2. Recommended distribution of crop land		
	Logan	Phillips	Washington
	pct.	pct.	pct.
Wheat	25	25	28.15
Barley	10	10	11.25
Corn	22	22	24.00
Forage sorghum	10	10	11.62
Dry beans	3	3	4.12
Grain millet	--	--	5.25
Hay millet	10	10	5.61
Fallow	20	20	10.00
Total	100	100	100.00

<sup>1/</sup> Alvin Kezer, D. W. Robertson, T. G. Stewart, J. E. Morrison, L. A. Brown of the Colorado Experiment Station and J. F. Brandon of the Akron Experiment Station were consulted for these recommendations.

The maximum percentage of first grade land to be used for crop was 75 percent in Logan and Phillips counties. The farms studied in type of farming area 12 lie within these counties. The Soil Conservation Service data for individual farms in area 12 resulted in 77.3 percent to be used for crop land.

The maximum percentage of first grade land to be in crop in Washington County was 50 percent and for second grade 25 percent. The Soil Conservation Service recommendation for farms in type area 14 resulted in 37.4 percent which is between these two limits. This shows a very close agreement between the results obtained by the two separate groups of workers. The 1935 recommendations, which incidentally were not changed in 1936, were intended as a general check upon conditions over wide areas. The 1936 detailed recommendation of the Soil Conservation Service for individual farms considered actual conditions upon those farms, and would naturally differ from the broader county-wide percentages. Yet the differences are less than might be expected.

Method of applying recommendations in the 1936 study.-- Reasonably accurate information was secured for representative farms in 1936. These farms were used as individual cases to illustrate the effect of changes. A discussion of the economic effects of the recommendations is given in the following pages.

#### Appraising the Economic Feasibility of Proposed Recommendations

Basic data used in analyses.-- The feasibility of proposed recommendations was tested by the use of farm budgets. The difference obtained by subtracting the variable or out-of-pocket farm expenditures from the gross farm income represented the cash farm income for each farm studied. The cash farm income furnished the basis for testing the feasibility of proposed changes. In other words, the difference between the cash income received by an owner-operator on a farm upon which the existing or normal cropping and livestock systems was used and the cash income which the same operator might receive, provided the proposed changes were made on the same farm, indicated the amount of loss in income sustained.

Actual farms which best typified the groups of farms in the sample areas and which were fairly representative of farms in each respective type of farming area were used for making the budget analyses. For type of farming area No. 12, a 328-acre and 640-acre farm were selected. These two farms had unlike soil problems and farming systems even though they were located in the same farming area. A 1000-acre farm was studied in area 13, and 1440-acre farm in area 14.

A summary of the recommendations that were made is as follows: (1) The number of cultivated acres of farm land suited for crop land and the number of acres which should be in pasture or grazing land, (2) the kinds of crops which might be planted on the remaining crop land designated as suitable for crops and which would maintain approximately present fertility of the soil provided proper tillage practices were used by farm operators, (3) the most likely shift in livestock production which the farmer would make, providing the recommended cropping systems were put into effect. The first set of recommendations was based upon information given in table 7 of this study. The second group of recommendations was based upon the proportion of crop area suggested in the 1935 regional project study (see table 9). Adjustments

in the livestock numbers became necessary in cases where the cropping systems were changed. The adjustments depended primarily upon the extent of the shift from the production of concentrated feeds to the production of roughage feeds and to the reduction of total quantity of feed produced. The existing livestock and farming practices were preserved as nearly as possible. In cases where additional roughage was produced the policy was to increase the number of that kind of livestock which could best utilize large quantities of roughage and small quantities of concentrates. The numbers of range cattle were thus increased in certain cases.

It must be remembered that these recommendations have been made primarily from the standpoint of land utilization and that the changes were not suggested with the idea of increasing or maintaining the present income of the farms studied. It was generally expected at the start that a decrease in crop acres and an increase in pasture land would reduce the amount of income which farmers received from the same farm area, especially during years of good crops. An acre of land producing cultivated crops usually contributes more to a farmer's income than the same acre would if it were in pasture. Thus the farmer sustains a loss if he puts crop land back to pasture. The amount of this loss indicates approximately how much benefit payments would need to be paid to induce farm owner-operators to shift from their existing farming systems to those suggested in this study, provided the given rates of production and prices were used.

The cash farm income basis (gross farm income less certain variable expenses) for determining the differences in income of the existing and recommended farming systems has been used so that the results of this study would be more or less comparable with the results in similar studies made in other states. This net farm income above variable cash expenses is the income available to the farmer to be used for the following purposes: To pay real estate and personal taxes; to pay interest on money borrowed; to cover depreciation on machinery and improvements; to pay the operator and his family for their labor; to pay interest on the farmer's investment in the business; and to pay any other items not included in the variable expense. Any income in excess of this would be "profit." The cash income as indicated in the budgets may or may not be identical with the actual cash income on those farms over a period of years. The purpose has been to calculate the approximate cash income on the basis of those rates which are given.

Two definite policies were followed throughout the study while working out the budgets. The operator of the farm was given as much work as one man could do under average conditions. The amount of labor performed by the operator depended upon the kinds, and size, and combination of enterprises pertaining to the existing and recommended farming units and the practices followed on each farm. The remainder of the labor was hired and thus constituted a variable expense. The other policy was to work each horse on each farm approximately 700 hours per year and to figure that the remainder of the power would be furnished by a tractor on all farms where a tractor was available. It was considered practical for the farmer to use the number

of horses already on the farm which he could use efficiently with the available horse equipment. Thus a reduction in crop acres reduced the number of hours of work performed by the tractor, provided the farmer had a tractor. If fewer horses were required to do the work on the reduced crop acres of the recommended farming systems, then fewer horses were considered as kept on the farm.

The essential considerations which were necessary to work out the budgets were as follows: seed requirements per acre, yields of crops, prices of farm products for sale and purchase, variable expense rates per acre of crops, production of livestock and livestock products, feed requirements for livestock, and acres of pasture required for the different kinds and ages of livestock in each type of farming area. These data are given in tables 10 and 11.

The seed requirements as used in the budgets are the recommended seeding rates per acre for each crop. The common practice is for farmers to plant approximately the amount of seed per acre as given in table 10.

The normal yields which are given in the same table represent the approximate average yields for each crop of grain and roughage in the given type of farming areas with climatic conditions, soil fertility, and tillage practices as of the period 1920 to 1929 inclusive.

The prices of farm commodities as given in table 10 are based primarily upon the series B prices as furnished by the Agricultural Adjustment Administration for the 1935 regional project. Adjustments were made to fit north-eastern Colorado price conditions. Although adjusted prices of a few commodities were less than the prices of a few commodities given in the B series, the average of all adjusted prices was slightly higher than the average of the prices given in the B series. Identical adjusted prices were used in the budgets for the various crops produced in all three type of farming areas.

The variable farm expenses represent certain out-of-pocket expenses which farmers must pay while operating their farm businesses. (See table 10) Since actual farms served as the basis for budget analysis in this study it became necessary to consider in detail the actual variable expenses which each farmer must pay during the business year when the existing farming system was followed and then it became necessary to work out different variable expense rates if the recommended farming system was followed on the same farm. It is inadvisable to use a flat variable expense rate for the same productive enterprises on all farms because of the differences in the farm organization and management practices on different farms. In each case the rates as given in this study apply only to the specific farm for which those rates were figured and to no other farm. A change in the number of horses on the farm, or an increase or decrease in the acreage of certain kinds of crops produced on the same farm, or an increase or decrease in the total crop acres which the operator cultivated, or an increase or decrease in the number of livestock to be fed, or a change in the kind of feed fed to the livestock makes a difference in the variable expense rates per acre for the various kinds of crops produced. These are reasons for indicated differences in the expense rates given in the accompanying table.

Table 10.-- Seed requirements, yield and prices used in the preparation of farm budgets in type of farming areas 12, 13 and 14, Colorado.

Items	Seed per acre (lbs.)	Normal yields per acre in areas 12 13-14 (bu)	Prices of products for sale 1/ and purchase (bu)	Variable expense rates per acre of crops for									
				Existing farming systems		Recommended farming systems		in areas					
				12 acre farm	13 acre farm	14 acre farm	12 acre farm	13 acre farm	14 acre farm				
Crops													
Corn	6	17	\$ .65	\$1.76	\$1.31	\$1.66	\$ .41	\$1.24	\$1.04	\$1.48			
Winter wheat F	45	20	.80	3.81	--	4.02	2.59	3.57	--	4.24			
" NF	45	12	.80	1.36	--	--	1.15	1.08	--	1.31			
Spring wheat	60	8	.80	1.31	--	1.31	--	--	--	--			
Barley	60	18	.50	--	--	1.95	1.21	1.14	--	2.17			
Oats	40	20	.38	--	--	--	--	--	--	--			
Millet grain	25	17	.50	--	--	1.95	--	--	--	2.17			
Sorghum grain	6	10	.50	--	--	1.91	--	--	--	--			
Sudan seed	6	8	3.00	--	--	--	--	--	--	--			
Beans	17	4 cwt	3.00	3.10	--	--	2.79	2.79	--	3.06			
Sudan hay	6	1.5 tons	per ton	1.65 <sup>2/</sup>	1.20 <sup>2/</sup>								
Millet hay	25	1.5 tons	6.00	.96	.90 <sup>2/</sup>	1.09	1.21 <sup>2/</sup>	.90 <sup>2/</sup>		1.31			
Sorghum roughage	15	1.75 tons	6.00	.89 <sup>2/</sup>	.90 <sup>2/</sup>	1.07	.96 <sup>2/</sup>	.83 <sup>2/</sup>		.70 <sup>2/</sup>			
Sudan pastured	17	1.25 tons	6.00	1.09 <sup>2/</sup>									

1/ Prices for beef cattle \$6.50 per cwt., hogs \$7.50 per cwt., chickens 12¢ per lb., and eggs 20¢ per dozen. Prices for commercial feeds per cwt: bran \$1.25, meat scraps \$2.50, tannage, \$2.40, cottonseed cake \$2.00, salt \$1.00 and oyster shells 95¢.

2/ Includes cost of seed.



The items which were included in the total variable expense rates were twine, out-of-pocket expense for operating the tractor, the tractor equipment, horse equipment, extra labor up to harvest time, variable machine and hired labor expenses for harvesting crops by use of both the combine harvester method and the binder-thresher method, the hired labor for husking corn, and the out-of-pocket expenses for shelling that percent of the corn shelled on the farm. The variable expense rates given in this report represent estimates of the total variable expense rate per acre for each crop and other variable expense rates pertaining to the livestock enterprises.<sup>1/</sup>

The rates of production of livestock and livestock products as given in table 11 represent approximate average production in these areas when the given quantities of each kind of feed are fed to the different classes of livestock.

The feed requirements for the kinds of livestock which were being produced upon the four different farms budgeted are given in table 11. The quantities of feed given in the table are estimates of the amount of indicated concentrates, roughages, and pasture which might be fed to the indicated classes of livestock in the farming areas studied in order to get the indicated results in production. However, the individual farmer would feed those feeds generally which he has available on his own farm. Those feeds would probably be fed in different proportions than those given in the table. Therefore, these feed requirement data were used only as a basis for the number of feed units of concentrates and roughages needed for livestock production. In working out the budgets the kind of feed and the proportion of each feed fed depended upon the amount of the various feeds available on each farm. Thus one feed was substituted for another in accordance with the practical thing the farmer would do under a given circumstance. For example, it is indicated in the table that an average milk cow consuming 600 pounds of corn, 300 pounds of oats, 300 pounds of barley, 6500 pounds of dry roughage, and the feed from 15 acres of pasture during a period of 6 months in type of farming area 12, would produce 4100 pounds of milk annually. Now if there was insufficient corn, or barley, or oats on a farm so that this ration of concentrates could not be fed, then the surplus concentrated feeds were substituted for the deficit concentrated feeds. One kind of roughage might be substituted for another. Also if there was an insufficient number of acres of pasture on an individual farm to provide the necessary feed for the existing livestock on the farm, dry roughage was substituted for pasture. The carrying capacity of pasture in the three type of farming areas has been estimated on the basis of available data furnished by the Department of Grazing and Range Management. These rates represent approximate averages.

Obviously, the making of fairly accurate substitutions required the use of additional information relative to the quality of the different kinds of feeds on the average farm, the efficiency of the livestock in utilizing the feeds and the total digestible nutrients per unit of all available feeds. It is impossible to substitute one bushel of corn for a bushel of oats or even to substitute one pound of corn for a pound of oats and expect the same results from the feed. For example, in table 12 is given a comparison of the relative feed value of a bushel of oats compared with the feed value of a bushel of corn on the basis of total digestible nutrients. The number of

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<sup>1/</sup> Data from a similar study in western Nebraska were used as an aid in estimating these items.

Table 11.-- Approximate rates of production and feed requirements for livestock for type of farming areas 12, 13 and 14, Colorado. (Substitutes of other feeds for those given depend upon the kind of feed produced on each farm on basis of feed values as given in table 12.) (a)

Livestock 1/	Production	Pounds indicated feeds			Acres native pasture required			Months on pasture
		Corn	High Dry pro-rough- tein age	Dry	Type of farming areas	12	13	
<u>Horses</u>								
Work	Work 700 hrs.	1000	4440		7.5	13.5	10.5	3
Unbroken	Growth 12 months	300	2500		15	27	21	6
Saddle	Miscellaneous 400 hrs.	300	3000		10	18	14	4
<u>Milk cow</u>								
2-yr. old heifer or steer	4100 lbs. milk @ 3.8% butterfat	600 6/	6500		15	27	21	6
Yearling heifer or steer	Gain 250 lbs.	500	3400		15	27	21	6
Calf	Gain 250 lbs.	500	2800		7.5	13.5	10.5	6
Mature bull	Gain 400 lbs.	250	2000		1.25	2.25	1.75	3
	Maintenance 12 months	450	5000		10	18	14	4
<u>Range cattle</u>								
Cow raising calf	Maintenance 12 months		3600	100	15	27	21	6
2-yr. old steer or heifer	Gain 225 lbs.		3000	100	15	27	21	6
Yearling heifer or steer	Gain 225 lbs.		2500	75	7.5	13.5	10.5	6
Calf 2/	Growth - total wt. 450 lbs.		1200	50	1.25	2.25	1.75	3
Calf 3/	Growth 350 lbs.		--	--	1.25	2.25	1.75	3
Mature bull	Maintenance 12 months		5000	100	15	27	21	6
<u>HOES</u>								
Sow 4/	5 pigs 40 lbs. each	900	80					
Sow to fattening	Gain 150 lbs.	750	75					
Spring pig	Gain 180 lbs.	720	70					
Boar	Maintenance 12 months	1440	100					
<u>Poultry</u>								
100 laying hens 5/	Eggs, 800 doz.	3000	500					
100 pullets to laying age	Meat, 350 lbs.	1100	120					
125 broilers	Meat, 312 lbs.	900	80					

Pounds indicated feeds for poultry

Wheat	Oats	Bran
2000	1500	500
900	600	125
600	400	75

(a) These data secured through consultation with A. C. Allen and H. B. Osland.  
 1/ Each animal is given 12 pounds of salt annually.  
 2/ To 12 months of age. 3/ To 6 months of age.  
 4/ From time spring gilt is fattened, through farrowing time, and to weaning time.  
 5/ Two hundred pounds oyster shell is fed in addition.

6/ Plus 300 pounds oats and 300 pounds barley.

Table 12.-- Total digestible nutrients and feed units of indicated feeds, type of farming areas 12, 13 and 14, Colorado. (1 bushel of corn equals 1 feed unit.)

	Total digestible nutrients per 100 pounds 1/		Pounds per bushel or ton		Total digestible nutrients per bushel or ton		Feed units per bushel or ton		Feed units per 100 pounds	
	1	2	2	per bu.	3	4	5	4	5	
<u>Grain concentrates</u>										
Barley	79.4	48	48	per bu.	38.11	.79	1.65			
Corn	85.7	56	56	"	47.99	1.	1.78			
Millet (hog)	77.5	50	50	"	38.75	.81	1.62			
Oats	70.4	32	32	"	22.53	.47	1.47			
Sorghum for grain	79.5	56	56	"	44.52	.93	1.56			
Spring wheat	80.0	60	60	"	48.	1.	1.67			
Winter wheat	79.7	60	60	"	47.82	1.	1.67			
<u>Roughages</u>										
Corn stover (very dry)	52.2			ton	1044	10				
Millet hay	58.4			"	1168	18				
Sorghum roughage	52.1			"	1042	18				
Sorghum stover				"		10				
Sudan hay	51.4			"	1028	18				
<u>Straw</u>										
Barley	42.5			"	850	9				
Bean	47.6			"	952	18				
Millet	44.1			"	882	9				
Oat	45.6			"	912	10				
Sudan				"		9				
Wheat	36.9			"	738	8				

1/ Feeds and Feeding. W. A. Henry and F. B. Morrison, 19th edition. The Henry Morrison Company.

total digestible nutrients in a bushel of corn has been made arbitrarily to equal one feed unit. A bushel of oats is equal only to .47 of a bushel of corn in feed value on this basis. One hundred pounds of corn and oats are equal to 1.78 and 1.47 feed units respectively. Thus, if oats were substituted for corn, it would take about 2 bushels of oats to 1 of corn. In the case of roughages and straw the figures given in the table do not represent the actual feed value of feeds based entirely upon the total digestible nutrients. The quality of these feeds and the efficiency of the livestock in utilizing the different kinds of feeds, depending partly in turn upon feeding practices in these farming areas, were taken into consideration and adjusted figures were then suggested. Information given in the table represents averages. Thus if it is desirable to use this table to compare the feed value of feeds produced in a single year the differences in quality of the given feeds in comparison with the average quality of those feeds must be taken into consideration. Another word of caution is that when different combinations of feeds are fed to certain classes of livestock different results are obtained. Thus a table of this kind serves merely as a guide to the approximate feed value of different feeds when these feeds are fed to the proper kinds and ages of livestock.

The reasons for setting up and using the uniform rates as given in the preceding tables in this budget study and for using definite policies applicable to all farms were as follows: (1) To eliminate as many variables as possible; (2) to make accurate comparisons of the cash income of two systems of farming--the existing or normal cropping and livestock system with the recommended system--on the same farm; (3) to make it possible to compare the cash income of farms in one type of farming area with the income of farms in other type of farming areas.

Budgets for type of farming area 12.-- The 328-acre farm is discussed first. It is located in a dryland farming area in Phillips County in area No. 12.

A statement of the production of grain, roughages, livestock and livestock products for both the normal and recommended farming systems is given in table 13. The acres of crops and numbers of livestock given in the first column indicate the actual normal use of farm land and the kinds and numbers of livestock reported by the operator of this farm. In other words, the figures indicate the normal cropping and livestock systems as reported. The amount of production was determined by the use of rates given in the preceding tables for type of farming area 12.

It may be seen readily by close inspection of the data given in the table that it was not necessary to use all available roughage on the farm to feed the livestock in either the normal or recommended farming systems. For example, it was necessary to use only 10 tons of threshed oat straw cut from the 20 acres of oats, and only 4.5 tons of threshed millet grain straw cut from 6 acres of millet grain besides the millet hay, sorghum roughage and sudan straw in order to furnish enough feed for the livestock under normal conditions. The corn was not cut for fodder or stover. The cornstalks were left standing in the field. The straw from winter wheat and barley, and part of the millet grain straw was also left standing in the field after the grains were harvested with a combine harvester. Since this particular farmer owned a combine, since it is much cheaper to harvest



these grains with a combine than it is with a binder and a stationary thresher, and since it is advisable to have stubble and stalks on the land to stop the snow during the winter months and to prevent erosion of soil by wind, it is logical to expect that the result reported in the budget is approximately the thing which the farmer has practiced on this particular farm as far as these policies are concerned. A larger quantity of roughages was produced in the recommended system of farming than was produced in the normal system. It was estimated that if the farmer produced more roughage on his farm with no corresponding increase in concentrated feeds that he would produce additional beef cattle in order to utilize the additional roughage. This was done in the budgets. The numbers of livestock added are given in the table.

In table 14 is given a statement of the gross income from various sources as indicated, the amount of variable expenses for each item relating to crops and livestock, and the farm cash income from each source, and the total cash farm income for both the normal and recommended farming systems. As indicated in the table the income less variable expenses, or the farm cash income of the existing farming system, was \$2,463.52 in comparison with \$2,243.83 for the recommended farming system. An approximate loss of \$220.00 was sustained provided the recommended farming system was put into effect on this farm. As previously stated, this loss is a result of a change in the whole farming system which was in turn due to a change in the cropping system recommended on the basis of land utilization.

The remainder of the budgets were worked out according to the same general procedure. However, there is one item of importance which deserves consideration at this point relating to a comparison of the income between the normal and recommended systems for the 640, 1000 and 1440 acre farms. The problem is: How much feed would be furnished by that crop land shifted to pasture uses? No definite conclusions have been made relative to this problem. The situation was handled by assuming in one case that the new pasture land would furnish no feed for livestock and in the other case that the crop land shifted to pasture uses would furnish as much feed as the feed furnished by existing native or permanent pasture. The results of the former case are given in tables 16, 18 and 20. Comparisons of the incomes in the latter case are given in table 21.

In table 15 is given the statement of production for the 640 acre farm in area 12. There is a redistribution of acres of the different kinds of crops. One hundred ninety-nine acres of crop land was shifted to pasture use. The latter is evidenced by the reduction in the number of acres of crop land from 507 to 308 acres and by the increase in acres of pasture from 108 to 307 acres. No increase is made in the numbers of livestock in this budget as a result of the increase in the number of pasture acres because in this budget the additional pasture is considered to furnish no feed. The increase in the number of beef cattle occurred as a result of the recommendation for an increase in the number of acres of crop land for the production of millet hay and sorghum roughage. Some corn and fallow winter wheat was cut with a binder and threshed with a stationary thresher. This was done because the threshed wheat straw and stover was needed in order to have sufficient roughage to feed the normal numbers of livestock produced on this farm. It is also indicated in the table that the same acreage of corn and winter wheat was cut for roughage in the recommended system of farming as

Table 14.-- Gross income and variable expense statement of normal and recommended farming systems for a 328 acre farm in Phillips County, type of farming area 12, Colorado.

Item	Normal				Recommended			
	Bushels sold	Gross income	Variable expenses	Income less variable expenses	Bushels sold	Gross income	Variable expenses	Income less variable expense
<u>Crop</u>								
Corn for grain	11	\$ 7.15	\$ 26.65	\$ -19.50		\$	\$ 25.01	\$ -25.01
Winter wheat F NF 1/	933	746.40	113.62	632.78	1100	880.00	158.55	721.45
Oats	250	95.00	39.60	55.40				
Barley	587	293.50	48.40	245.10	80	40.00	33.28	6.72
Millet grain	260	130.00	50.25	79.75				
Millet hay			9.60	-9.60			33.28	-33.28
Sorghum roughage			8.90	-8.90			26.88	-26.88
Sudan for seed	47	70.50	10.62	59.88				
Beans					30.6 c	91.80	22.32	69.48
<b>Total</b>		1,342.55	307.64	1,034.92		1,011.80	299.32	712.48
<u>Livestock 2/</u>								
Horses			.48	-.48			.48	-.48
Milk cows		172.00	.60	171.40		172.00	.60	171.40
Dairy cattle		94.25	.26	93.99		94.25	.26	93.99
Other cattle						120.24	17.50	102.74
Eggs		880.88	111.48	769.40		880.88	111.48	769.40
Poultry		450.60	56.30	394.30		450.60	56.30	394.30
<b>Total</b>		1,597.73	169.12	1,428.61		1,717.97	186.62	1,531.35
<b>Total Crops and Livestock</b>		2,940.28	476.76	2,463.52 3/		2,729.77	485.94	2,243.83 3/

1/ F, fallow; NF, non-fallow.

2/ Depreciation and losses have been considered for all livestock except horses.

No veterinary expense has been included for any class of livestock.

3/ This income is the amount of cash the owner-operator receives for the rent of his land (real estate taxes), interest on investment, depreciation, personal taxes, wages as laborer and manager of the farm business, and for a few minor out of pocket expenses.

Table 15.-- Production statement of normal and recommended farming systems for a 640 acre farm in Logan County, type of farming area 12, Colorado.

Items	Normal		Recommended		Harvested roughage (tons)
	Acres or number	Grain (bu)	Acres or number	Grain (bu)	
<b>Crops</b>					
Corn for grain	192	3264	69	1173	Stover 18.75
Winter wheat F	70	1400	61	1220	Straw 20.25
" " NF	80	960	16	192	
Spring wheat	60	480			
Barley	8	32 1/2	31	558	Straw 1.3
Beans	10		8	32 1/2	54.25
Sorghum roughage			31		46.5
Millet hay			31		
Sudan hay	8				
Sudan pasture	9				
Fallow	70				
Total crop land	507		61		
Permanent pasture	108		308		
Waste land, roads, farmstead, etc.	25		307 1/2		
Total acres in farm	640		640		
<b>Livestock</b>					
Horses -- work	6	work	6	work	
saddle pony	1		1		
Dairy cattle -- cows	6	24,600	6	24,600	lbs. milk
heifers 2's	2	500	2	500	" gain
heifers 1's	3	750	3	750	" "
calves	5	2,000	5	2,000	" "
bull	1		1		
Range cattle -- cows	11		11		lbs. gain
2's	1		1		" "
1's	2		2		" "
calves	9		9		" "
Hogs -- sows to fattening	3	615	3	615	lbs. gain
spring pigs	15	3,300	15	3,300	" "
Poultry -- laying hens	150	1,200	150	1,200	doz. eggs
pullets to laying age	150	525	150	525	lbs. gain
broilers	188	470	188	470	" "

1/ Hundred pounds.  
 2/ It is considered that the 199 acres of additional pasture land has no value as feed in this budget.



was cut with the normal system. Only sufficient numbers of beef cows, heifers, and calves were added in order that the additional roughage produced would be consumed by livestock. Obviously, this kind of roughage would be fed on the farm in practice. The size of the other livestock enterprises remained the same.

In table 16 is given a comparative income statement of the 640 acre farm under the two systems of farming. The cash farm income for the normal system was \$3,703.87 in comparison with \$2,222.33 for the recommended system. No income was considered as received for the 199 acres of crop land shifted to pasture uses in the recommended system. The loss was \$1,482.00 provided the average yields and other rates were used as given in this study. This loss was due to the interworking of two variable factors--a reduction in the acres of crop land, and a redistribution of the acres of different crops upon the remaining crop land. Therefore in order to determine the effect of either one of the two factors upon the cash income of the farm it would be necessary to eliminate the effect of the other variable. Incidentally, it is reasonable to expect that the yields of the crop land shifted to pasture uses would not be as high as the average yield on the whole farm. This, of course, would apply to all farms where crop land is shifted to pasture according to recommendations given in this study.

Budget for type of farming area 13. The statement of production for the 1000 acre farm is given in table 17. This farm is a typical sand hill farm upon which a considerable acreage of crops was produced. A decrease of 142 acres in crop land was recommended. The distribution of crops was changed very little on the remaining crop land. The acreage of corn under the recommended system remained approximately 65 percent of the total crop acres in the recommended system as it did under the normal system. Sorghum roughage replaced sudan hay. Due to the reduction of acres of crop land it was no longer necessary to use as much power to cultivate the crops. This farmer had no tractor. The logical thing to do was to reduce the number of work horses from 8 to 6. Even then it was impossible to work each of the 6 horses as many hours with the new farm set-up as was performed by each of the 8 head of horses on the old set-up. It was considered, however, that the farmer would keep 6 head in order to utilize the available equipment and his own labor efficiently. Since less roughage feed was produced under the recommended system, it was necessary to reduce the number of milk cows from 12 to 10 and the heifers and calves in a like proportion as indicated in the table. In order to keep 10 cows it was necessary to cut some corn and feed the threshed stover. The size of the other livestock enterprises remained the same in both budgets.

The cash farm income for the normal farming system on the 1000 acre farm was \$1,798.88 in comparison with an income of \$921.13, provided the recommended system was used. (See table 18.) This is a loss of \$879.00. This loss was due almost entirely to a shift of 142 acres of crop land to pasture uses with no value figured for this pasture. The change in the relative proportion of crops in the recommended cropping system in comparison with normal is of minor significance. Therefore \$879.00 divided by 142 acres, or \$6.19 per acre, was the loss sustained per acre of crop land shifted when the pasture furnished no feed. Assuming that the pasture would eventually furnish feed equal to existing permanent pasture the loss would be \$6.19 less \$0.24 (the indirect value of pasture as feed in this area when



Table 17.- Production statement of normal and recommended farming systems for a 1000 acre farm in Washington County, type of farming area 13, Colorado.

Item	Normal		Recommended	
	Acres or number	Production	Acres or number	Production
<b>Crops</b>				
Corn for grain	150	2250	55	825
Sorghum roughage	65	81½	28	35
Sudan hay	10	12½		
Total crop land	225		83	
Permanent pasture	765		907 1/2	
Waste land, roads, farmstead, etc.	10		10	
Total acres in farm	1000		1000	
		Production Unit		Production Unit
<b>Livestock</b>				
Horses - work stock	8	work	6	work
unbroken	1		1	
Dairy cattle - cows	12	42,200 lbs. milk	10	41,000 lbs. milk
heifers 2's	4	1,000 lbs. gain	3	750 lbs. gain
heifers 1's	6	1,500 lbs. gain	5	1,250 " "
calves	10	4,000 " "	8	3,200 " "
bull	1		1	
Hogs - sows to fattening	3	615 lbs. gain	3	615 lbs. gain
spring pigs	15	3,300 " "	15	3,300 " "
Poultry - laying hens	50	400 doz. eggs	50	400 doz. eggs
pullets to laying age	50	175 lbs. gain.	50	175 lbs. gain
broilers	62	155 " "	62	155 " "

1/ It is considered that the 142 acres of additional pasture land has no value as feed in this budget.

Table 18.-- Gross income and variable expense statement of normal and recommended farming systems for a 1000 acre farm in Washington County, type of farming area 13, Colorado.

Item	Normal			Recommended		
	Bushels sold	Gross income	Variable expense	Bushels sold	Gross income	Variable expense
<u>Crop</u>						
Corn for grain	1356	\$881.00	\$196.50	444	\$ 28.60	\$ 57.20
Sorghum roughage			58.50			19.60
Sudan hay	12.5 T	75.00	12.00			
Total		956.00	267.00		28.60	76.80
<u>Livestock 1/</u>						
Horses			1.08			.84
Milk cows		410.50	1.44		344.00	1.20
Dairy cattle		370.50	1.16		295.75	.94
Hogs		293.60	36.36		293.60	36.36
Poultry		112.60	37.28		112.60	37.28
Total		1,187.20	77.32		1,045.95	76.62
Total crops and livestock		2,143.20	344.32		1,074.55	153.42
						921.13 2/ 3/

1/ Depreciation and losses have been considered for all livestock except horses.

No veterinary expense has been included for any class of livestock.

2/ This income is the amount of cash the owner-operator receives for the rent of his land (real estate taxes), interest on investment, depreciation, personal taxes, wages as laborer and manager of the farm business, and for a few minor out-of-pocket expenses.

3/ No income is received from the 142 acres of crop land shifted to pasture.

marketed through range cattle at the given rates on the basis of cash farm income) <sup>1/</sup> or \$5.95 per acre.

This change in method of operation reduces the net cash income on this farm to a point where the farmer would need more than 1000 acres handled in this manner to furnish an adequate income. It would be desirable to have at least 2000 acres, and 3000 would be even better for an adequate income.

Budget for type of farming area 14.— In table 19 is given the production statement for the 1440 acre farm in type of farming area 14. Thirty-six acres of crop land were shifted to pasture uses. Thus the crop acres were changed from 605 to 569, and pasture acreage changed from 741 to 777 acres. A redistribution of crop acres was also made as may be seen by inspection of the table. An increase in the production of roughage made it necessary to increase the numbers of beef cattle in order to consume the roughage. It is evident that it was necessary to cut considerable grain and corn with the binder and thresh the grain with a stationary thresher in order to have enough roughage to feed the normal numbers of livestock on this farm.

A comparison of the income of the two systems of farming is given in table 20. For example, the cash income for the 1440 acre farm was normally \$3,839.82 and the amount of income for the recommended system was \$3,487.14. This is a loss of \$353.00. This loss was due to the same two factors as given in the discussion of the 640 acre farm.

A summary of the cash income for the four farms in the type of farming areas studied is given in table 21.

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<sup>1/</sup> See discussion of table 21.

Table 19.-- Production statement of normal and recommended farming systems for a 1440 acre farm in Washington County, type of farming area 14, Colorado.

Item	Normal			Recommended		
	Acres or number	Production Grain (bu)	Production Harvested roughage (tons)	Acres or number	Production Grain (bu)	Production Harvested roughage (tons)
<b>Crops</b>						
Corn for grain	200	3,000	Stover 50½	136.5	2,047½	Stover 50½
Winter wheat F	80	1,200	Straw 60	57	855	Straw 42 3/4
" NF				103	927	
Spring wheat	60	360				
Barley	80	1,120	Straw 40	64	896	Straw 32
Millet grain	30	420	" 22½	30	420	" 22½
Sorghum grain	30	300	" 22½			
Beans						
Millet hay	20	20	20	23.5	82½ 1/	" 4
Sorghum roughage	25	31½	31½	32		32
Fallow	80			66		82½
Total crop land	605			57		
Permanent pasture	741			569		
Waste land, roads, farmstead, etc.	94			777 2/		
Total acres in farm	1440			1440		
<b>Livestock</b>						
Horses -- work stock	10					
Dairy cattle -- cows	8	32,800	lbs. milk	10	work	lbs. milk
" heifers 2's	1	250	" gain	8	32,800	" gain
" heifers 1's	1	250	" "	1	250	" "
" calves	6	2,400	" "	1	250	" "
" bulls	2			6	2,400	" "
Range cattle -- cows				2		
" 1's				3		
" calves				1	225	lbs. gain
Hogs -- sows to fattening	5	1,025	lbs. gain	1	1,150	" "
" spring pigs	25	5,500	" "	3	1,025	" "
" boar	1			5	5,500	" "
Poultry -- laying hens	150	1,200	doz. eggs	1	1,200	doz. eggs
" pullets to laying age	150	525	lbs. gain	150	525	lbs. gain
" broilers	188	470	" "	188	470	" "
1/ hundred pounds						

1/ It is considered that the 36 acres additional pasture land has no value as feed in this budget.  
2/

Table 20. Gross income and variable expense statement of normal and recommended farming systems for a 1440 acre farm in Washington County, type of farming area 14, Colorado.

Item	Normal				Recommended			
	Bushels sold	Gross income	Variable expenses	Income less variable expenses	Bushels sold	Gross income	Variable expenses	Income less variable expenses
<u>Crop</u>								
Corn for grain and stover	2006	\$1,303.90	\$ 332.00	\$ 971.90	1060	\$ 688.68	\$ 202.02	\$ 486.66
Winter wheat F 1/	1052	841.60	321.60	520.00	724	579.20	241.68	337.52
Spring wheat	315	252.00	78.60	173.40	688	344.00	138.88	205.12
Barley	892	446.00	156.00	290.00	389	194.50	65.10	129.40
Millet grain	395	197.50	58.50	139.00			41.92	41.92
Millet hay			21.80	-21.80				
Sorghum grain	294	147.00	57.30	89.70			93.06	93.06
Sorghum roughage			26.75	-26.75			134.93	545.07
Winter wheat NF 1/					850	680.00	71.91	162.84
Beans					78c	234.75		
Total		3,188.00	1,052.55	2,135.45		2,721.13	989.50	1,731.63
<u>Livestock 2/</u>								
Horses			1.20	-1.20			1.20	-1.20
Milk cows		277.50	.96	276.54		277.50	.96	276.54
Dairy cattle		162.50	.30	162.20		162.50	.30	162.20
Other cattle		654.87	110.24	544.63		714.99	119.22	595.77
Hogs		489.38	63.00	426.38		489.38	63.00	426.38
Poultry		338.04	42.22	295.82		338.04	42.22	295.82
Total		1,922.29	217.92	1,704.37		1,982.41	226.90	1,755.51
Total crops and livestock		5,110.29	1,270.47	3,839.82 3/		4,703.54	1,216.40	3,487.14 3/ 4/

1/ F, fallow; NF, non-fallow.

2/ Depreciation and losses have been considered for all livestock except horses.

No veterinary expense has been included for any class of livestock.

3/ This income is the amount of cash the owner-operator receives for the rent of his land (real estate taxes), interest on investment, depreciation, personal taxes, wages as laborer and manager of the farm business, and for a few minor out-of-pocket expenses.

4/ No income is received from the 36 acres of crop land shifted to pasture.

Table 21.-- Summary of cash income on four farms in type of farming areas 12, 13 and 14, Colorado.

Type of farming area	Size of farm	Normal farming system	Gross income less certain variable expenses on farms with Recommended systems of farming	
			1/	2/
12	328	\$2,464	\$2,244	\$2,244
12	640	3,704	2,222	2,310
13	1000	1,799	921	955
14	1440	3,840	3,487	3,498

1/ Assuming that the acreage of crop land shifted to pasture furnishes no feed for livestock.

2/ Assuming that the acreage of crop land shifted to pasture furnishes the same quantity of feed per acre for livestock as existing permanent pasture. The imputed value of an acre of pasture was \$0.44, \$0.24, and \$0.31 for areas 12, 13 and 14 respectively, determined as follows: On the 1440-acre farm, area 14, it requires 1040 acres of pasture and 91 tons of roughage, 5200 pounds of cottonseed cake, and 624 pounds of salt to produce 10,075 pounds of beef for sale annually or, at \$6.50 per 100 pounds, \$654.87 worth of beef. After deducting \$110.24, the cost of the commercial feeds, there was left \$544.63.

The feed from the pasture and roughage on this farm amounts to 2,488 feed units on the basis that there were 1.43 feed units in an acre of pasture in area 14 (30 feed units for 6 months pasture season divided by 21, the acres required for 1 animal unit for 6 months) and on the basis of 1 ton of the roughage being equivalent to 11 feed units. It was assumed that each feed unit of roughage, either as feed from pasture or from harvested roughages contributed equally to the income of beef cattle and, in this case, received a proportionate share. Thus  $\$544.63 \div 2488 = \$0.22$ , the value of each feed unit. Since the feed from one acre of pasture furnished 1.43 feed units of roughage, one acre of pasture would be worth  $.22 \times 1.43 = \$0.31$  in area 12. The value of pasture in the other areas depended upon their relative carrying capacity in comparison with pasture in area 14.

(Colo. Sta. Bul. 327, page 50, shows that the net return per acre for the use of land on cattle ranches in eastern Colorado in 1922-25 was 10¢ per acre. If the sales shown in bulletin 327 are adjusted to the price level used in this study the net return per acre for use of land would be approximately 33¢.)



The only additional information given in this table is the cash income of each farm when the acreage of crop land shifted to pasture is considered to furnish the same quantity of feed as existing permanent pasture. The increase in income on the 328, 640, 1000 and 1440 acre farms are \$0.00, \$88.00, \$34.00 and \$11.00 for diverting 0, 199, 142 and 36 acres of crop land to pasture, respectively. The additional income made up a very small percent of the total income of the farms and depended upon the relative value of an acre of pasture as shown above. It was estimated that the roughage feed from this additional pasture on the 640, 1000 and 1440 acre farms would support approximately 7, 3, and 1 animal units per year respectively. Additional commercial feeds would be needed in order to maintain these additional units of livestock.

Summary of budgets.— Summarizing these four farms, the reduction in income by adoption of changes in use of land, when shown in relation to the areas adjusted, resulted in from \$6.28 to \$9.81 loss of income for each acre so adjusted (based, of course, upon the uniform yields and prices assumed in the analysis). This compares with a possible net crop income above variable expense from \$6.15 to \$8.88 per acre for the four farms.

This raises a pertinent question. Will it pay to adopt changes in use of land when the purpose of these changes is the maintenance of yields that otherwise would decrease? The answer might be found in the possible new uses for this land. The data in table 21 show that livestock will add 24 to 44 cents per acre of permanent pasture, depending upon intensity of stocking in the three type of farming areas, 12, 13 and 14. That apparently will not pay the bill for reseeding pasture nor offset an annual loss of \$6.28 to \$9.81 per acre for the lands shifted out of crops.

How about annual pasture plants? The farmers interviewed reported that they used 1.03 acres of grain pasture per cow month, and 3.5 acres of sudan pasture per cow month. Experimental data indicate that one acre of grain pasture or one-half acre of sudan pasture should carry a cow one month in years of average rainfall.

Using these pasture rates and the feed requirements as given in table 11 it would require approximately 6.7 acres of land to grow roughage or sudan and grain pasture for one beef cow and her calf till 6 months of age. With an 80 percent calf crop this would result in approximately \$19 income from the sale of beef. Protein concentrates purchased would reduce this to approximately \$16.50 which would mean \$2.45 per acre income from using this land primarily for annual pasture plants, with some added sorghum roughage. This is \$2 more per acre than the income from native pasture grasses under the conditions used in the budgets.

Apparently annual pastures will bring in more income than to return the crop land to permanent pastures. There will be, however, the added cost of seeding these annual pastures. The variable rates shown in table 10 would indicate that approximately \$1 per acre would cover this seeding charge. This would give a net of approximately \$1.50 from annual pasture.

Is it wise to advocate a change to more permanent pasture? This is the chief point at issue. Here we deal with some unknowns. For instance,

how many years before present crop yields would drop materially, due to unwise soil handling? What is the cause of reduced yields? Is it due to a loss of organic matter in the soil? or to a lack of moisture? or to loss of the top soil from blowing?

Experimental studies furnish some clues to the answers. So far as continuous records at the Akron Experiment Station for 25 to 30 years can be used as a guide, this seems to be true, i.e., that moisture is the most critical factor in crop yields. Where crops are rotated to permit grain stubble to help hold winter snows and check soil blowing; and where fallow is used to increase soil nitrogen through bacterial action; and where row crops are grown to help destroy weeds; and where sorghums are followed by late planted crops the next spring to permit a bacterial correction of soil toxins associated with sorghum growth; where these conditions (together with strip cropping) are present there is little evidence that the organic content is being lost or that soil blowing is serious. These tested and tried dry land practices will maintain yields if moisture is available. It would seem, then, that the need in this area is for a wider acceptance of the experience and studies in soil control. If this is done there will be little need for a reduction of crop acreage.

But, as one goes south or west from this northeast Colorado area, the average rainfall is less. Here the problem is more serious. Prevention of soil blowing is more difficult.

Certainly it would be a fine thing if there were more grazing land within the area. But now that it has been plowed up, there is no direct evidence that a farmer on a definite area can improve his income by restoring some crop land to sod. If such proves to be a desirable national policy, he must either increase his size of farm and secure average adjustment in land values and tax burdens to permit carrying a larger area of low income land or some agency must pay him for his financial sacrifice.

In fact, unless positive restrictions are enforced, the area of crop land in northeast Colorado will tend to increase rather than decrease in future years.

The "off the record" attitude of farmers in this area seems to be that they would have very little fallow or strip cropping if no government payments were available. Since these practices are important in maintaining productivity or reducing wind erosion, it would appear necessary to continue some method of rewarding a farmer for their use or penalizing him for failure to follow such practices.

Relation of budgets to yields.— In all these comparisons "average yields" are assumed. This for the obvious reason that they are the only data available. What is needed is a record of yields on the different soil types within the area. For example, what are the yields upon those soils which the Soil Conservation Service favor taking out of crop? Are they lower than upon adjacent more favored soils? If yields are low upon these soils poorly adapted to crops, then the removal of these soils from cropping would not cut the farm incomes as much as assumed in the above discussion. Here our analysis is checked by a lack of reliable data.

If the acreage yields and prices used in the budget result in a crop production worth approximately from \$6.15 to \$8.88 per acre for all crops (see previous comment), then a yield of one-fourth the "normal" would cut crop values to approximately \$1.50 to \$2.25 per acre. This is slightly below the \$2.45 per acre value of annual pastures for use for beef production. It is doubtful whether yields on these poorer soils would fall as low as to one-fourth of the normal.

This would indicate that very low crop yields would be necessary before crop values per acre would fall below the values secured from the use of these lands for pasture.

However, this comparison is deceptive. Which will offer greater security of income - cash crops or livestock production? Here again, this study does not have adequate data for an answer. The cash-grain farmer who follows soil conserving practices, who builds a cash reserve, and who does not plant when soil moisture is too low to indicate a crop (see Kansas Bul. 273) will succeed over a period of years if one may judge from a study of men within the area. But will the "average farmer" do better with more forage crops and livestock?

#### Adaptation of These Budgets to a Wider Area

Considerable caution should be exercised in attempting to apply the detailed analysis of these four farms to conditions either within the type of farming areas from which they were selected or to county-wide areas. The type of farming areas do not coincide with county lines, nor do the precinct boundaries, for which data from the 1935 census are available, conform to the type of farming boundaries.

Handicapped by these limitations these budgets are of value primarily in showing the effect upon individual farms, other things remaining approximately unchanged, of a reduction in crop land. The analysis of each individual farm showed for that farm the reduction in net income resulting from a changed cropping system. This reduction was from 24¢ to \$2.31 per acre for the entire farm area and for the total of the four farms amounted to 86¢ per acre. These figures cannot be applied definitely to any farms except the ones analyzed, but they do offer a rough check upon the needed payments within the area. For example, a 320-acre farm might need from \$77.00 to \$740 payment, depending upon whether 24¢ or \$2.31 per acre was needed to cover reduced income.

Preliminary data compiled by the Colorado Extension Service as of mid-April 1937 show that average payments per farm within the three counties of Logan, Phillips and Washington vary from \$130 to \$282. This would indicate that the 1936 program has, to a substantial degree, paid farmers for lost income due to changes in their cropping practice.

How representative are these four farms? Tables 1, 5 and 6 show the percentage of farm land in crop land for all farms studied in 1936 by counties, for each of the three counties from the 1930 census, and for sample precincts from the 1935 census for the three types of farming areas.

The two farms used for study in type of farming area 12 had 79 and

84 percent of their total land area in crop land. Table 6 shows 75.9 percent for the sample 1935 census precincts.

The farm selected in area 13 had 22.5 percent of its land in crops, the 1935 census data in table 6 showed 26.8 percent of the farm land in crops.

The farm selected in area 14 had 42.5 percent of its area in crop land. Table 6 shows 43.2 percent for the sample precincts in area 14.

These individual farms came as close to "normal" conditions as could be hoped for, consequently one would be justified in assuming a somewhat similar change if Soil Conservation Service recommendations for reduced crop land were applied over a wider area.

In fact the Soil Conservation Service recommendations applied to all farms for which map data are available in type of farming area 12 show that 83 percent of the land was in crop and that this should be reduced to 77.3 percent. For area 13 the crop land percentage mapped was 28.1 percent and the Soil Conservation Service advised that this be reduced to 9.4. For area 14 the farms mapped had 45.2 percent of their land in crops. The Soil Conservation Service cut this to 37.4 percent.

No data were secured for individual farms in any other county of eastern Colorado. It would be unwise to assume that the changes advised within Logan, Phillips and Washington counties should apply over the entire eastern Colorado area.

However, it might be said that the changes advocated in 1936 are close to the general recommendations made in 1935 for these same counties. It seems reasonable to assume that a similar agreement might result if data were available for other counties. On that assumption one might conclude that the 1936 study, to a considerable degree, indicates that the 1935 adjustments were in the right direction, although it is impossible to say that they are exact. That is a matter that depends upon conditions upon individual farms.

The problem of the individual farm.— The problem of adaptation of these recommendations can be emphasized by considering the 1937 soil conservation program relative to payments necessary to induce farmers to follow a sound soil conservation program. The following table, No. 22, indicates the variations in the percentage of crop land which should be diverted to pasture land on individual farms according to recommendations given in this study.

In type of farming area 12 only one of the farms needs to have more than 11 percent of its crop land returned to permanent pasture. On that farm 49 percent of the present crop land should not be cultivated. The two farms mapped in area 13 need to have 56 and 83 percent of the crop land on each farm put back to pasture. In area 14 the percents are 1, 19 and 29. In other words, there is a wide variation in the methods by which each individual farm should be organized and managed in order to follow sound soil conservation practices.

Table 22.-- The percent of crop land and of an assumed depleting crop base which should be diverted to permanent pasture on individual farms in type of farming areas 12, 13, 14, Colorado, 1936.

Type of farming area	(1) Farm No. (Survey No.)	(2) Acres in crops	(3) Depleting base provided it is equal to 85% of the acres in crops.	(4) Acres of crop land and idle crop land which should be in pasture.	(5) Assuming 85% of crop land as base (Percent Col. 4 is of col. 3)	(6) Assuming all crop land as base (Percent Col. 4 is of col. 2)
Area 12	P6	511.7	434.9	33.6	7.7	6.6
	P11	896.9	762.4	87.5	11.5	9.8
	P13	845.0	718.2	---	---	---
	P20	379.6	322.7	.6	.2	.2
	P21	540.0	459.0	28.0	6.1	5.2
	P23	232.2	197.4	26.0	13.2	11.2
	P22	283.6	241.1	---	---	---
	P14	943.8	802.2	13.2	1.6	1.4
Area 13	L6	598.6	508.8	23.0	4.5	3.8
	L4	1099.2	934.3	41.2	4.4	3.7
	L17	547.5	465.4	269.2	57.8	49.2
	L7	807.8	686.6	3.3	.5	.4
Average	640.5	544.4	43.8	8.0	6.8	
Area 13	W2	200.6	170.5	112.9	66.2	56.3
	P15	125.4	106.6	103.7	97.3	82.7
Average	163.0	138.6	108.3	78.2	66.4	
Area 14	W16	663.8	564.2	8.9	1.6	1.3
	W4	807.0	686.0	152.7	22.3	18.9
	W23	806.4	685.4	233.0	34.0	28.9
Average	759.1	645.2	131.5	20.4	17.3	

A sound soil conservation program should be elastic enough to take care of such circumstances and induce farmers to put this land back to pasture. It is quite probable that since diversion payments in the 1937 farm program cannot be made on acres diverted in excess of 15 percent of the soil depleting base, and since soil building allowance payments are not high enough to offset the decrease in income lost by diverting the crop land to pasture plus the additional expense involved in making the shift, that farmers will not put all the recommended acreage back to pasture. It is not suggested that farmers be paid as high a rate of payment for diverting those crop acres above 15 percent of their depleting base as is now offered for the first 15 percent diverted, provided the present payments induce farmers, who are farming the better farm lands, to qualify for maximum diversion payments. The reasons would follow in sequence as follows: (1) Land which should go back to pasture is land which is not as productive as adjoining land on the farm, (2) there is a tendency in any farm program for local appraisers to give the poorer lands a higher productivity index number than the land should have in comparison with the better lands in the area, (3) thus if existing benefit payment rates are high enough to induce farmers to divert acres of the better lands to other uses it would not require as high rates to induce farmers to make recommended diversions on the poorer lands.

Further study would be needed on this particular problem provided such cases as these should be dealt with on a more detailed individual farm basis. The problem of making it possible for the individual farmer to continue to have the proper size of farming unit necessary for the efficient production of farm products should be considered in the study.

1935 Recommendations as to livestock.-- The 1935 regional adjustment study made no positive recommendation as to changes which should be made in numbers of livestock, the reason being that for the state as a whole the feed and livestock were in reasonable balance. The report did state "For western Colorado the 11 years, 1924 to 1934 inclusive, show that the numbers of livestock were 116 percent of the available feed....while in eastern Colorado the numbers of livestock were 94 percent of the number that could be fed." Data as to intercounty and interstate movement of livestock and feed were not available in sufficient detail to justify a positive recommendation as to changes in livestock. Much of the apparent surplus of feed in eastern Colorado was used up by such movement. Some reduction of livestock was needed in western Colorado, but the actual shift might be less than indicated by the preliminary data of the 1935 study.

This study has had access to more complete data, through cooperation with the National Forest Service and the Grazing Administration, hence the recommendation given on page 2, that livestock numbers in northwestern Colorado should be reduced 23.5 percent.

The four farms studied in detail within this report show that livestock on those four farms can be increased to 118.8 percent of the normal numbers on those farms. This could not be taken as a safe guide to the entire eastern Colorado area without more data than are available for this report. Both these shifts agree in their trend with the general statement of the 1935 regional adjustment study.

Comparison with County Planning Committee report.-- "Table IV, Distribution of land use among selected uses, western wheat regions, 1929 and

recommended", contains a summary of recommendations by the county planning committees. Any one who was familiar with the procedure followed by the county planning committee meeting in 1936 would recognize this procedure as being responsible for differences between their conclusions as compared to the regional adjustment study. Farmers think in terms of their own farm and of the land under plow and of the necessity for making the best use of such lands. Frequently this would mean little or no change in total crop area on their farms.

The regional adjustment study did not consider the individual farm, but applied data and opinions of research and extension workers to the 1926-27 Geological Survey classification of land and to the 1930 census, with the objective of showing what should be the goal of land use over a long period of time. Farmers did not have access to these data, and had not thought of their farms from an impersonal, long-time viewpoint.

For example, the county planning committees advised 1 percent reduction in the crop area for U. S. Bureau of Crop and Livestock Estimates district 6. The summary of the 1935 project advised an 8 percent reduction. These percentages for areas as large as crop reporting districts hide variations that exist within the area. Furthermore, the county committees dealt with counties as a whole, while the regional adjustment study broke counties down into first, second and third grade dry farming lands and the proper use of each.

Farmers think in terms of money income. The theoretical changes advised in 1935 were not made in terms of money income, but as related to a long-time desirable use of land for the area. It would be difficult to find agreement between these diverse viewpoints. The county planning committee recommendations, however, show one interesting condition, namely, that farmers will not recommend a change in their cropping system unless forced to or promised a payment for the change.

### Conclusions

It is apparent that part of the difficulties in dry land farming is due to an unwise use of land. Trained observers are in essential agreement as to the need for improved practices or for a return of some lands to grazing. Special problems exist on each individual farm. There is no one program that will fit all cases. One experienced dry land farmer says, "We must be continuously learning and adopting other ideas and practices that mean better farming. Every year is different and brings new problems and trials which must be met as they arise. These variable conditions which must be met individually are the basis of my belief that a person never learns how to farm for wheat in this country. You must keep on learning."

It would seem desirable to adjust the cropping system so as to increase the stability of income and to aid in conserving soil and moisture. This may mean a reduction in cash crops and an increase in feed crops and in numbers of livestock. Or it may involve nothing more complicated than the adoption of improved methods of farming.

There is need for a continuous study of dry land agriculture and the effects of change in practice to aid in developing a more permanent type of farming and to learn the social costs of such a development.

Appendix

Constant reference throughout this report to the 1935 regional adjustment study makes it seem desirable to repeat some of the tabulations which summarized the 1935 analysis. Table 23 gives in parallel columns, for Logan, Phillips and Washington counties, the 1930 census data of dryland crops and the adjusted area from the 1935 study. Then the original census area of irrigated crops are added to give a total recommended arcp area for each county.

Table 24 is a similar analysis for the three crop reporting districts of eastern Colorado.

Table 25 compares the practice as to sale of crops for all farms included in the study in each of the three type of farming areas. Also the percentage of "normal" production sold under existing systems on the four individual farms used for budgets; and the percentage of production to be sold on each farm when the recommended cropping system was followed.



Table 23.—Dry land crop areas in Colorado: Logan, Phillips and Washington counties, adjusted on 1929 figures.

Crops	Logan County			Phillips County		
	Dry		Irrigated 1929 area	1929		adjusted area
	1929 area	adjusted area		area	adjusted area	
Wheat	123,247	72,150	1,717	73,867	124,505	69,585
Oats	4,549		3,360	3,360	9,995	
Barley	47,661	28,860	14,079	42,939	27,836	27,834
Corn	85,504	63,492	3,346	66,838	72,736	61,235
Grain sorghum	9,449		47	47	6,595	
Forage sorghum		28,860		28,860		27,834
Potatoes	638	638	316	954	203	203
Dry beans	6,040	8,657	893	9,550	968	8,351
Alfalfa	2,496	2,496	23,101	25,597	573	573
Tame grass	3,096	3,096	541	3,637	4,279	4,279
Small grain hay	1,981		113	113	697	
All other hay	28	28		28	44	44
Sweet clover	982	982		982	165	165
Hog millet						
Millet hay		28,860		28,860		27,834
Wild grass	6,688	6,688	6,705	13,393	187	187
Sub-total	292,359	244,807	54,218	299,025	248,783	228,124
Minor crops	7,520	3,073	15,219	18,292	4,577	1,208
Total dry (or irr.) crops	299,879	247,880	69,437	317,317	253,360	229,332
Fallow	28,990	57,720			16,313	55,668
Crop failure	79,557				15,961	
Total dry land area	408,426	305,660		285,634		285,000
Irrigated crops	69,437	69,437		(1)	(1)	(1)
Total crop land	477,863	375,097		285,634		285,000

(1) No irrigated crops reported.

Table 23.- Continued

Crops	Washington County			
	Dry		Irrigated 1929 area	Total irrigated plus adjusted dry area
	1929 area	1929 adjusted area		
Wheat	109,686	96,814	253	97,097
Oats	4,135		198	198
Barley	52,836	38,703	1,773	40,476
Corn	132,835	82,567	919	83,486
Grain sorghum	18,039		22	22
Forage sorghum		39,950		39,950
Potatoes	374	374	23	397
Dry beans	14,545	14,191	125	14,316
Alfalfa	1,884	1,884	1,657	3,541
Tame grass	9,214	9,214	28	9,242
Small grain hay	5,754			
All other hay	179	179		179
Sweet clover	137	137		137
Hog millet		18,062		18,062
Millet hay		19,309		19,309
Wild grass	10,151	10,151		10,151
Sub-total	359,767	331,565	4,998	336,563
Minor crops	10,092	4,582	1,434	6,116
Total dry (or irr.) crops	369,859	336,247	6,432	342,679
Fallow	46,908	34,403		
Crop failure	138,955			
Total dry land area	555,722	370,650		
Irrigated crops	6,432	6,432		
Total crop land	562,154	377,082		

Table 24.-- Irrigated and dryland crop areas in Colorado crop reporting districts 2, 6, and 9, adjusted on 1929 figures.

Crops	District 2				District 6				Total irrigated plus adjusted dry area
	Dry		Irrigated		Dry		Irrigated		
	1929 area	1929 adjusted area	1929 area	1929 adjusted area	1929 area	1929 adjusted area	1929 area	1929 adjusted area	
Wheat	434,690	157,659	76,637	234,296	779,266	501,882	15,351	517,233	
Oats	21,213		29,301	29,301	52,175	18,511	3,276	21,787	
Barley	137,116	75,817	98,189	174,006	267,900	178,626	8,117	186,743	
Corn	268,727	160,418	46,552	206,970	963,429	374,293	6,503	380,796	
Grain sorghum	26,616		971	971	152,203	220,806	192	220,998	
Forage sorghum		91,757		91,757		198,147		198,147	
Potatoes	2,847	2,847	24,029	26,876	3,302	3,302	344	3,646	
Dry beans	67,412	21,153	17,705	38,858	202,235	90,673	959	91,632	
Alfalfa	18,838	18,838	217,202	236,040	39,029	39,029	35,224	74,253	
Tame grass	16,416	16,416	10,247	26,663	36,208	36,208	1,275	37,483	
Small grain hay	13,012		2,058	2,058	46,872		854	47,726	
All other hay	156	156	311	467	622	622		622	
Sweet clover	6,455	6,455		6,455	3,048	3,048		3,048	
Hog millet	31,884	31,884		31,884	36,573	36,573		36,573	
Millet hay	67,842	67,842		67,842	103,904	103,904		103,904	
Wild grass		30,430	18,413	48,843	41,859	41,859	2,710	44,569	
Broom Corn	30,430								
Sub-total	1,043,928	681,672	541,615	1,223,287	2,588,148	1,847,483	74,805	1,922,288	
Minor crops	34,403	14,901	171,756	186,657	68,018	18,953	20,779	39,732	
Total dry land (or. irr.)	1,078,331	696,573	713,371	1,409,944	2,656,166	1,866,436	95,584	1,962,020	
Fallow	197,002	105,427			314,090	244,314			
Crop failure	208,633				527,318				
Total dry land area	1,483,966	862,000			3,497,574	2,110,750			
Irrigated crops	713,371	713,371			95,584	95,584			
Total crop land	2,197,337	1,575,371			3,593,158	2,206,334			

Table 24, ---Continued

Crops	District 9			
	Dry		Irrigated 1929 area	Total irrigated plus adjusted dry area
	1929 area	1929 adjusted area		
Wheat	118,824	41,138	18,257	59,395
Oats	4,993		9,303	9,303
Barley	25,018	15,024	21,744	36,768
Corn	154,306	39,110	60,694	99,804
Grain sorghum	94,219	82,406	4,275	86,681
Forage sorghum		35,655		35,655
Potatoes	1,864	1,864	269	2,133
Dry beans	52,792	9,813	10,868	20,681
Alfalfa	7,272	7,272	163,636	170,908
Tame grass	3,781	3,781	23,862	27,643
Small grain hay	6,567		2,054	2,054
All other hay	98	98	440	538
Sweet clover	2,363	2,363		2,363
Big millet				
Millet hay		13,336		13,336
Wild grass	3,453	3,453	5,644	9,097
Broom corn		3,861		3,861
Sub-total	475,550	259,174	321,046	580,220
Minor crops	69,805	6,345	78,392	84,737
Total dry land (or irr.) crops	545,355	265,519	399,438	664,957
Fallow	195,556	35,284		
Crop failure	84,749			
Total dry land area	825,660	300,803		
Irrigated crops	399,438	399,438		
Total crop land	1,225,098	700,241		

Table 25.-- Percent of total production of indicated crops sold, type of farming areas 12, 13 and 14, Colorado.

Crop	Percent of normal pro- duction sold from farms			Percent of production sold from farms which were budgeted			Existing farming systems			Recommended farming systems		
	in areas			in areas			in areas			in areas		
	12	13	14	12	13	14	12	13	14	12	13	14
No. of farms	46	15	5	1	1	1	1	1	1	1	1	1
Corn	38.4	16.8	2.5	1.0	76.2	60.3	66.9	---	35.1	5.3	51.7	
Winter wheat	78.4	83.7	64.8	84.2	90.2	---	87.7	---	86.8	---	84.7	
Spring wheat	83.1	75.9	83.5	---	90.6	---	87.5	---	---	---	91.7	
Oats	13.8	---	---	62.5	---	---	---	---	---	---	---	
Barley	16.4	4.7	24.6	81.5	---	---	79.6	---	16.2	---	76.8	
Rye	6.5	46.6	---	---	---	---	---	---	---	---	---	
Beans	88.2	96.1	88.4	---	95.8	---	---	---	95.6	---	95.1	
Potatoes	50.0	---	---	---	---	---	---	---	---	---	---	
Millet grain	48.6	66.3	---	61.2	---	---	94.0	---	---	---	92.6	
Sudan seed	100.0	100.0	---	97.9	---	---	---	---	---	---	---	
Alfalfa hay	71.4	---	---	---	---	---	---	---	---	---	---	
Oat hay	60.0	---	---	---	---	---	---	---	---	---	---	
Sudan hay	---	---	---	---	---	100.0	---	---	---	---	---	
Sorghum grain	---	---	---	---	---	---	98.0	---	---	---	---	