

POTENTIAL FOR AGRICULTURAL ADJUSTMENT AND DEVELOPMENT IN THE OUACHITA HIGHLANDS OF OKLAHOMA

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Potential for Agricultural Adjustment and Development in the Ouachita Highlands of Oklahoma

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The Ouachita Highlands of Oklahoma comprises parts or all of the counties of Atoka, Haskell, Latimer, LeFlore, McCurtain, Pittsburg and Pushmataha (Fig. 1). With the exception of Haskell county, this area is classed by the United States Department of Agriculture as one with "seriously" low incomes of rural people in 1954.¹ Low incomes of rural people in the Ouachita Highlands are not of recent origin. The area is one of many in the South that has been by-passed by the main streams of agricultural and general economic development during the past several decades.

Research was initiated in 1956 for the purposes of gaining an understanding of the economic problems of rural people in the area and of evaluating their opportunities for agricultural adjustment and development. The research was limited to Latimer County, but the results apply to much of the Ouachita Highlands area.

Sources of Data and Methods of Research

A survey of 153 rural households in Latimer County was taken in 1956. Information obtained from these households included sources and amounts of income, land and other resources for agricultural production, how resources were used, population characteristics, and attitudes of the farm operators about adjustments and investments to increase farm income and about non-farm employment.

A survey of agricultural leaders in the Ouachita Highland area and in other counties of Eastern Oklahoma was made during 1957 and

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¹*Development of Agriculture's Human Resources*, U. S. Government Printing Office, House Document No. 149, Washington, 1955. Three additional counties in Oklahoma classed as "seriously" low in incomes of rural people were Adair, Cherokee, and Delaware.

Research reported herein was done under Oklahoma Station Project 915.

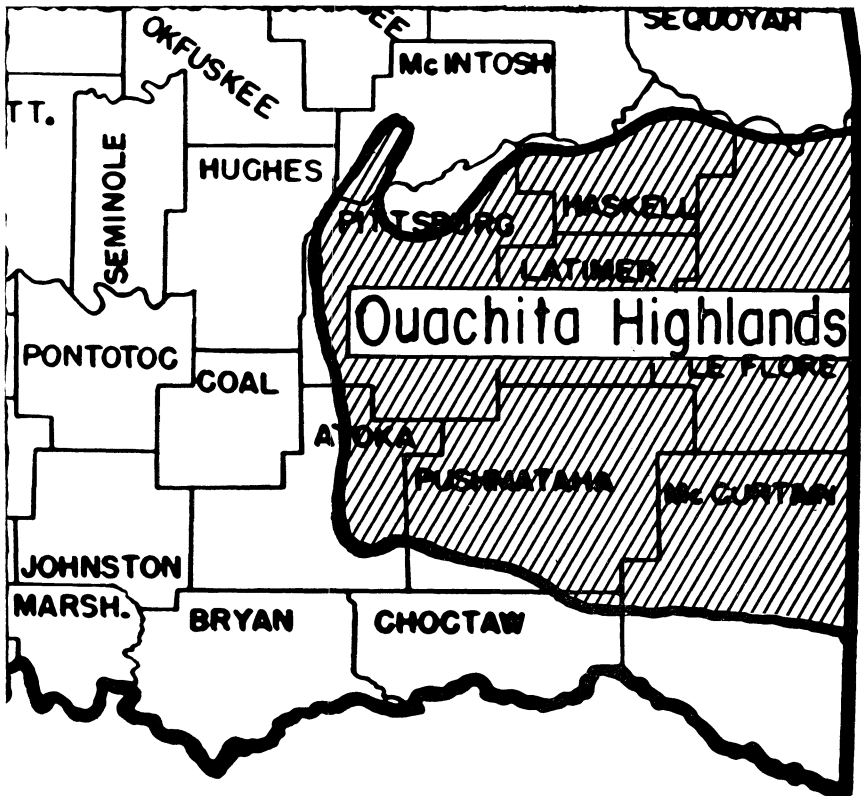


Figure 1. Location of the Ouachita Highlands in Oklahoma—Area of the Study.

1958 for the purposes of obtaining estimates of producing practices, crop yields, and output of livestock. The leaders providing input-output estimates for the study were county agents, Soil Conservation Service technicians, and Farmers Home Administration supervisors. The data obtained from these local agricultural leaders were supplemented by estimates provided by Oklahoma State University agricultural scientists and by experimental data from the field stations at Colgate, Heavener, and Idabel.

Farm product and input prices used in the study were obtained from the survey records of Latimer County households, from retailers of farm production supplies in the area, and from secondary sources. Generally, the farm product prices used apply to the period 1951-58. An exception was the price used for corn; since the trend in corn prices in the State during the period was downward, the lowest of the annual average prices per bushel received in the period by Oklahoma farmers was assumed to be reasonable as an expected future price.

Estimates of agricultural adjustment and development opportunities were obtained by linear programming analysis. These estimates were limited to beef cattle, feed crop systems of farming.

The Problem Situation

The agricultural economy of Latimer County has experienced a transition during the past years from a subsistence agriculture of predominantly row crop production, principally corn and cotton, to predominantly small scale beef cattle and extensive feed crop enterprises. It has never been an economy of large scale commercial farms, and the situation may best be described as a lack of agricultural development consistent with developments in the major agricultural regions of the nation. This lack of development, accompanied by limited non-farm employment opportunities in the local area, largely accounts for the present relatively low income of rural households in Latimer County. The characteristics of the present economic situation, including incomes, population problems, and resources, have to be considered in any study of potential for agricultural adjustment and development. These characteristics as presented in this bulletin are based upon conditions during 1955-56 as determined from the information obtained in the rural survey of Latimer County.

Sources and Amounts of Income

A classification of the 153 rural households was developed to facilitate meaningful tabulations of income and other data from the survey. The first division of the households was between farm and non-farm. A farm household was defined as one whose members participated in some farming activity and the residence included ten or more acres of land. By this definition, there were 68 farm households in the sample and 85 non-farm households (Table 1).

The farm households were separated into part-time and full-time farmers on the basis of income of more or less than \$800 from off-own-farm work by the family during 1955. The average wage rate for off-farm work by the farm operators was about \$8 per day; thus, as defined, part-time farm families were those with about 100 or more operator-equivalent days of off-farm work during the year and full-time farm families had less than 100 operator-equivalent days of off-farm work.

The full- and part-time farmers were further divided into three classes each by ranges in farm product sales of 0-\$250, \$250-\$1,200 and \$1,200 or more. The non-farm households were placed into two classes

Table 1.—Amounts of Income per Rural Household by Sources and by Classification of Households, and per Capita Income; Latimer County, 1955

Classification of Households	Number in Sample		Income per Household by Source (dollars)				Per Capita Income (Dollars)	
	Households	Individuals	Net Farm Income ¹	Work on other Farms	Nonfarm Work	Other ²		Total
Farm Households								
Full time farmers								
Farm Sales 0-\$250	11	32	-387	52	76	574	315	108
Farm Sales \$250-\$1,200	15	41	246	234	69	523	1072	392
Farm Sales \$1,200 and more	14	50	1325	16	43	252	1636	453
Part-time farmers								
Farm Sales 0-\$250	10	42	-383	550	1603	110	1880	448
Farm Sales \$250-\$1,200	14	49	72	403	2427	152	3054	873
Farm Sales \$1,200 and more	4	18	712	120	1183	89	2104	468
Total or Average	68	232	265	234	841	313	1653	485
Non-Farm Households								
Work Income of 0-\$800	48	147	—	70	77	1216	1363	445
Work Income of \$800 or more	37	155	—	347	2324	274	2944	703
Total or Average	85	302	—	190	1055	806	2051	577
All Households	153	534	118	210	960	587	1875	537

¹Includes as a deduction from farm sales the cash outlays for feeds, seeds, fertilizer, gasoline, livestock, etc., and a depreciation allowance on machinery and buildings. It does not include an allowance for farm products in home consumption, nor does it fully account for increases or decreases in inventory of livestock or other farm assets during the year.

²Includes welfare payments and other non-labor income such as social security, unemployment compensation, rents, etc.

on the basis of more or less than \$800 income from work by family members.

Amounts of income per household and per capita during 1955 by sources and by the eight classes (six farm and two non-farm) are presented in Table I. These are estimates which may be compared with national or state estimates of personal income. The net farm income represents a net cash income from farming for the year, since adjustments were not made for farm products in home consumption or for possible changes in the inventory value of farm assets. The income from work on other farms, non-farm work, or other sources was not adjusted for acquisition costs.

Income from farming was the least important of the sources of income to the rural people in the county. The income from work on other farms cannot be interpreted as a contribution of the agriculture of the county since most of this income was from farms outside the county. The low income from farming was responsible for the low incomes of the full-time farmers.

The "other" category of income sources included welfare, private pensions, social security, unemployment compensation, and the like, all of which are non-work sources. About 40 percent of the total in this category was public welfare payments, and this source was particularly important to the full-time farm families with less than \$250 in farm sales and to the non-farm families with less than \$800 in income from work.

All per capita incomes by classes were far below the 1955 state and national averages of about \$1,500 and \$2,000, respectively.

Population Characteristics

The character of the human resources from the standpoint of relation to income earning potential can be inferred partially from attributes of age, education and health of members of the population, particularly the household heads and members of the work force.

The age structure of the population reflects heavy outmigration of young adults from the county (Table 2). The full-time farm families and those non-farm families with less than \$800 of income from work especially have a low proportion of young adults (17-34 years of age). These were the classes with the lowest income per household and per capita. Most of the individuals 65 years of age or over were retired on welfare, pensions or other non-work sources of income; and, because

Table 2.—Age Distribution of Population by Classes of Households; Latimer County, 1956.

Classification of Households	Percent of individuals in age interval:			
	0-16	17-34	35-64	65 or more
Farm Households				
Full-time farmers				
Farm Sales 0-\$250	31.3	12.5	46.9	9.3
Farm Sales \$250-\$1,200	14.6	9.8	53.5	17.1
Farm Sales \$1,200 or more	42.0	14.0	36.0	8.0
Part-time farmers				
Farm Sales 0-\$250	45.2	26.2	28.6	0.0
Farm Sales \$250-\$1,200	26.5	16.3	53.1	4.1
Farm Sales \$1,200 or more	33.9	27.8	27.8	5.5
Total	32.8	16.8	43.1	7.3
Nonfarm Households				
Work income 0-\$800	33.3	11.6	32.0	23.1
Work income of \$800 or more	42.6	22.6	31.0	3.8
Total	38.1	17.2	31.4	13.3
All Households	35.8	17.0	36.5	10.7

their incomes generally were lower than the part-time farmers or non-farm households containing member(s) regularly employed, classes with high percentages of the aged individuals had relatively low incomes per household and per capita.

The educational level of household heads was low in all classes except the class of part-time farmers with \$1,200 or more in farm sales. However, only four farmers were in this class (Table 3). With this exception, no class had household heads averaging completion of as many as eight grades of school. The percent of the household heads employable (see definition as footnote to Table 3) ranged from about 42 percent for non-farm households with less than \$800 of work income to 90 percent for one of the classes of part-time farmers. Other data from the survey revealed that 33 percent of the adult male population was afflicted with partial to total disability, and nearly half of these were under 65 years of age.

A major reason for the low income-earning potential of the population was the selectivity of migration in respect to age and education. The age structure of the population shown in Table 2 verifies selectivity of migration in relation to age. Information was obtained in the survey on location and education of adult sons and daughters of the residents to ascertain the relation of migration and education. This information, summarized in Table 4, indicates that those remaining in the low in-

Table 3.—Age, Education and Employability of Household Heads, by Classes of Households; Latimer County, 1956.

Classification of Households	Average Age (Years)	Average Number of School Grades Completed	Percent Employable ¹
Farm Households			
Full-time farmers			
Farm Sales 0-\$250	53.1	6.3	54.5
Farm Sales \$250-\$1,200	43.1	6.2	73.4
Farm Sales \$1,200 or more	52.7	6.0	71.5
Part-time farmers			
Farm Sales 0-\$250	53.9	7.8	90.0
Farm Sales \$250-\$1,200	52.6	7.7	85.7
Farm Sales \$1,200 or more	54.0	10.2	75.0
Total	51.6	7.0	75.0
Nonfarm Households			
Work income of 0-\$800	59.0	5.9	41.6
Work income of \$800 or more	47.3	7.0	89.2
Total	53.9	6.3	62.4
All Households	52.9	6.6	68.0

¹Includes those below 65 years of age indicating when interviewed that no health problems would prevent full-time employment.

Table 4.—Relation of Education to Location of Adult Children of Residents in Rural Area of Latimer County

Item	Children ¹ located in . . .			
	Southeast ² Oklahoma	California	Other Locations	All Locations
Distribution by locations, percent				
Males	40.6	19.4	40.0	100.0
Females	32.7*	27.6*	39.7	100.0
Total	36.7	23.4	39.9	100.0
Average number of school grades completed				
Males	9.1**	10.3**	11.1**	10.1
Females	10.1*	10.2	10.4*	10.2
Total	9.6**	10.3**	10.8**	10.2

*Females differ slightly from males within locations ($\alpha \leq .05$).

**Difference among locations significant ($\alpha \leq .05$).

¹Age of children included in analysis was 21 years and over.

²Includes the counties of Latimer, LeFlore, Haskell, Pittsburg, Pushmataha, McCurtain, and Choctaw.

come area, particularly the male children, have significantly less education than those who have migrated to California or to other locations.

Farm Resources and Resource Use

The 68 farms in the survey had an average of about 220 acres of land (Table 5). The average value of land and buildings, as estimated by the farmers, was about \$5,500. Livestock, mainly beef cattle, ranked next as an asset, with a capital value of about \$2,400 per farm. The low value of machinery and equipment per farm reflects the low degree of mechanization in agricultural production in the county. Only about 20 percent of the farmers owned a tractor and equipment. Most of the others, however, custom-hired the services of this machinery.

Latimer County farmers had a small amount of indebtedness, and therefore a high equity in assets managed. Other data from the survey indicated the farmers, generally, were reluctant to borrow heavily for the capital investments needed for more efficient farming. Nearly all the farmers in the survey indicated some major investments in land, such as seeding of clovers and grasses, terracing, fencing, clearing brush land, etc., "would pay." However, few actually planned to make these investments because of lack of necessary capital. Only about one-fourth believed additional machinery would be worth its cost, and less than half believed the purchase of additional land would increase their net farm incomes.

An analysis of the farm sales for 48 Latimer County farms was made to determine the degree of importance of land, capital and labor as factors associated with these sales. These 48 farms were those with some farm sales and those mainly with cattle-feed crop systems of farming. The results indicate only variations in capital value of the inputs (excluding land and buildings and family labor) contributed significantly to the variations in farm sales among the farms. The results are consistent with the propositions that capital is the main limiting factor to increased farm production on farms in the county, and that labor and land would become limitative only after substantial capital investments were made.² The potential for accumulating capital in the county through farming is evaluated in a subsequent section of this bulletin (see Page 25).

Latimer County farmers used their land and other resources mainly

²These results also are consistent with findings in a recent study of Adair County. See Norman L. Ulsaker, *et.al.*, *Resources and Incomes of Rural Families in the Ozark Plateau of Northeastern Oklahoma*, Okla. Agr. Expt. Sta. Pro. Ser. P-377.

Table 5.—Resources and Indebtedness per Farm by Farm Classes, Latimer County, 1956.

Classification of Farm Households	Acres of Land	Value of Land and Buildings (Dollars)	Value of Livestock (Dollars)	Value of Machinery (Dollars)	Farm Indebtedness (Dollars)	Equity ¹ (Percent)
Full-time farmers						
Farm Sales 0-\$250	188.2	4374	1523	251	573	90.7
Farm Sales \$250-\$1,200	128.0	3586	1502	280	288	94.6
Farm Sales \$1,200 or more	354.1	8305	4348	1112	1439	89.5
Part-time farmers						
Farm Sales 0-\$250	163.0	3604	1513	199	257	95.2
Farm Sales \$250-\$1,200	245.5	5750	2753	749	410	95.6
Farm Sales \$1,200 or more	247.5	9438	2649	754	61	99.5
All Farms	220.7	5477	2418	559	578	93.2

¹Determined by deducting farm indebtedness from the value of land, buildings, livestock and machinery to obtain a net worth, and then dividing this net worth by the value of assets managed.

Table 6.—Distribution of Farm Sales by Source and by Classes of Farm Households; Latimer County, 1955.
(Dollars)

Classification of Farm Households	Livestock Sales per Farm	Livestock Product Sales per Farm	Crop Sales per Farm	Timber Sales per Farm	Total Sales per Farm
Full-time farmers					
Farm Sales 0-\$250	46	39	12	2	99
Farm Sales \$250-\$1,200	456	130	81	6	673
Farm Sales \$1,200 or more	2000	298	530	22	2849
Part-time farmers					
Farm Sales 0-\$250	77	12	6	0	95
Farm Sales \$250-\$1,200	566	43	12	4	625
Farm Sales \$1,200 or more	2249	47	9	0	2305
All Farms, per farm	757	128	147	7	1039
Percent of Total	72.9	12.4	14.1	0.6	100.0

for producing beef cattle. Livestock sales, principally beef cattle, were about 73 percent of total farm product sales by the farmers in the survey (Table 6). The crop sales were primarily feed crops (grain or hay) to other farmers in the county; thus the orientation of the agricultural economy toward cattle was more significant than indicated by livestock sales. Dairy and poultry products made up the small amount of livestock products sold.

Possible Alternatives in Development

There are two general alternatives in development of the agriculture of the county: (1) development of more intensive operations in livestock-feed crop production per farm by increasing farm size and by fuller utilization of present land resources, and (2) production of crops or livestock products with greater potential for income than afforded with present systems of farming. The first alternative requires greatly increased capital investment per farm, and the second alternative poses problems in management and marketing. Data from the survey indicate the farmers lack the interest necessary for major developments in the production of fruit, vegetables or specialty crops. Some farmers with the interest, resources, and "know-how" may have opportunities to develop specialized enterprises of crops, dairy or poultry. However, the following analysis of potential for agricultural adjustment and development is based upon the assumption that cattle-feed crop systems of farming will predominate in the future in the county and area.

Procedure and Data for Programming Analysis

The general procedure in estimating potential for agricultural adjustment and development in the Ouachita Highlands was to determine some alternatives for higher income from farming for a "typical" farm and to assess the possibilities of acquiring the additional assets necessary for these alternatives from farming. In all cases, beef cattle-feed crop systems of farming were assumed.

Land Resources

Most of the soils of the Ouachita Highlands are low in fertility, poorly drained, droughty, erosive, steep, shallow, and/or gravelly.³ The "typical" farm was defined mainly in terms of acreages of different kinds of land.

The 48 livestock-crop farms in the survey which had some farm sales averaged about 240 acres in size. In accordance with estimates of the agricultural leaders in the area, these 240 acres "typically" would be composed of acreages by kinds of land about as follows:

20 acres of bottomland

60 acres of the deeper, more fertile and less steep open upland (called "good upland")

40 acres of shallow, less productive open upland (called "poor upland")

118 acres of woodland, mainly upland

2 acres of farmstead, roads and waste.

Investment in land and buildings was estimated on the basis of a \$25 per acre value for farms in the survey of Latimer County. This price applied to tracts of land having the proportions of bottomland, good upland, poor upland and woodland as defined for the "typical" 240-acre farm. Obviously, farms with greater (or smaller) proportions of bottomland and good upland than listed above were worth more (or less) than \$25 per acre.

³Fenton Gray and H. M. Galloway, *Soils of Oklahoma*, Okla. Agr. Expt. Sta. Misc. Pub. No. 56, 1959, p. 54.

Management

The agricultural leaders provided estimates of crop yields by kinds of land for "average" and "above average" management in the area.⁴ These estimates applied to the higher income farmers who used tractors and equipment in their farming operations. Thus the "average" yields must be interpreted to be above average for the area, and the "above average" yields given apply to those farmers carrying out most of the recommended practices in production, particularly in respect to fertilizer use.

The "average" yields were used in most of the analysis. However, the effect of adjustment to "above average" yields upon income was estimated. It was believed the "average" yields would represent a reasonable expectation of accomplishment by farmers for the cropping programs considered.

The practices programmed in beef cattle production definitely represented "above average" management for the area. A cow-calf system was assumed, with calves dropped in the spring and sold in the fall as good to choice feeders weighing 470 pounds each. An 84 percent calf crop was assumed. A protein supplement of cottonseed meal was programmed to "balance" the ration for cattle wintered on low quality roughages such as prairie hay.

Machinery Situations

Two machinery situations were assumed for the analysis: (1) custom hiring of all operations with tractor and equipment, and (2) farmer ownership of this machinery and equipment. For the programs with ownership of machinery and equipment, it was assumed the farmer still would custom hire the bermuda sprigging and the harvesting of grain. Custom rates and the basis for estimating costs of owning and operating machinery and equipment are presented in Appendix Tables 3 and 4.

Enterprise Budgets

Corn, grain sorghum, bermuda-clover, lespedeza hay, prairie hay, and native pasture were considered the cropping alternatives on the bottomland and good upland (Table 7). Bermuda-clover and native

⁴The levels of management pertain to practices in crop production. The agricultural workers distinguished "average" and "above average" management mainly by whether recommended production practices, mainly on the use of fertilizer, were carried out.

Table 7.—Land Uses, Production Expenses and Yields Considered for Programs for "Average" Management and Alternative Machinery Situations

Land Use by Kind of Land	Yield per Acre		Cash Expenses per Acre ¹	
	Unit	Amount	Custom Hire (Dollars)	Own Machinery (Dollars)
Corn				
Bottomland	Bu.	40	23.98	20.26
Good upland	Bu.	21	28.18	19.86
Grain Sorghum				
Bottomland	Cwt.	17.5	22.75	16.51
Good upland	Cwt.	10.5	22.45	16.51
Bermuda-Clover ²				
Bottomland	Ac. per A.U.	2.5	4.86	3.65
Good upland	Ac. per A.U.	3.5	4.72	3.51
Poor upland	Ac. per A.U.	4.0	4.63	3.42
Lespedeza Hay				
Bottomland	Ton	1.4	29.68	12.49
Good upland	Ton	1.2	28.12	12.16
Prairie Hay				
Bottomland	Ton	1.0	10.41	3.81
Good upland	Ton	.8	8.85	3.48
Native Pasture				
Bottomland	Ac. per A.U.	7.4	1.00	.55
Good upland	Ac. per A.U.	9.2	1.00	.55
Poor upland	Ac. per A.U.	11.0	1.00	.55

¹Includes custom harvesting of hay and grain; *excludes* depreciation and interest cost of \$553 per year per farm for ownership of tractor and equipment excepting harvesting machinery.

²The annual costs for bermuda-clover were obtained by allocating over 12 years the establishment cost (net of ACP payments) including loss of income from the land during establishment, and by adding the annual maintenance cost. These annual costs of bermuda-clover are lower than some estimates for the crop (CF Alfred L. Barr, *Dynamic and Static Analysis of Cattle Systems and Range Improvement Practices, Northeastern Oklahoma*, Ph.D. Dissertation, Oklahoma State University, 1960, Appendix C, Table 3).

pasture were the considered alternatives for poor upland. These cropping alternatives were selected for the programming analysis on the basis of significance of production in the area, except for grain sorghum. Usually, the sorghum produced in the area is harvested for forage instead of grain. Other alternatives, such as alfalfa for feed or for sale, rye or oats and vetch for winter pasture, or small grain for hay, may, if considered, make some difference in the net income estimates, but consideration of additional alternatives is not expected to significantly affect the conclusions of this study.

The yields and total cash expenses per acre for the land-use alternatives and for "average" management are presented in Table 7. The "above average" yields ranged up to about 50 percent higher than "average" yields. The expenses per acre for owned machinery in the

table includes only variable costs. Fixed costs of ownership of machinery (depreciation and interest) can be allocated to the enterprises only after the acreage of the different crops has been determined.

The beef cattle budget used in the analysis is presented in Table 8. The net cash income excludes, of course, the cash expenses of producing the pasture and hay for the cattle.

Table 8.—Estimated Sales and Expenses per Animal Unit Per Year of Beef Cattle

Item	Unit	Quantity Sold or Purchased per A.U.	Sales or Costs (Dollars)
Sales:			
Cull Cows	Cwt.	1.12	11.97
Feeder Calf	Cwt.	3.10	73.47
Total			85.44
Expenses:			
Veterinary Charges	A.U.		2.00
Salt	lb.	25.00	.30
Selling Costs	A.U.		2.00
Cottonseed Meal	Cwt.	1.80	7.20
Bull Depreciation	A.U.		1.25
Total			12.75
Net Cash Income	A.U.		72.69

Income Targets

Usually in farm management studies, an objective is to seek the combination of resources and enterprises which maximizes net farm income. There is reason to believe that farmers in the Ouachita Highland area would be satisfied with less than the maximum attainable income from their farm resources.⁵ In order to account for this possibility, selected income levels below the maximum attainable were used in some of the analyses. In each case, the target income was considered an annual net income from farming for family living expenses, and the analysis was designed to minimize the costs of attaining each specified net farm income level. Maximum attainable net farm incomes under the restrictions imposed in the programs were determined when unattainable target incomes were introduced.

⁵Justification for the use of income targets (below maximum incomes) in farm management analysis is contained in Verner G. Hurt, *Capital Investment and Resource Adjustments on Individual Farms in the Ouachita Highlands of Oklahoma*, Ph. D. Dissertation, Oklahoma State University, 1961, Ch. 2.

Other Restrictions and Assumptions

For the analysis of alternatives in adjustment, it was assumed that needed investment capital could be borrowed at 6 percent interest with repayment in five equal annual installments. It was further assumed that the maximum borrowing capacity of the farmers would be up to 50 percent equity in land and buildings, livestock and machinery. These conditions are approximately those of lending agencies in the area for intermediate-term credit.

Results of the survey indicated only about one man year of labor was employable per farm. Additional farm labor was permitted to be hired in the analysis at 65 cents per hour (the average farm wage rate in the area). In a few of the cases, off-farm work by the operator was permitted at \$1.00 per hour.

The prices used for products, inputs, and services hired are presented in Appendix Tables 1-3. In general, these prices represent price cost conditions for the area during 1953-58.

Alternatives in Adjustment

In accordance with conditions set forth in the preceding sections, some of the programs were designed to provide answers to the following questions:

- (1) How do farm resource requirements and use change with change in the net income desired from farming for family living?
- (2) What effect does varying amounts of off-farm work by the operator have upon farm resource requirements, use, and net income?
- (3) Under what conditions can the farmers afford to own machinery if it can be hired on a custom basis?
- (4) What farm acreage and other resources are necessary to provide net farm incomes of \$3,000 per year under yield expectations consistent with "average" management?
- (5) How does change in the yield expectations from "average" to "above average" affect farm resource requirements, use, and net income?
- (6) How does change in the quality of the land from the average of the area affect farm resource use and net income?

Other programs, relating to other questions, are presented in a section to follow (see Page 25).

Effect of Income Levels Upon Resource Requirements and Use

The 68 farms in the survey had a net farm income of \$265 from farms averaging 220 acres in size. The 240-acre farms did better. However, on the basis of this performance, the first target level of income was set at \$400, and \$200 increments to this provided the other targets of \$600, \$800 and \$1,000 for determining the effect of net income levels from farming upon resource requirements and use. The maximum net income was \$996; thus, the latter target of \$1,000 was not attained. Custom hiring of all machinery operations was assumed for these programs. The land use by kind of land resulting therefrom is presented in Table 9.

As the income target, or pressure on the farm resources for income,

Table 9.—Alternative Crop and Livestock Programs for Adjustment to Specified Target Incomes; Custom Hiring of Machinery and "Average" Management, 240-Acre Farm, Ouachita Highlands (Land Use in Acres)

Land Use by Land Class ¹	Net Farm Income Target of			
	\$400	\$600	\$800	\$1000
Bermuda-Clover				
Bottomland, Acres	0.0	20.0	11.6	0.0
Good Upland, Acres	0.0	6.4	25.2	26.9
Poor Upland, Acres	0.0	0.0	28.4	40.0
Total, Acres	0.0	26.4	65.2	66.9
Corn, Bottomland, Total, Acres	0.0	0.0	8.4	20.0
Prairie Hay				
Bottomland, Acres	13.8	0.0	0.0	0.0
Good Upland, Acres	0.0	28.3	38.4	34.3
Total, Acres	13.8	28.3	38.4	34.3
Native Pasture				
Bottomland, Acres	6.2	0.0	0.0	0.0
Good Upland, Acres	60.0	25.3	0.0	0.0
Poor Upland, Acres	26.4 ³	40.0	11.6	0.0
Total², Acres	92.6	65.3	11.6	0.0
Beef Cattle, Animal Units	9.2	15.1	18.6	18.3

¹Two acres are assumed used by farmstead and roads.

²Excludes 118 acres of woodland pasture.

³Excludes 13.6 acres of poor upland listed in the program as idle.

was increased, there was an increase in acreage of bermuda-clover and other crops and a corresponding decrease in native pasture. Grain sorghum and lespedeza hay did not enter these cropping programs. Use of bottomland shifted from bermuda-clover to corn between the net incomes of \$600 and \$996. However, as bermuda-clover was replaced on bottomland by corn, it increased on other land, primarily on the poor upland. With the \$400 income target, all the pasture was provided by native grasses for the program; but, with the net income of \$996 (the maximum), all the pasture (except woodland pasture) was provided by bermuda-clover for the program.

Livestock numbers increased with increase in income target up to \$800. Above \$800, they declined slightly due to the greater potential of corn as a cash crop for providing income under extreme pressure on the farm resources. However, this substitution was limited by the available bottomland for corn production.

Farm resource use in the area during 1955 was similar to that for the program with the \$400 income target, except that in some cases forage sorghum replaced part or all the prairie hay, and bermuda-clover replaced part of the native pasture.

The results of this analysis indicated farmers can increase their incomes by developing improved pastures, such as bermuda-clover, provided the livestock program is such that efficient use can be made of the improved pastures. The results also indicated the cash crops such as corn have more income potential than pasture or hay crops usually grown in the area on the bottomland.

The total investment in land and buildings, livestock and machinery for the four programs ranged from about \$7,600 to about \$9,200 (Table 10). All of the variation was due to variation in livestock investment, since land was held constant and machinery operations in each case were custom hired. Less than 150 hours of operator labor per year were required for each of the programs, and the labor was mainly for feeding and care of livestock.

Effect of Off-Farm Work on Farm Resource Use and Income

Some programs were developed to assess the off-farm work alternative as a source of income. The results of these analyses indicated that the farm operators could meet a target income of about \$2,600 by obtaining the maximum farm income of about \$1,000 and working off

Table 10.—Resources, Farm Sales, Costs and Income Associated with Alternative Programs; 240-Acre Farm, Ouachita Highlands

Case Number	Machinery Situation	Level of Management	Capital Investment ¹ (Dollars)	Labor Requirement (Hours)	Farm Sales (Dollars)	Farm Costs (Dollars)	Net Farm Income (Dollars)
1	Custom Hired	"Average"	7,610	71	787	387	400
2	Custom Hired	"Average"	8,642	117	1,290	690	600
3	Custom Hired	"Average"	9,255	143	1,976	1,168	808
4	Custom Hired	"Average"	9,202	141	2,484	1,488	996
5	Owned	"Average"	16,169	467	1,954	1,075	879
6	Owned	"Above Average"	15,469	623	3,493	2,119	1,374

¹Investment in land and buildings, livestock and machinery, and equipment.

farm 1,600 hours at \$1 per hour. However, for a target income of \$3,000, the operator would work off farm full-time and hire all labor required above that performed in the custom operations. For the latter alternative, the net farm income would be reduced by the farm wage bill (141 hrs. at \$.65), but the resource use would be the same as the program for a maximum farm income of \$996.

Effect of Ownership of Machinery and "Above Average Management"

An additional investment of about \$7,000 would be needed to own the machinery (excepting harvesting equipment) used in the custom hired operations of previously discussed programs (Table 10, Cases 5 and 6). However, for this size of farm (240 acres) and for "average" management, ownership of machinery rather than custom hiring of pre-harvest operations does not pay; by so doing, the maximum net farm income was decreased from \$996 to \$879. There may be advantages of ownership of machinery and equipment not reflected in the net farm incomes. For example, it may not be possible to attain timeliness of operations when dependent upon custom operators.

Under "above average" management in crop production with the ownership of machinery, net farm income increased from a maximum of \$879 to a maximum of \$1,374, or by about 50 percent. These results indicate net incomes of all preceding cases examined would increase by about 50 percent by substituting "above average" for "average" management. Thus, about \$1,500 would be an attainable maximum net farm income from a 240-acre farm under the conditions assumed for the analysis and for custom hiring of machinery and equipment operations.

Ownership of machinery as compared with custom hiring of operations made an insignificant difference in land use or in livestock numbers when "average" management was assumed. However, for "above average" management in crop production, corn as a cash crop replaced bermuda-clover on good upland, and livestock numbers were reduced (Table 11). Also, in the latter case, lespedeza replaced prairie hay for livestock feed.

Effect of Size of Farm and Quality of Land

To obtain a net income of \$3,000 per year with "average" management, the size of the "typical" farm in the Ouachita Highlands would need to be about triple—or an increase from 240 to 720 acres (Table 12). There are many obstacles to attaining this average farm size in the

Table 11.—Alternative Crop and Livestock Programs for Adjustment To Maximum Incomes; Ownership of Machinery and Two Levels of Management, 240-Acre Farm, Ouachita Highlands

Land Use by Land Class ¹	Acres Used When Level of Management is:	
	"Average" (Net income of \$879)	"Above Average" (Net income of \$1374)
Bermuda-Clover		
Good Upland, Acres	26.9	0.0
Poor Upland, Acres	40.0	40.0
Total Acres	66.9	40.0
Corn		
Bottomland, Acres	20.0	20.0
Good Upland, Acres	0.0	41.8
Total Acres	20.0	61.8
Lespedeza Hay		
Good Upland, Total Acres	3.3	18.2
Prairie Hay		
Good Upland, Total Acres	29.8	0.0
Beef Cattle, Animal Units	18.6	14.6

¹Two acres are assumed used by farmstead and roads.

Table 12.—Resources, Farm Sales, Costs and Income Associated With Alternative Programs and Land Resource Situation; 720-Acre Farm, Ouachita Highlands

Case Number	Machinery Situation	Capital Investment ¹ (Dollars)	Labor Requirement (Hours)	Farm Sales (Dollars)	Farm Costs (Dollars)	Net Farm Income (Dollars)
7 ²	Custom Hired	27,607	423	7,450	4,463	2,987
8 ²	Owned	31,144	1,048	5,795	2,842	2,953
9 ³	Custom Hired	*	502	5,564	3,253	2,311
10 ⁴	Custom Hired	*	513	6,758	3,798	2,960

*Investment not estimated for changes in quality of land.

¹Includes land and building, livestock, and machinery and equipment.

²Proportions of kind of land by classes the same as for the 240-acre farm.

³Same as for Case 7 except bottomland was eliminated, and this acreage was divided between good and poor cropland on basis of the original ratios of good and poor upland to the total of these two classes.

⁴Same as Case 7 except the poor upland was eliminated, and the acreage was divided between bottomland and good upland on the basis of the original ratios of bottomland and good upland to the total of these two classes.

area. About two-thirds of the farm families would be displaced, and the remaining third would need to about triple their capital investment in farming assets. Even so, a 720-acre cattle-fed crop operation, with machinery and equipment hired, provides only about one-fourth time employment to a farm operator, or one-half time employment for the

year if machinery and equipment are owned. The greatly increased labor required when operations are performed by owned machinery may encourage custom hiring of pre-harvest operations by farmers with farms this size, particularly if off-farm work is available for adding to family income.

Elimination of bottomland (Case 9) resulted in a major reduction in net income from the 720-acre farm (from near \$3,000 to about \$2,300). Elimination of the poor upland and substituting, therefore, bottomland and good upland, would result in a maximum net farm income of about \$3,500. However, the data on resources, land use, and income, as shown in Tables 12 and 13 (Case 10) resulted from the use of an income target of about \$2,950 for this case.

Table 13.—Alternative Crop and Livestock Programs for Selected Resource Situations; 720-Acre Farm, Ouachita Highlands

Land Use by Land Class	Acres Used When Net Farm Income ¹ is . . .			
	\$2,987 (Case 7)	\$2,953 (Case 8)	\$2,311 (Case 9)	\$2,960 (Case 10)
Bermuda-Clover				
Bottomland, Acres	0.0	0.0	—	70.5
Good Upland, Acres	77.1	44.1	102.9	132.2
Poor Upland, Acres	120.0	0.0	135.0	—
Total, Acres	197.1	44.1	237.9	202.7
Corn				
Bottomland, Total, Acres	60.0	60.0	—	19.5
Prairie Hay				
Good Upland, Total, Acres	102.9	66.8	122.1	128.6
Native Pasture				
Good Upland, Acres	0.0	69.1	0.0	9.2
Poor Upland, Acres	0.0	120.0	0.0	—
Total², Acres	0.0	189.1	0.0	9.2
Beef Cattle, Animal Units	54.9	35.6	65.1	68.6

¹See Table 12 for land and machinery situations by case numbers.

²Excludes 358 acres of woodland pasture.

There were major differences in land use between the cases with and without ownership of machinery and equipment (7 and 8). Native pasture substituted for both bermuda-clover and prairie hay when ownership of machinery was assumed. This result was brought about by two interrelated factors:

- (1) In the latter program (Case 8), all available operator labor was used during the summer quarter, and the cost of hiring labor in this period forced a more "extensive" forage production program; and

- (2) The reduction in livestock numbers, brought about in part by forced changes in forage production, in turn provided less need for an "intensive" forage production program.

Earlier results from use of "above average" management in crop production indicate that \$4,000 to \$4,500 in net farm income is possible from a 720-acre farm if this level of management is applied. Realization of the potential of improved technology by the farmers first requires a shift in land use from mainly native grasses to grain and improved pasture crops (little, profitably, can be done to increase native grass yields). Also, realization of the potential of improved technology in forage crop production requires efficient utilization by livestock of the increment added to forage production. Thus, the problem of attaining technological progress on farms in the area involves farm planning in addition to enterprise planning. It also requires additional capital investment, particularly in livestock, to improve overall efficiency in farm resource use.

Potential for Capital Accumulation

The preceding results indicate substantial capital investments in land and farm enterprises will be necessary if the earning capacity of the "typical" farm in the area is to be increased sufficiently to provide incomes to families at or above present rural family income from all sources. The major sources of additional capital available to farmers are (1) lending agencies or institutions, (2) savings from current farm income, (3) savings from income from off-farm work, and (4) inheritance. This study is limited to the first two sources.

The major question guiding this phase of the study was: What rate of capital accumulation and increase in net farm income can be expected of the "typical" farmer in the area if increased capital investment is to be made by borrowing and by savings from current farm income? The first few years of a plan are critical because of the limited time spans of farming plans by farmers and of the pressure created by demands of families for income for consumption. A four-year period was selected for this study.

Initial Conditions and Assumptions

A 240-acre farm with unimproved land as described earlier as "typical" for the area was assumed owned initially. It was assumed this acreage was worth \$25 per acre, and additional land of the same composition by kinds could be purchased at \$25 per acre. All other initial

farming assets owned by the farmer were considered worth \$3,250, and it was assumed that this amount could be invested in farming at no interest cost. Borrowing from lending agencies or institutions was permitted so long as equity in land did not fall below 50 percent. Thus, initially, the farmer had \$9,250 in assets and he could borrow \$3,000 (one half of land value of \$6,000). All loans were to be repaid in 20 equal annual installments and interest on unpaid balance at 6 percent would be paid annually. All programs were for custom hiring of machinery operations; thus the investment alternatives were to buy additional land, to buy livestock, and to establish enterprises such as bermuda-clover.

Two programs (one for "average" and one for "above average" management) included a risk factor in the form of a restriction on operation expenses to \$5 or less for each dollar of net income for family living. Two other programs (one for "average" and one for "above average" management) permitted returns on operating expenses to be as low as 0.2 percent.

Target incomes for family living of \$1,000, \$1,200, \$1,400 and \$1,600 were used for years 1, 2, 3 and 4 for each program, respectively, to force increases in capital investment in farming and in net farm incomes. A slack factor was introduced to permit failure to attain the targets, in which case the maximum net farm incomes by years would be attained. The net farm incomes included withdrawals for family living plus payments of principal and interest on loans.

Results

The most striking result was the failure to attain the target income for family living of \$1,600 the fourth year in any of the programs (Table 14). However, the targets for the first three years were attained for the program with "above average" management and with the small restriction on operating capital. Also, the third year target income of \$1,400 was attained in the other program with "above average" management. With "average" management, the first year target income for family living of \$1,000 was attained during the third and fourth years.

The requirement of a 20 percent rate of return on operating capital did effectively restrict capital investment and increases in net farm income (compare Case 11 with 12 and Case 13 with 14). Other programs with requirements of 10, 8 and 6 percent rate of return on operating capital resulted in about the same income, capital investment and resource use as those with the 20 percent requirement.

Table 14.—Income, Capital Borrowed and Capital Assets by Years for Four Year Period and for Selected Case Situations

Case No.	Year	Cash Income for Family Living (Dollars)	Net Farm Income ¹ (Dollars)	Capital Borrowed (Dollars)	Total Capital Invested (Dollars)	Equity in Capital Invested (Dollars)	Acres of Land (Number)	Animal Units of Beef Cattle (Number)
11	"Average" Management and 20 percent or more return on operating capital							
	1	682	682	0	7,632	7,632	240	7.9
	2	813	813	0	9,243	9,243	240	9.5
	3	1,029	1,166	1,336	10,590	9,321	240	17.2
	4	973	1,116	0	10,590	9,388	240	17.2
12	"Average" Management and 0.2 percent or more return on operating capital							
	1	796	796	0	9,082	9,082	295.4	9.7
	2	684	879	1,776	11,027	9,340	295.4	9.7
	3	1,004	1,410	2,006	13,022	9,514	295.4	21.1
	4	1,016	1,410	0	13,022	9,598	295.4	21.1
13	"Above Average" Management and 20 percent or more return on operating capital							
	1	934	934	0	7,605	7,605	247.5	8.1
	2	994	994	0	9,247	9,247	247.5	8.1
	3	1,405	1,670	2,411	11,656	9,366	247.5	21.6
	4	1,408	1,667	62	11,708	9,454	247.5	21.9
14	"Above Average" Management and 0.2 percent or more return on operating capital							
	1	1,006	1,706	5,453	13,850	8,670	450.4	14.8
	2	1,204	1,787	0	14,708	9,800	499.8	7.0
	3	1,402	2,089	1,341	16,038	10,102	499.8	14.6
	4	1,449	2,148	423	16,468	10,429	506.5	16.1

¹Includes payments of interest and principal on loans.

Borrowing for purchasing additional land occurred only for Case 14 ("above average" management and small restriction on return on operating capital). Other borrowing shown in the programs was for purchasing livestock and for establishing bermuda-clover. Initial capital and current farm earnings provided the basis for land purchases in Cases 12 and 13.

The increase in total capital invested during the four-year period was about \$3,000 to \$4,000 for each of the cases. Equity in capital invested increased by less than \$2,000 for each of the cases. Generally, livestock numbers increased during the four-year period in each program. All programs contained less than 500 hours of operator labor per year.

The major land use changes during the four-year period were increases in acreage of prairie hay needed to provide hay for livestock, and shift from native pasture to bermuda-clover pasture (Table 15). Corn acreage increased during the period in the program with "above average" management and without the high required return on operating expense. The cropping alternatives of grain sorghum and lespedeza hay were not considered in the programs of capital accumulation.

It is evident that, with "average" management, there is very limited potential for capital accumulation on farms in the Ouachita Highlands if the sources of such accumulation are to be from borrowing and from savings from current farm income. The potential is better for those with "above average" managerial ability, but the rate of accumulation is expected to be low in these situations. Evidently, substantial investments in farming in the area, if they are to be made, must be from sources other than farming in the area. Off-farm work may provide some with opportunities to invest capital in farm development. An alternative not explored in this study is renting instead of purchasing land. The insignificance of renting farmland in the area indicates the possibility of existing attitudes against renting in or out land for farming, or of other obstacles.

Summary and Conclusions

The major purpose of this study was to evaluate the potential for agricultural adjustment and development in the Ouachita Highlands area of Oklahoma. A survey of 153 rural households in Latimer County in 1956 revealed that less than 10 percent of the family income was from farming and only about one-third of the rural families had some

Table 15.—Cropping Programs for First and Fourth Year of Capital Accumulation Period and For Selected Case Situations (Acres)

Case*	Year	Corn		Bermuda-Clover		Prarie Hay;	Native Pasture	
		Bottom'and	Good Upland	Good Upland	Poor Upland	Good Up'and	Good Upland	Poor Upland
11	1	20.0	0.0	10.7	0.0	14.7	34.5	40.0
	4	20.0	0.0	27.8	40.0	32.2	0.0	0.0
12	1	24.6	0.0	0.0	0.0	18.1	55.7	49.2
	4	24.6	0.0	34.2	49.2	39.6	0.0	0.0
13	1	20.6	0.0	0.0	0.0	15.2	46.7	41.2
	4	20.6	0.0	20.5	41.2	41.3	0.0	0.0
14	1	37.5	0.0	0.0	0.0	27.7	84.9	75.1
	4	42.2	96.5	0.0	36.1	30.1	0.0	48.3

*See Table 14 for description of cases.

farm sales. Of the farm sales, about three-fourths was from livestock, principally beef cattle.

Various farm resource situations were programmed to determine farm income earning capacity for beef cattle-feed crop systems of farming. The basic unit in the analysis was a 240-acre farm of which 20 acres was bottomland, 60 acres good upland, 40 acres poor upland, and the remainder woodland and waste. Use of different levels of net farm income as targets indicated the maximum net farm income for the 240-acre farm and for "average" management was slightly less than \$1,000. At this maximum, corn was produced as a cash crop on the bottomland, and bermuda-clover substituted for native pasture on most of the upland. Use of lower income targets resulted in less "intensive" land use. The use of "above average" management in the programs resulted in an increase in net farm income by about 50 percent over the income with "average" management. Ownership of machinery and equipment, rather than custom hiring of tractor and equipment, resulted in a reduction of net farm incomes for the 240-acre farm.

A 720-acre farm with the same proportions of bottomland, good upland, poor upland and other land as the 240-acre farm provided a net farm income of about \$3,000 for "average" management and for either custom hiring or ownership of machinery and equipment. Nearly \$4,500 in net income could be obtained from this size of farm with "above average" management.

Operator labor required in farming was about one-fourth man-year or less for all the programs with both the 240-acre and 720-acre farms except in the case of the 720-acre farm with ownership of machinery. For that program, about half of the operator's labor was required in farming.

Substantial capital investments would be needed to meet the resource requirements for higher net farm incomes. Several plans for capital accumulation, starting with the "typical" unit of 240 acres, were analyzed. With "average" management, there was a very limited potential for development to higher net farm incomes if the resources were to be acquired through borrowing from lending agencies and through savings from current farm earnings. Better results were obtained by use of "above average" management, but with this the situation, the rates of accumulation were low and much risk-taking by the operators would be necessary.

Appendix Table 1.—Prices for Products Used for Farm Programming Analysis (Dollars)

Item	Unit	Price
Beef Cattle: ¹		
Slaughter Cows		
Commercial	cwt.	15.59
Utility	cwt.	13.61
Canner and Cutter	cwt.	10.69
Stocker and Feeder Steers		
(500 lbs. and less)		
Good and Choice	cwt.	23.70
Medium	cwt.	18.94
Crops: ²		
Corn	Bu.	1.15
Grain Sorghum	cwt.	1.90

¹United States Department of Agriculture, Agricultural Marketing Service, Livestock Division, *Weekly Livestock Reports*, Oklahoma City, Oklahoma. Prices are averages for the months of September and October, 1951-1958.

²United States Department of Agriculture, Agricultural Marketing Service, *Agricultural Prices*, Washington, D. C., 1953-1958.

Appendix Table 2.—Prices for Seed, Fertilizer and Feed as Used in Programming Analysis (Dollars)

Item	Unit	Price ¹
Seed:		
Clover, large hop	lb.	1.00
Clover, Ladino	lb.	.82
Corn, Hybrid	Bu.	10.50
Lespedeza, Kobe	lb.	.11
Grain Sorghum, Hybrid	cwt.	16.50
Fertilizer:		
10-20-10	Ton	81.00
Superphosphate, 20 percent	Ton	41.50
Ground limestone	Ton	6.20
Ammonium Nitrate	Ton	87.00
Feed:		
Cottonseed meal	Ton	80.00
Prairie Hay	Ton	15.00

¹Except for ground limestone, all prices are from United States Department of Agriculture, Agricultural Marketing Service, *Agricultural Prices*, Washington, D.C., April, 1959 (pp. 43-49) and June, 1959 (p. 33). The price for ground limestone was obtained from Oklahoma State ASC Office, average of prices for ground limestone delivered and spread, A-Area counties.

Appendix Table 3.—Custom Rates for Selected Operations as Used in Programming Analysis (Dollars)

Operation	Unit	Rate ¹
Plowing	Acre	4.25
Discing	Acre	1.50
Harrowing	Acre	.75
Planting and fertilizing (2-row)	Acre	1.75
Planting and fertilizing (E-Z-Flow)	Acre	1.50
Cultivating	Acre	1.25
Sprigging Bermuda (including sprigs)	Acre	14.00
Harvesting:		
Grain Sorghum	Acre	5.00
Corn	Acre	5.00
Hay:		
Mowing and raking	Acre	1.85
Baling	Bale	.17
Hauling and Storing:		
Grains	Bushel	.05
Hay	Bale	.08

¹E. A. Tucker, et al., *Custom Rates for Farm Operations in Oklahoma*, Oklahoma Agricultural Experiment Station Bulletin No. B-473, 1956.

Appendix Table 4.—Costs of Owning and Operating Selected Items of Machinery and Equipment as Used in Programming Analysis (Dollars)

Item	New Price ¹	Annual Depreciation ²	Variable Cost ³
Tractor, 2-plow	2,300	209.09	.51
Plow, moldboard, 2-14 inch	234	14.63	.12
Disc Harrow, 7 ft. tandem	290	18.13	.05
Cultivator, 2-row	270	22.50	.08
Harrow, 3-Section, splicetooth	125	6.25	.01
Planter, 2-row (with fertilizer attachment)	300	15.00	.08
Rotary clipper	435	36.25	.18
Mower, Tractor, 7 ft.	432	18.75	.18
Rake, side delivery	532	35.33	.30
Baler, pick-up, pto	1,855	141.68	.55
E-Z-Flow, 12 ft.	300	15.00	.10

¹Average of prices obtained from dealers serving area.

²Based upon straight-line depreciation for life of item.

³Based upon F. C. Fenton and G. E. Fairbanks, *The Cost of Using Farm Machinery*, Kansas Agricultural Experiment Station Bulletin 74, 1954. Includes lubrication, repairs, and, for tractor, gasoline and oil.