ADJUSTMENT ALTERNATIVES FOR NORTH CENTRAL OKLAHOMA WHEAT FARMERS

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PREFACE

This thesis contains a portion of the results of research in connection with Oklahoma Agricultural Experiment Station project No. 882 entitled "Economic Analysis of Crop and Livestock Adjustments in Oklahoma." It is intended that the thesis illustrate a method of solving a resource adjustment problem as well as give feasible solutions. Attention was not given to specifying and discussing the economic theories which are implicit in this type of analysis. This was deemed unnecessary, as the purpose of the research is to provide readily usable decision-making guides to farmers who must make immediate resource-use adjustments.

Results of an analysis such as this are determined by the production coefficients and prices used. Members of the Agronomy and Animal Husbandry Departments of Oklahoma Agricultural and Mechanical College were very helpful in suggesting production coefficients for the resource situation considered. Other materials such as bulletins, circulars, mimeographed reports and feeder-day reports were also used as a source of resource input-putput estimates. The author made final selection of coefficients used and thus assumes full responsibility for their adequacy.

The author expresses his deep appreciation to Professor E. A. Tucker, who as Chairman of the Advisory Committee provided much assistance and guidance. The timely suggestions of Professor James S. Plaxico and the careful reading of the final thesis manuscript by Professor Nellis A. Briscoe are also appreciated. Professors Schlehuber, Eck, Davies, Harlan and Gray of the Agronomy Department and Professor Nelson of the Animal

Husbandry Department assisted greatly in the preparation of appropriate input-output estimates.

Soil Conservation personnel located at Enid and Medford, Mr. Vance Deaton, Garfield County Agent, and Mr. J. D. Edmonson, Grant County Agent, were most helpful. Mr. W. A. Smith, Hunter, Oklahoma and Mr. Ralph Kuehney, Deer Creek, Oklahoma graciously cooperated in allowing visits to their respective farms.

The assistance of Mrs. Sue Anne Bradley in organizing the material and typing the final manuscript is appreciated.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER I

INTRODUCTION

Discovering, evaluating and deciding for or against alternative resource combinations is a continuous farm management job. Federal programs designed to reduce farm output have intensified the need for this type of decision. In the North Central cash-wheat producing area of Oklahoma, farmers have land, labor, machinery and capital formerly used in the production of wheat for which alternative uses must be selected. This study was undertaken to provide guides for farmers faced with these decisions whereby they may select resource-use plans which will lead to the most satisfactory returns under existing or anticipated circumstances, considering the goals of the farm family.

The physical adaptation of a cool season growing crop such as wheat was early recognized by settlers of the area. Low annual rainfall and hot, dry summers make desirable the growing of a crop which can utilize available moisture during seasons when evaporation and heat are relatively low. Summer crops frequently make good growth during early summer only to "burn up" during the intense heat of the summer. Some soils intensify the problem by having qualities of low permeability resulting in a slow rate of taking in moisture and giving it up to crops. Mechanization development was suited to the gently rolling to level area, thus large-scale operations could be developed allowing competition in economy of production with areas capable of producing greater per acre yields.

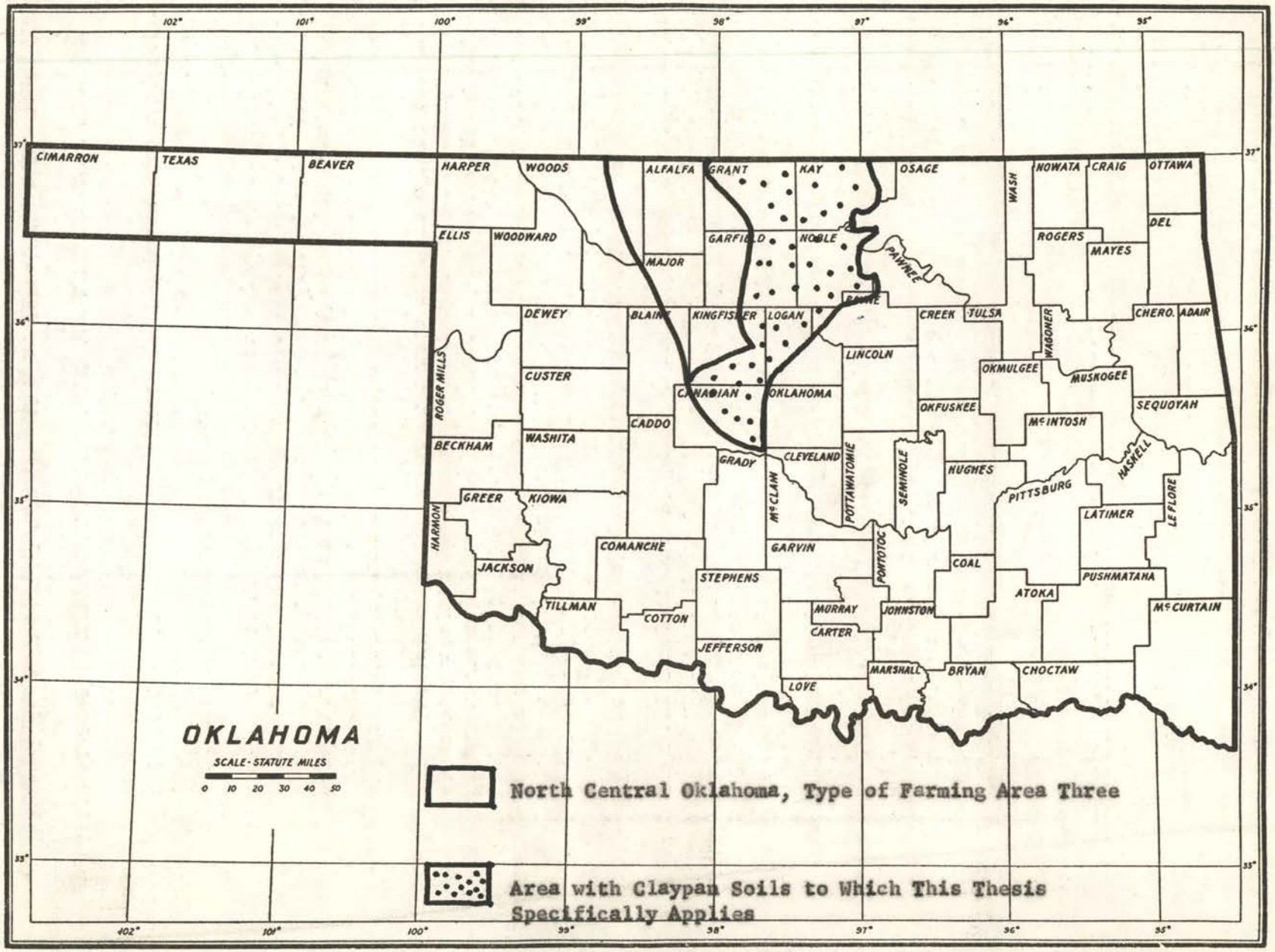

Figure 1. A Map Showing the North Central Oklahoma Area Referred to in This Thesis

An example of the resources which must be diverted will further focus the problem. A farmer formerly growing 324 acres of wheat on his 360 cultivated acres now has this acreage reduced approximately one-third to 216 acres as a result of allotments. He has 108 acres for diversion plus the machinery capacity for farming it to wheat or a similar crop. Capital formerly used to provide for seed and other productive agents is still available. Family labor is tied to the other resources and fixed in the short-run. Until sufficient time elapses so that machinery is depreciated away, contracts fulfilled and other productive agents disposed of, these resources represent fixed costs to the farmer. It is this short-run period of time which we are dealing with primarily in this thesis. Therefore, in comparing alternative resource uses we need only consider costs and returns which result from employment of the diverted resources in other uses. In later chapters the longer run period is considered.

Farmers in the area are generally more familiar with improved production techniques for producing wheat than for the production of other crops. Before allotments, oats, alfalfa and sorghums were grown in small acreages mostly to provide feed for livestock. Adjustments to now have been toward these crops; however, productive practices which are likely to result in efficient resource use are not in general use.

The specific objectives of the study are:

1. Determine resource use alternatives in the area.
2. Estimate results of adoption of the alternative resource uses or practices.
3. Compare, in both tabular and verbal form, the alternative resource use systems. It is intended that these comparisons will allow a farmer to select an alternative on the basis of his own

criteria. More likely criteria of farmers are anticipated in the discussions accompanying the comparisons.

CHAPTER II

METHODOLOGY

The North Central Oklahoma wheat producing area has two rather clearly defined soil types. East of a line running north and south through Enid, in Garfield county, are generally soils with claypans. The predominate soils there are Tabler and Kirkland in association with Renfrow and Vernon. The claypans are found at a depth of 12 to 20 inches. Available plant moisture is limited mostly to the friable soil area lying above the claypan as moisture beyond the claypan is accessible to only a few roots. West of Enid, where the predominate soils are Grant and Pond Creek, claypans seldom exist. The differences indicated are only important if they affect resource uses, production or management practices. This thesis is based on a study of soils lying in the claypan area.

Discovery and evaluation of alternative resource uses presupposes the existance of accurate input-output data for the resources. Results of experiments and estimates of experienced agricultural workers are the main source of technical coefficients. "Present" resource uses and the resulting production are needed as well as "possible" resource uses and production.

The area was sampled by schedule during the summer of 1955 to determine present organizations, practices and technical input-output relationships. Machinery and labor requirements, seeding rates and dates of job performance in production of crops are examples of input data collected. From the information collected in this way a summary of inputs and resulting outputs has been compiled.

Members of the Oklahoma Agricultural and Mechanical Experiment Station Agronomy, Animal Husbandry, and Agricultural Economics Departments, along with Extension and Soil Conservation field personnel, have provided "possible" resource input and output data. Representatives of these groups visited farms on Kirkland and Tabler soils so that the available resources could be viewed. Recommendations resulting from these farm visits are presented as the appropriate resource use alternatives and results in following chapters.

Just as important as technical coefficients are the prices used in getting results. In planning for "next year", different prices may be used than for a plan several years from the present. Most of the discussion here is for the shorter period of time; therefore, prices used are an average of 1950-55. Some adjustments were made where short-run outlooks indicate changes are forthcoming. One example of this is wheat which has been given a price equal to the allotment price.

The farm budget is utilized as the method of analysis and presentation. It is easily used and understood by farmers and other agricultural workers. Since certain costs are fixed in the planning period we are considering, the partial budget is used. Only the expenses, income and capital requirements which differ between alternatives need be shown. For example, small poultry enterprises do not enter into comparisons of plans since they do not vary between plans.

Results and interpretations of the study are made in the following ways. First, the crop enterprises are examined in their present management setting, then possible changes are given as recommended by soils and crop technicians. Present and proposed practices are evaluated for the

enterprise, then enterprises are compared on the basis of returns to labor, capital and management.

Livestock enterprises are evaluated by comparing results of using a given amount of resources in alternative ways. Other livestock alternatives are evaluated for use in preparing the whole farm systems. The whole farm organizations are made up of alternative ways of combining livestock and crop enterprises. Enterprises for use in the organization are selected for profitableness compared to alternative enterprises. The "whole farm" organizations are compared one with another and with the "usual" plan now found in the area. Criteria used in this section include:

a. Income expectations

b. Risk

c. Flexibility

d. Additional labor and capital required

CHAPTER III

PRESENT RESOURCE USE SYSTEMS

The farm described in this thesis is referred to as "present plan" or "present resource use" in following chapters. A budget showing results of present uses of diverted resources is presented along with possible resource uses in the final chapter on alternative systems of farming. In order to clarify discussions of crop and livestock enterprises, the "present resource use system" is presented prior to crop and livestock chapters. The "typical farm" is not representative of any one farm. The amounts and kinds of resources given as "usual" are indicative of averages or modes. The present system reflects the most common managerial decisions for the use of these agents of production.

The size of farm in acres is 480, composed of 360 acres of land in cultivation, 104 acres of native pasture and 16 acres of farmstead and roads. Cultivated land is Kirkland or Tabler soil and pasture is usually Vernon or Renfrow.

Wheat, oats and alfalfa are the usual land uses. Wheat allotments are about sixty percent of cultivated acres on the average; thus, there are 216 acres of wheat on the typical farm. There are 90 acres of oats which comprise the largest use of diverted acres. Where barley is grown this 90 acres would be divided between oats and barley; however, barley is not grown on a majority of farms in the area. Alfalfa acreages have changed little since allotments on wheat were set. The amount grown depends

on numbers of livestock kept and ability to establish and maintain the desired acres. Twenty one acres is used as typical on this farm.

Most farms grow three or four crops. Four crops are used in this thesis because of feed requirements under the present livestock systems and because sorghum is a "catch" crop after alfalfa or small grain failure. To reflect these considerations, sorghum is divided between grain and forage crop acreages which in a normal year would meet forage requirements and provide grain for sale or feed.

The usual livestock program found is a cow-calf herd with mostly spring calves. These calves are either sold in the fall or carried through the winter on small grain pasture. The average stocking rate for native is one Animal Unit to 4.5 acres for a six months period. This is too heavy and necessitates supplemental feeding during the period.

Crop residue from small grains is not usually grazed as early plowing is practiced. In the fall sorghum residue, sorghum for pasture and alfalfa afford some grazing. If available, small grain pasture is grazed from about December 1 to March 1. Some days must be excluded from this period for the time that snow or rain precludes grazing or when pastures are scant from lack of moisture. Assuming that forty percent of the small grains would not be grazed due to lack of stock water in some fields, distances from home farm, rental arrangements, lack of fencing or a preference not to graze some areas, the small grain is presently stocked at a rate of one A. U. to 7.5 acres. This includes only the cow-calf herd as few farmers buy additional animals for grazing on wheat or oat pasture.

Sheep are present in the area but not on the typical farm. Hogs and chickens on the farm are mostly for family use. These will consist of one or two hogs and from 75 to 100 hens. They will not be considered in

budgeting except to exclude feed requirements from amounts available for sale or use. One or two cows may be kept for milking, but are included in with the beef herd here for simplicity. Quality of cattle is high compared to averages for the state.

Table I shows land uses, acres and production. The disposition of production is shown as sold or fed. Numbers of cattle and production are also shown. Later, prices and costs are applied to this data to form a budget of the "present plan".

The labor available on this farm is assumed to be that of the operator and two members of the family. This amounts to about 1.5 man equivalents per year. Labor is adequate for all work except during small grain harvest and plowing during the summer. For this reason a man is hired to work during combining and one-half the plowing period. Custom baling is used which amounts to hiring labor plus machinery. In future budgets it is assumed that a man is hired to assist in hauling bales to barn or stack.

At least two tractors and plows will be found on the typical farm, thus enabling full use of manpower during combining and early plowing. Machinery required for small grain production is owned by the farmer. Most farmers also have a mower and rake, but baling is hired. Little row-crop equipment is found on the farms. Row-crop tillage, as indicated in later chapters, is adapted to small grain equipment.

This typical farming system can be called a "cash-grain - roughage - cow-calf" type farm. Cash-grain distinguishes it from farms selling only wheat. The most significant adjustment since allotments is the increase in oat acreage and number of crops grown. The livestock program was expanded due to the increase in feed available; however, recent droughts have reduced cattle numbers. Cow-calf herds were common prior to acreage restrictions.

TABLE I

PRESENT TYPICAL LAND USE AND LIVESTOCK SYSTEMS FOR A 480 ACRE FARM ON KIRKLAND - RENFROW TYPE SOILS OF THE NORTH CENTRAL OKLAHOMA[1] WHEAT PRODUCING AREA. (1956)

Crops	Acres	Yield/Acre	Total Production	Amount Used on Farm	Amount Sold
Wheat	216	15	3240 bu.	---	3240 bu.
Oats	90	21	1890 bu.	72 bu.[2]	1818 bu.
Sorghum	xx	xx	xx	xx	xx
Grain	20	14	280 bu.	110 bu.[3]	170 bu.
Forage	13	1.5	19.5 T	19.5 T[4]	---
Alfalfa	21	1.2	25.2 T	25.2 T[4]	---
Total	360	xx	xx	xx	xx

Livestock	Number	Animal Units	Products Sold	Amount Sold
Beef type cows	16	16	3 culls (900 lb.)	2700 lb.
Beef type bull	1	1	Avg. of 1/3 cull each year	400 lb.
Replacement heifers 1/2 years	4	2	1/2 cull	400 lb.
Calves - 1 year	15	5	11 yearlings (600 lb.)	6600 lb.
Total	36	24	xx	xx

[1]See Figure I

[2]39 bu. hens, 13 bu. chicks, 20 bu. milk cow.

[3]45 bu. hens, 15 bu. chicks, 50 bu. hogs.

[4]Small amount of feed not required for cattle is used for bedding, litter, milk cow, etc.

CHAPTER IV

PRESENT PRACTICES AND ORGANIZATION OF CROP ENTERPRISES WITH PROPOSED CHANGES

Practices and organizations presented here do not describe in all respects any particular farm in the area. They are representative of the usual managerial decision for resource-use in production of crops. Present practices are presented and evaluated and those recommended are discussed and budgeted along with those currently in use.

Tilling Practices

Practices reported for small grains pertain more specifically to wheat. Oats and barley are secondary to wheat in importance. They are second choice for timeliness or quality of work performed. Weather and rainfall variability result in variation of practices to match conditions. For example, in very dry weather an operation other than moldboarding such as hoeming, discing or onewaying may take place. The moldboard operation would be performed later if rains come early enough to permit the preparation of a firm seed bed. The number of spring toothings may also vary, depending on weed and moisture conditions.

In Table II may be seen the present tilling practices for fall sown small grains. In western counties two onewayings sometime replace moldboarding. One time over with the spike tooth harrow may replace a spring toothing just prior to seeding. Spring sown small grain land is handled much the same way if it follows a small grain crop. Additional harrowing

or hoeming is done during November and December with drilling in January or February. If the spring sown grain follows a row-crop harvested in the fall, it will have the same tilling operations performed in October, November, December and January.

Major emphasis by technical advisors was on early plowing, which is a common practice by farmers in the area. It is also suggested that when conditions are too dry for one operation then another should be performed to conserve moisture and facilitate the preparation of a proper seed bed. Agronomists indicate that present practices on wheat are appropriate, but more of the same timeliness and thoroughness should be given to land for other small grains. Use of custom operators or hired labor during harvest time so that early plowing may be done can result in increases in production the following year.[1] This is particularly true where continued dry, hot weather drys out the land shortly after harvest is complete. Timeliness in planting small grains is also important.

TABLE II

USUAL TILLING OPERATIONS FOR FALL SOWN SMALL GRAINS IN NORTH CENTRAL OKLAHOMA

Operation	Time Performed	Times Over
Moldboard	Immediately after harvest	1
Spring tooth harrow	When weeds appear or after rain	3
Drill	September to November	1
Combine	June	1

[1] Wesley Chaffin, Wheat Production in Oklahoma, Oklahoma Extension Circular 447, p. 7.

Table III indicates present land operations for row-crops following row crops. If small grains harvested in June are followed, the same operations would occur but at times would resemble those for small grain land preparations. Control of weeds by harrowing in the spring would be done as usual. Cultivating and spike tooth harrowing are usually only practiced on 32 to 40 inch rows; however, spike harrowing could be done on closer drilled rows. Most sorghums are planted with a drill having part of the holes stopped. Sixteen inch rows are most common for grain crops. Many fields are drilled by circling lands, thus eliminating end turning.

Sorghum specialists at the college indicate that present tilling practices are adequate for hay and grain crops. It was pointed out that the careful attention of spacing plants and rows to eight inches between plants and 32 to 40 inch rows will result in greatest silage tonnage in most years.

Present land preparation for alfalfa is indicated in Table IV. There were some reports of spring seeding, but the usual time is in the fall. Present tilling practices are very close to recommended ones. Plowing in early June is recommended as soon as possible after removal of the previous crop.[2] This permits more rapid absorption and deeper penetration of summer rainfall. It also provides more time for decay of organic matter thus increasing the availability of nitrogen, phosphorus and other plant nutrients.

Rotation and Summer Fallowing

Summer fallowing is not a recommended practice nor is it commonly practiced in the area. Yields resulting from such a practice will not compete with the alternative of growing another crop on diverted acres.

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[2] Wesley Chaffin, Alfalfa, Queen of Forage Crops, Oklahoma Extension Circular 497, p. 9.

TABLE III

USUAL TILLING OPERATIONS FOR ROW CROPS
IN NORTH CENTRAL OKLAHOMA

Operation	Time Performed	Times Over
Moldboard	February - June	1
Spring tooth	To prepare seedbed, warm the ground and to keep down weeds	2
Drill	May - June	1
Spike tooth harrow	June	2
Cultivate	June - July	2
Harvest - Combine	September - October	1
Field cut for Silage	August - September (depends on growth of plant)	1
Bale	August	1

TABLE IV

USUAL TILLING PRACTICES FOR ALFALFA
IN NORTH CENTRAL OKLAHOMA

Operation	Time Performed	Times Over
Moldboard	June - July	1
Spring tooth harrow	After rains or when weedy	2 or 3
Spike tooth harrow	Before seeding	2
Drill	September	1
Harvest	May, June - July August - September	3[1]

[1]On Tabler and Kirkland soils two cuttings are often the maximum.

A rotation, in the usual sense of the word, is non-existent in this wheat region. Variability of factors such as rainfall, climate and insect pests disrupt such an orderly system of planting. Land is alternated between uses except that wheat is kept on the better land at all times. Alfalfa is moved about on land suited to it.

The sequences necessary in order to have both summer and winter crops on one farm are fairly definite. In order to grow wheat, alfalfa and sorghums together the usual system would be:

Alfalfa - 5 years - plowed under in fall of the fifth year

Sorghum - 1 year - planted in June

Oats - 1 year - planted in late fall or winter

Wheat - continuous until alfalfa has been rotated on all adapted land

Alternative systems are:

1. Alfalfa - 5 years - plowed under in fall

   Summer fallow - 1 year

   Wheat - continuous - planted one year after alfalfa is plowed

2. Alfalfa - 5 years - plowed under in fall

   Oats - 1 year - planted late fall or winter

   Wheat - continuous

3. Alfalfa - 5 years

   Sorghum - 1 year

   Summer fallow - 1 year

   Wheat - continuous

Crop Practices and Recommendations

This section includes discussions and evaluations of present and proposed crop practices. Budgets accompanying the individual crop discussions

permit comparisons between alternative practices on the basis of profitableness. Comparisons between alternative crops can also be made by use of the budgets.

Care should be taken in reading and using the budgets to prevent misinterpretations. The costs specified are only those which must be incurred to produce an acre of crop using the practices indicated. Operator labor, land, machinery depreciation, interest and taxes are costs which will be experienced whether a crop is grown or not. It is not necessary, therefore, to include these in the budgets since they are the same (fixed costs) regardless of the employment of the resources. Payment of these costs is made out of the residue, if any, remaining after operating costs are subtracted from the value of total production. Since this thesis deals with the period of time during which these costs remain fixed, this treatment of the enterprises is sufficient.

Three figures are given at the end of each budget and need some explanation. The most useful of these figures is "the returns to all fixed factors of production-land, labor, and capital". It is the one referred to above as the residue remaining after operating costs are paid. This is further broken down into rent, which is the return to land, and returns to labor and capital of the operator. This should be helpful in making enterprise selections for rented land.

Wheat

One adjustment in resource use is to shift more resources to the fixed wheat acres. This shift could be in the form of using fertilizer, better quality seed and more labor and machinery. Since this type of adjustment competes with other alternatives, it is budgeted.

Present labor and machinery practices are considered to be near optimum. High quality seed is presently used and it is also cleaned and treated. The recommendation with regard to seed is to select both an early and midseason maturing variety rather than either early or midseason. This allows distribution of labor and machinery, thus less need be hired. In some years weather conditions cause early or late crops to be mutually exclusive with regard to each other. Farmers feel that by planting both, whole farm yield variability will be reduced. Varieties recommended are Triumph and Concho.

Agronomists recommend the use of 100 pounds of 0-20-0 fertilizer per acre. Increases in yields shown in Table V are attributed to the use of fertilizer.

Oats

Spring seeding of oats is the major present practice which should be changed. Recommendations are for Cimarron or Forkedeer to be planted during the last two weeks of September. Cimarron produces earlier pasture and matures two weeks ahead of Forkedeer oats and one week ahead of Triumph wheat. Forkedeer produces more hay and grain than other recommended varieties. Planting rates should continue to be 1.6 bushels with two or more bushels when more pasture is desired. One hundred pounds of 0-20-0 applied at drilling will help increase yields.

Winter oats seeded in January or early February may sometimes be used to facilitate growing of summer and spring crops on the same farm where fields are rotated. If moisture is normal or greater 10-20-0 should be substituted for 0-20-0 for spring seeding. Fall seeded oats would yield higher as a result of nitrogen fertilizer in years of favorable moisture. Spring seeded oats yield 5 to 10 bushels per acre less than fall seeded ones under the plan budgeted.

TABLE V

ESTIMATED PRESENT AND PROPOSED VARIABLE PRODUCTION COSTS AND RETURNS FOR AN ACRE OF WHEAT GROWN ON KIRKLAND - REINFROW SOILS IN NORTH CENTRAL OKLAHOMA

Item	Unit	Price	Present		Proposed	
			Amount	Cost/A	Amount	Cost/A
Seed and Treatment	Bu.	$ 2.25	1	$2.25	1	$2.25
Moldboard	Acre	.67	1	.67	1	.67
Spring Tooth	Acre	.23	3	.69	3	.69
Drill	Acre	.24	1	.24	1	.24
Combining	Acre	.74	1	.74	1	.74
Haul	Bu.	.006	15	.09	18	.11
Fertilizer (0-20-0)	Ton	35.00	-	-	.05	1.75
Hired Labor[1]	Hour	1.00	.5	.50	.5	.50
Total Variable Costs				$5.18		$6.95
Yield	15 bu.				17 bu.	
Price	$1.85				$1.85	
Gross sales per acre				$27.75		$31.45
Less variable cost				5.18		6.95
Return to Land Labor and Capital				$22.57		$24.50
Less Rent[2]				9.25		9.90
Return to Capital, Labor and Management				$13.32		$14.60

[1]Hire one man during combining and during 1/2 of plowing.

[2]1/3 of total sales less 1/3 of fertilizer costs.

Budgets on the proposed side of Table VI assume use of varieties, fertilizer and seeding times indicated above. In addition to the gain in income indicated, fall oats provide grazing not possible with spring sown oats.

Barley

Barley, when grown, is treated as though it were of little importance. This means that little attention is given to selection of variety or date of planting. The majority of farmers interviewed did not know which variety they were growing. Tenkow was most often named by farmers who knew the variety. Agronomists indicate that Harbine or Rogers would be more desirable. Tenkow is probably selected by some farmers because of its larger seed; however, test weights of Harbine and Rogers are heavier. Rogers, a recently released variety, is more winter hardy than the other recommended varieties except Ward.

Farmer stated views and low acreages of barley indicate that it has a low rating as an alternative crop to wheat. Historically it is only grown to any extent when an allotment system on wheat is in force. In contrast to this, some acreage of oats is usually present on farms. Barley harbors green bugs and chinch bugs more than other small grains. Probably a year or so of experience with barley and chinch bugs has led to its low rating.

Although barley is not favorably regarded by the majority of farmers, it appears to be as profitable as oats. The variability of barley yields is no greater than that of oats (Appendix Table I). Elimination of barley during years when heavy infestations of insects are likely would add to its average yield. Entomologists have had some success in predicting the population of green bugs for the coming year prior to planting, thus such a forecast might be available.

TABLE VI

ESTIMATED PRESENT AND PROPOSED VARIABLE PRODUCTION COSTS AND RETURNS FOR AN ACRE OF OATS GROWN ON KIRKLAND - RENFROW SOILS IN NORTH CENTRAL OKLAHOMA

Item	Unit	Price	Present		Proposed	
			Amount	Cost/A	Amount	Cost/A
Seed and treatment	Bu.	$ 1.20	1.6	$1.92	1.6	$1.92
Moldboard	Acre	.67	1	.67	1	.67
Spring tooth	Acre	.23	3	.69	3	.69
Drill	Acre	.24	1	.24	1	.24
Combine	Acre	.74	1	.74	1	.74
Haul	Bu.	.003	21	.06	35	.10
Fertilizer	Ton	35.00			.05	1.75
Hired labor[1]	Hour	1.00	.5	.50	.5	.50
				$4.82		$6.61

		Fall seeded winter varieties	Spring seeded winter varieties
Yield	21 bu.	35 bu.	27 bu.
Price per bu.	.80	.80	.80
Gross sales per A.	$16.80	$28.00	$21.60
Less variable cost	4.82	6.61	6.61
Return to land labor and capital	$11.98	$21.39	$14.99
Less rent[2]	5.60	8.75	6.62
Return to capital labor, and management	$ 6.38	$12.62	$8.37

[1] Hire one man during combining and 1/2 of plowing.

[2] 1.3 of total sales less 1/3 of fertilizer costs.

TABLE VII

ESTIMATED PRESENT AND PROPOSED VARIABLE PRODUCTION COSTS AND RETURNS FOR AN ACRE OF BARLEY GROWN ON KIRKLAND - RENFROW SOILS IN NORTH CENTRAL OKLAHOMA

Item	Unit	Price	Present		Proposed	
			Amount	Cost/A	Amount	Cost/A
Seed and treatment	Bu.	$ 1.51	1.5	$2.26	1.5	$2.26
Moldboard	Acre	.67	1	.67	1	.67
Spring tooth	Acre	.23	3	.69	3	.69
Drill	Acre	.24	1	.24	1	.24
Combine	Acre	.74	1	.74	1	.74
Haul	Bu.	.006	19	.11	27	.16
Fertilizer 0-20-0	Ton	35.00			.05	1.75
Hired labor[1]	Hour	1.00	.5	.50	.5	.50
Variable costs				$5.21		$7.01
Yield			19		26	
Price			1.09		1.09	
Gross sales per acre			$20.71		$28.34	
Less variable cost			5.21		7.01	
Returns to land, labor, capital and management			$15.50		$21.33	
Less rent[2]			6.90		8.87	
Return to labor, capital and management			$8.60		$12.46	

[1]Hire one man during combining and 1/2 the plowing.

[2]1/3 of total sales less 1/3 of the fertilizer.

The use of fertilizer along with more attention to variety, time of planting and land preparation should increase yields significantly. These recommendations are incorporated into Table VII.

Alfalfa

The soils in question are not particularly adapted to alfalfa. This is evidenced by average yields of 1 to 1.5 tons while area averages are near two tons. Most of the hay production comes from first and second cuttings because of hot, dry weather in July and August. Possibilities of getting a seed crop should be considered on second and third cuttings, particularly if the weather is very hot and dry.

Use of lime and super phosphate is recommended on alfalfa. Two hundred pounds of 0-20-0 should be applied at seeding, then an additional 200 pounds early each spring of following years. This can be broadcast, then incorporated into the soil with a spring tooth harrow. An application of three tons of lime is used in the following budget, but soil tests should always be made prior to applications to determine exact needs. Lime would be applied in July and worked in with disc or spring tooth. Experiments at the Oklahoma Agricultural and Mechanical College farm near Stillwater have shown increases of two or three times in yields on alfalfa as a result of fertilizer and lime use.[3] At present prices a one-half ton increase must be received to make use of fertilizer profitable. Due to the unsuitability of this soil to alfalfa the expectation would be little more than one-half ton. The lime application is amortized, along with other establishment costs over the five year expected life of the stand, to obtain estimates of yearly variable costs. Fertilizer prices include application costs.

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[3]Ibid., p. 8

TABLE VIII

ESTIMATED PRESENT AND PROPOSED VARIABLE COSTS FOR THE PRODUCTION OF ONE ACRE OF ALFALFA GROWN ON KIRKLAND - REINFROW - TABLER SOILS IN NORTH CENTRAL OKLAHOMA

Item	Unit	Price	Present		Proposed	
			Amount	Cost/A	Amount	Cost/A
Seed and treatment	Lbs.	.27	13x1/5	.70	13x1/5	.70
Moldboard	Acre	.67	1x1/5	.13	1x1/5	.13
Spring tooth	Acre	.23	3x1/5	.14	3x1/5	.14
Spike tooth	Acre	.24	1x1/5	.05	1x1/5	.05
Drill	Acre	.74	1x1/5	.15	1x1/5	.15
Fertilizer Lime	Ton	2.60[1]			.6	1.56
Superphosphate	Ton	35.00			.1	3.50
Harvest						
Mow	Acre	.29	3	.87		.87
Rake	Acre	.27	3	.81		.81
Bale	Bale	.18	36	6.48	48	8.64
Haul	Bale	.02	36	.72	48	.96
Hired labor	Hour	1.00	3/4 hr.	.75	1	1.00
Variable Costs				$10.80		$18.51
Yield - ton			1.2		1.6	
Price/ton			25.00		25.00	
Gross sales			$30.00		$40.00	
Less variable expenses			$10.80		$18.51	
Returns to land, labor capital and management			$19.20		$21.49	
Rent[2]			7.12		7.88	
Return to capital labor and management			$12.08		$13.61	

[1]Assume A.S.C. payments of $2.00 per ton on lime thus the net cost is $4.60 - $2.00 = $2.60 per ton.

[2]Landlord pays 1/3 seed, baling, fertilizer and hauling; gets 1/3 crop.

Oklahoma Common is the recommended variety of alfalfa for this area. Inoculation, cleaning and treating of seed are important in the handling of alfalfa seed. Present practices relating to selection and handling of seed are adequate in most cases.

Grain Sorghum

Present sorghum practices and resultant yields provide little basis for evaluation of sorghum as an alternative resource use. Its usual uses as a "catch" or emergency crop preclude estimates of such possibilities. The usual variety reported was "Maize". This is thought to be indicative of lack of planning with regard to selection of better varieties. Some seed dealers report that a substitute is readily accepted even though a particular variety is asked for by name. This may even include changing from a grain to a forage type. Sorghum is usually planted on other than the best land so that good "on the farm" measures of production capabilities are not available.

If sorghum for grain is drilled, rows should not be more than twenty four inches apart. Ideally, plants should be four inches apart with a seeding rate of eight pounds per acre. Under present practices eleven pounds is the usual rate. A reduction in seed used will lower costs slightly and increase yield possibilities. Seeding should be around June 20th with harvest about mid-October. Varieties recommended are Redlan, Dwarf Kafir 44-14, Darset, Darso and Hegari. Redlan, Kafir 44-14 and Darset have some resistance to chinch bug injury. There is a chinch bug danger in the area due to the predominance of small grain; thus isolation of sorghums from small grain, particularly barley, is desirable. Early planting to allow a good start for the young plants prior to chinch bug migration should be

TABLE IX

ESTIMATED PRESENT AND PROPOSED VARIABLE PRODUCTION COSTS AND RETURNS FROM AN ACRE OF GRAIN SORGHUM GROWN ON KIRKLAND-RENFROW-TABLER SOILS IN NORTH CENTRAL OKLAHOMA

Item	Unit	Price	Present		Proposed	
			Amount	Cost/A	Amount	Cost/A
Seed and Treatment	Cwt	6.00	11	.66	8	.48
Moldboard	Acre	.67	1	.67	1	.67
Spring tooth	Acre	.23	2	.46	2	.46
Drill	Acre	.24	1	.24	1	.24
Combine	Acre	.74	1	.74	1	.74
Haul	Bu.	.006	14	.08	17	.10
Hired labor	Hour	1.00	.4	.40	.4	.40
Total Variable Costs				$3.25		$3.09
Yield	Bu.		14		17	
Price	Bu.		1.22		1.22	
Gross Sales			$17.08		$20.74	
Less variable costs			3.25		3.09	
Returns to land, labor capital and management			$13.83		$17.65	
Rent[1]			5.69		6.91	
Returns to capital, labor and management			$8.14		$10.74	

[1]Rent is 1/3 of gross sales.

practiced in years of heavy infestation in small grain. Another problem in the growing of sorghum is the difficulty of planning a system with wheat without resorting either to spring seeded oats or summer fallow. The increase in yield shown in the budget is due to better selection of adapted varieties, use of good soil and reduction of the seeding rate to allow distribution of moisture to fewer plants. As yields of summer crops are usually limited by moisture rather than by fertility, the use of fertilizer has not been assumed in the grain sorghum budget. However, it appears likely that the use of fertilizer in years of above average moisture would result in worthwhile yield increases.

Forage Sorghum

Most of the general comments about grain sorghum apply to production of forage as well. Two kinds of products can be and are produced. These are sorghum for hay or dry forage and for silage. Forage sorghum for silage is presently drilled in 32 to 40 inch rows, although some row planters are used. The usual seeding rate is about eleven pounds, which is too heavy for maximum growth to be obtained from the plants. The desired growth for best quality silage is tall well-developed stalks for maximum sugar production. This is not possible under present heavy seeding rates. Rates should be four pounds per acre. Recommended varieties are Atlas, Sumac 1712, Sugar Drip and Leoti. Planting as early in May as weather permits in order to get ahead of chinch bug migration may be wise. The 32 to 40 inch rows presently used are acceptable. Some cultivation and harrowing to prevent weed competition for moisture is needed.

The same varieties recommended for silage can be used individually or in a mixture to produce hay. The recommended seeding rate is twenty pounds

TABLE X

ESTIMATED PRESENT AND PROPOSED VARIABLE PRODUCTION COSTS AND RETURNS FROM AN ACRE OF FORAGE SORGHUM GROWN ON KIRKLAND-RENFROW-TABLER SOILS IN NORTH CENTRAL OKLAHOMA

Item	Unit	Price	Present				Proposed			
			Silage		Hay		Silage		Hay	
			Amt.	Cost/A.	Amt.	Cost/A.	Amt.	Cost/A.	Amt.	Cost/A.
Seed and treatment	Cwt.	10.00	11	1.10	20	2.00	4	.40	20	2.00
Moldboard	Acre	.67	1	.67	1	.67	1	.67	1	.67
Spring tooth	Acre	.23	2	.46	2	.46	2	.46	2	.46
Drill	Acre	.24	1	.24	1	.24	1	.24	1	.24
Plant	Acre	--	--	--	--	--	--	--	--	--
Cultivate	Acre	1.00	2	2.00	--	--	2	2.00	--	--
Spike harrow	Acre	.21	2	.42	--	--	2	.42	--	--
Spring tooth	Acre	.23	--	--	--	--	--	--	--	--
Fertilizer	--	--	--	--	--	--	--	--	--	--
Cut, put in silo	Ton	2.50	5	12.50	--	--	5	12.50	--	--
Mow	Acre	.29	--	--	1	.29	--	--	1	.29
Rake	Acre	.27	--	--	1	.27	--	--	1	.27
Bale	Bale	.18	--	--	45	8.10	--	--	48	8.64
Haul	Bale	.02	--	--	45	.90	--	--	48	.96
Total Variable Costs				$17.39		$12.93		$19.19		$13.53
Yield	Ton		5		1.5		5		1.6	

per acre. For an emergency crop millet may be used as it matures in 45 to 60 days. Yields on forage sorghum can range from one to four tons of field cured hay per acre. It is drilled in eight inch rows; thus no cultivation is needed. Hay of highest quality will be obtained from cutting when the sorghum is in first boot.

Small Grain for Pasture or Hay

Growing of small grains for pasture or hay is considered by some to be a profitable alternative. Past studies have indicated that forage yields may be doubled by grazing them completely out rather than to stooling as is the common practice. This alternative would also involve selection of small grains with high forage yields rather than for grain production. Recommendations, yields, and costs for this alternative are presented here. These data are used later in an evaluation of the grain versus pasture alternative. A mixture is recommended in the pasture program to obtain such desired characteristics as earlier pasture in the fall, winter hardiness, and abundant spring growth. Although wheat is highly rated by farmers for dependability and palatability, its low forage production relative to other available crops virtually eliminates it from consideration for a pasture mixture. However, this may be changed by the development of new varieties with higher forage yields. Concho is reported to be one of the best pasture wheats. Barley, winter oats and rye, along with hairy vetch, are the crops from which the mixture is chosen. Barley is an early pasture producer and has high total production. A winter hardy variety such as Ward or Rogers should be used. Rye is the hardiest of the crops, provides more mid-winter pasture than others and is a high total forage yielder. Winter oats are among

the top in total production and produce heavy spring growth which remains tender and palatable longer than other crops. Most of the vetch production comes in the spring; however, it may afford some fall pasture if seeded early.

Where early planting is possible due to suitable moisture conditions, the recommended mixture is barley, rye and vetch. In dryer seasons oats could be substituted as they are able to withstand scarcity of moisture in the fall better than barley since their growth occurs mostly in late winter and spring. Recommendations on seeding rates per acre are 15 pounds of vetch, 33 pounds of rye and 28 pounds of barley. Seeding time should be as early as sufficient moisture is available to allow the mixture to germinate and become established.

There is some hesitation on the part of farmers to plant either rye or vetch on land to be used for wheat. This could be solved by planting the pasture on the same land each year rather than rotating. At the end of three or four years this could be rotated back to wheat and a spray used to kill vetch. During the last year or two the mixture would not be allowed to seed to help control rye and vetch. This system might even allow harvest of a vetch seed crop in some years and would allow the vetch to fix a maximum of nitrogen as it matures. Another solution is to never allow the mixture to go to seed. This procedure, along with extreme care in cleaning equipment and handling seed, should prevent contamination of wheat by either rye or vetch. A cost is included in the pasture budget, Table XI, for spraying wheat with 2-4-D if necessary to eradicate volunteer vetch which results from seed planted in a previous seeding.

An application of superphosphate at the rate of 100 pounds per acre will give the pasture a big boost. Increases of 2.5 to 4 times in forage

TABLE XI

RECOMMENDED PRODUCTION PRACTICES AND ESTIMATED COSTS FOR AN ACRE OF SMALL GRAIN PASTURE GROWN ON KIRKLAND-RENFROW-TABLER SOILS IN NORTH CENTRAL OKLAHOMA

Item	Unit	Price	Pasture Mixture[1]	
			Amount	Cost/Acre
Seed and treatment	1	1	75 lbs.	4.52
Moldboard	Acre	.67	1	.67
Springtooth	Acre	.23	3	.69
Drill	Acre	.24	1	.24
Fertilizer	Ton	35.00	.05	1.75
Fence maintenance (including labor)				.50
Spray with 2-4-D[2]	Acre	1.25	1	1.25
Total Variable Cost				$9.62

[1]A mixture of 15 lbs. of vetch, 33 lbs. of rye and 28 lbs. of barley is used. Prices are $.17/lb. for vetch, .03/lb. for rye and .035/lb. for barley.

[2]This is a cost resulting from use of the mixture even though it may not occur during the period the pasture exists. It is assumed the land is rotated annually and that wheat following the mixture must be sprayed for vetch control each spring.

Yields as a result of fertilizer application have been reported.[5] Due to the multiplicity of factors affecting forage production this should not be construed to mean that it is the case each year.

Small grains can be cut for hay rather than grain. Since oats make a great deal of spring growth and retain forage quality longer, they would be selected over a mixture or one of the other crops. The usual yield would be from 1.5 to 2 tons. This does not appear to be as profitable as cutting the grain crop with normal yields. However, when grain yields are low, it might well be a good alternative since hay value is not entirely a function of grain content.

In some instances cutting a hay crop from the mixture may be feasible. The pasture becomes increasingly abundant during spring months. This means that a suitable stocking rate in March may be too light for April. Thus additional animals must be bought in April to utilize this growth or the stocking in March must be heavy, resulting in more use of supplementary feeds. The supplementary feeding could be done by using hay cut from excessive small grain growth the previous year. Either or both of these alternatives may be practiced, depending on pasture conditions and cattle prices. Election of the alternative for fairly stable numbers during the season would appear to be sensible. It would take advantage of complimentarity between dry feeds and small grain pasture and it would allow the farmer to sell his cattle as one fairly homogeneous lot. Storing of hay would tend to add to the farmer's flexibility with a low risk of small amount of capital funds or income.

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[5]Horace J. Harper, A Study of Phosphate Fertilization and Legume Rotations for Small-Grain Winter Pastures, Oklahoma Experiment Station Bulletin No. B-414, pp. 16-17.

Sudan Pasture and Hay

Use of sudan pasture is not uncommon in the area. At the present time it is most frequently used when native pasture is not adequate for the size of the cow herd. In some years part of the sorghum included in the present plan might be sudan. It would supply part of the forage presently fed in August under present plans.

The same land preparation used for sorghums is suitable for sudan. It should be drilled in mid-May at a rate of 20 pounds per acre. Drills should be adjusted so that 16 inch rows are obtained. Sudan may be seeded as soon as danger of killing frost has passed. This might result in higher forage production as a result of taking advantage of spring rains. Two cuttings are expected with a total yield of 1.6 tons per acre. The first cutting would come about six weeks after planting.

Grazing should not be allowed until plants reach a height of 18 inches. For sudan drilled in mid-May, grazing would start about July 1. Rotation grazing should be practiced to allow plants to get growth ahead of the cattle. Sudan completes its growth cycle by the end of August unless overgrazing or drought affect it prior to that time. The farmer could plant an acreage in mid-June for August and September grazing. Grazing rates calculated to remove 1.6 tons of dry forage are assumed here with normal rainfall. The yield of 1.6 tons is, of course, a long-term estimate which takes into account variations in rainfall. Sudan pasture should be rotated with other crops to prevent weed or soil structure difficulties.

In the following discussion, returns to land, labor and capital are referred to for the various crops. These are summarized in Table XIII, rendering it useful as a reference in following the discussion. Wheat has

TABLE XII

RECOMMENDED PRODUCTION PRACTICES AND ESTIMATED COSTS FOR AN ACRE OF SUDAN PASTURE AND HAY GROWN ON KIRKLAND-RENFROW-TABLER SOILS IN NORTH CENTRAL OKLAHOMA

Item	Unit	Price	Amount	Cost/Acre
Seed and treatment	Lb.	$ .08	20	1.60
Moldboard	Acre	.67	1	.67
Spring tooth	Acre	.23	2	.46
Drill	Acre	.24	1	.24
Fencing				.50
Mow	Acre	.29	1	.29
Rake	Acre	.27	1	.27
Bale	Bale	.18	48	8.64
Haul	Bale	.02	48	.96
Labor	Hour	1.00	.75	.75
Variable Costs		Pasture - $3.47		Baled - $14.38

TABLE XIII

ESTIMATED COSTS, YIELDS AND RETURNS WITH PRESENT PRACTICES AND WITH PROPOSED PRACTICES FOR ONE ACRE OF ALTERNATIVE CASH CROPS IN NORTH CENTRAL OKLAHOMA

	Wheat		Oats			Barley		Alfalfa		Grain Sorghum	
	Present	Proposed	Present	Proposed		Present	Proposed	Present	Proposed	Present	Proposed
				Fall	Spring						
Variable cost per acre	5.18	6.95	4.82	6.61	6.61	5.21	7.01	10.80	18.51	3.25	3.09
Yield per acre	15	17	21	35	27	19	26	1.2	1.6	14	17
Price per bu. or ton	1.85	1.85	.80	.80	.80	1.09	1.09	25.00	25.00	1.22	1.22
Total Sales	27.75	31.45	16.80	28.00	22.40	20.71	28.34	30.00	40.00	17.08	20.74
Rent Paid rate 1/3 to 2/3	9.25	9.90	5.60	8.75	6.62	6.90	8.87	7.12	7.88	5.69	6.91
Return to capital and labor of operator	13.32	14.60	6.38	12.62	8.37	8.60	12.46	12.08	13.61	8.14	10.74
Return to capital, labor and land	22.57	24.50	11.98	21.39	14.99	15.50	21.33	19.20	21.49	13.83	17.65
Return per $1 of variable cost	5.36	4.52	3.48	4.24	3.39	3.98	4.04	2.78	2.16	5.26	6.71

the greatest returns to the fixed factors under the level of support price assumed. Oats, barley and alfalfa are all about equal in returns to land, labor and capital. Table XIII does not include a value of supplementary pasture forthcoming from these crops. Though no computations are presented here, it is safe to say that the value of the pasture from the small grains will give the returns advantage to oats or barley. The value of pasture is evaluated in later sections.

Oats and barley require identical production resources. They are competitive crops with more oats being produced only by a reduction in barley production. Therefore, it follows that one would be substituted for another as long as a gain in return is made. Since returns to land, labor and capital are the same, we must look further for an advantage of one over the other.

Experimental results have shown that barley produces pasture earlier in the fall than all other small grains, including oats. Oats produce the majority of their forage in the spring. This is significant because if a grain crop is taken any forage utilized must be produced earlier than spring since livestock would be removed in March. Barley thus provides longer grazing than oats. It would compliment wheat pasture in producing beef by supplementing it in late fall and early winter. This would result in a longer grazing season and less need for hay to feed cattle held over from native pasture. These considerations appear to give barley a real advantage over oats.

It was pointed out in a previous discussion of barley that oats are preferred over barley as a crop by the majority of farmers. It is believed that this preference results from the fact that barley is a favorite host of chinch bugs and that the area in question is a region where these

insects may be a problem. Chinch bugs feed to a lesser extent on oats. Analysis of variety test yields at Cherokee and Stillwater does not show greater variability in barley yields than oats. It must be concluded from this, that regardless of the factors affecting yields of the crops, the range of values is approximately the same for income forthcoming from either crop. This still leaves the advantage with barley except for one consideration which is difficult to evaluate. The effect of increased acres of barley on the chinch bug cycle and degree of infestation in a given year is not known. An increase in availability of the insect's favorite winter food, combined with a dry, mild year, could result in an effect on yields of all crops not accounted for in our variability calculations. This possibility indicates the necessity of considering the ratio of risk to gain. In this case there may well be a high risk resulting from unknown variables from which a rather small gain is expected. This may explain the farmer preference for oats over barley though he may not have a full knowledge of income possibilities.

Agronomists indicate that barley has proven more drought resistant than oats providing moisture is available in the seedling stage. An oat stand can be established on a small amount of moisture but may not be maintained if a drought occurs. This might give some basis on which to select a crop. If moisture is normal or better, barley could be planted and early pasture would be expected. With less than normal rainfall, the possibility of early pasture lessens. Oats might be planted with a small amount of moisture with the expectation of later rains to maintain the stand.

Barley is used in budgets of farm systems in this thesis. It is regarded as identical to oats except for additional pasture. The recommendation is to switch to oats in some years for moisture reasons stated above

and to avoid planting barley during the heavy part of chinch bug cycles. Information on these cycles can be obtained in part from entomologists.

Though not specifically pointed out, the farmer criteria which were set up in Chapter II have been covered in the crop evaluation. Most emphasis was given to the returns to capital, land and labor. It was pointed out that the small grains which seem to be most profitable require identical resources in terms of land and capital. Barley has a slightly higher per acre cost through the harvest operation. The relative risks of crops under consideration were evaluated except for pointing out the difference in risk due to variable cost differences. Flexibility, defined as allowing reallocation of resources quickly and with low capital loss, is equal for the crops.

Selection of the most profitable crop on a returns to one acre of land plus necessary capital and labor basis implies that acres are the effective limiting factor. It can be safely assumed that labor is not limiting in this area of high mechanization and low labor using crops. However, capital may well be more restricting than acres. To allow for this very real possibility the crops are ranked for priority of capital use.

Table XIII, line 8, shows the returns forthcoming for each one dollar invested in the form of variable costs. This is useful as a means of determining where limited funds should be used to maximize profits. Up to now discussion has been confined to returns to one acre of land plus necessary labor and capital as the profit criteria. This implies that the supply of land limits the level to which income may rise in this short run, problematic area. The farmer may find that some of his funds should be shifted at the expense of returns to land in order to increase profits. For

example, if land is available, $6.18 could be spent on two acres of grain sorghum with a total of $35.30 returns to fixed factors. This same $6.18 (really $6.61) when spent on oats would return only $21.39 to the fixed factors of production.

Though the assumption followed in this thesis is that capital is available in sufficient quantities to allow maximization of returns to acres, the above should point out that the case may be otherwise. We can reduce this assumption in making whole farm plans by setting a level of capital input which is available, or which the farmer wishes to employ. The budgeting procedure used here prevents by time requirement the testing of all possible alternatives for employment of the resources.

Table XIV shows the returns forthcoming from feed crop alternatives. These returns are lower than those possible if cash crops are grown. Sorghum silage returns to fixed factors are about equal to those of alfalfa hay. Capital requirements for silage do not differ greatly from those for growing alfalfa as the digging and maintenance of a trench silo would approximate costs of owning a baler and rake. Baling and silo filling costs are custom operations on most farms. It should be noted that variable costs are high on the forage crops as a result of the harvest costs. Total variable costs are proportional to production for a given year. Returns per one dollar invested in variable costs are low relative to cash crop opportunities. Since there is no market price for a crop such as silage, its value is computed by the value of a feed such as alfalfa it replaces in a ration. Values of all other forages were approximated by their feeding value relative to alfalfa.

The budgeting method allows an average situation to be worked with, thus we select crops which maximize and/or minimize the farmer criteria in

TABLE XIV

ESTIMATED COSTS, YIELDS AND RETURNS WITH PRESENT PRACTICES AND WITH PROPOSED PRACTICES FOR ONE ACRE OF ALTERNATIVE FORAGE CROPS IN NORTH CENTRAL OKLAHOMA

	Alfalfa		Forage Sorghum				Oat Hay	Sudan Hay
			Silage		Hay			
	Present	Proposed	Present	Proposed	Present	Proposed	Proposed	Proposed
Variable Cost per A.	10.80	18.51	17.39	16.48	12.93	13.53	16.56	14.38
Yield per Acre	1.2	1.6	5	5	1.5	1.6	1.5	1.6
Price per Ton	25.00	25.00	7.50	7.50	17.00	17.00	15.00	17.00
Gross values of prod.	30.00	40.00	37.50	37.50	25.50	27.20	22.50	27.20
Return to capital and labor of operator	19.20	21.49	20.11	21.02	12.57	13.67	6.00	12.82
Return per $1 of variable cost	$2.78	$3.18	$2.16	$2.28	$1.97	$2.01	$1.36	$1.89

various ways assuming an average set of conditions. However in some very short-run situations, these average conditions will not exist and decisions will have to be made. An example is a winter small grain crop that has been lost due to weather or insects. The decision that must be made then is whether to plant a summer crop of grain sorghum and follow this by winter seeded oats, or to summer fallow and go back to the usual small grains the next fall. On wheat land the decision must be to plant wheat in the fall to avoid losing allotment acres. In the case of a barley failure, it appears profitable to adopt the grain sorghum - oat sequence so that in the two year period, returns to fixed factors would be $33.50 instead of the $21.43 possible from one crop of barley in two years. These are the types of choices that will be required in short-run situations which cannot be foreseen and planned for in our budgeting. Data in Tables XIII and XIV may prove useful in making such choices.

CHAPTER V

EVALUATION OF PRESENT LIVESTOCK PRACTICES AND ORGANIZATIONS WITH POSSIBLE ALTERNATIVES

Development and discussion of livestock alternatives is in two phases. The first is largely a comparison of systems. These involve the overall plan of livestock production such as cow-calf and stocker-feeder systems. Systems are in turn made up of other choices such as kind of product to produce, feeding plans, grazing rates, timing, etc. Though most emphasis here is on selection of the livestock system, it is realized that the choice of alternatives within systems is at least as important as the selection of the more suitable system. Systems and alternatives within systems were selected for budgeting which are likely to lead to most satisfactory results when evaluated by the use of the established criteria - profit, risk, flexibility and capital or labor requirements. It is assumed that the farmer would carefully evaluate such alternatives as feeding alfalfa hay versus cotton seed cake, good versus common grades or light versus heavy weights of animals to sell so that decisions could be made to fit his own situation. These would likely change more often than the choice of an overall livestock system.

Within this first phase of discussion the present cow-calf system is compared with others which appear to fit the available resources. The second part is a comparison of the alternative of growing a pasture crop such as small grain mixture with that of a cash barley crop.

The present cow-calf system, which has been previously described, is not well suited to the feed supply in the area. Feed and pasture are more abundant in winter than summer but their availability is very variable. This indicates that means of utilization should be flexible, but flexibility is not an outstanding characteristic of the cow-calf enterprise. A budget of the present livestock system appears in Table XV. In Table XVI can be found the feed and pasture calendar along with total feed requirements. Feed needs are based on total digestible nutrient requirements, however these were adjusted to reflect present feeding practices in the area. The assumption in this budget and those following is that 180 acres of small grain pasture and 104 acres of native will be available for utilization.[1] The items varied are kinds or classes of cattle, feeding rates and timing. In the final chapter these data are used, with adjustments for acres of pasture, feed, etc., made on a percentage basis. It may be noted that in some months alfalfa hay is fed at the rate of 23 pounds per A.U. per day. Actually, this feed might be made up of C.S.M. and a low protein roughage or a combination of alfalfa hay, C.S.M. and low protein roughage. This is shown as all alfalfa hay for simplification and the assumption is made that existing prices allow this substitution.

Present stocking rates on native pasture are too heavy, resulting in feeding during months when pasture should be available. The herds are not large enough to fully utilize wheat and oat pasture, thus it is undergrazed. The budget in Table XVII and the pasture and feed use plan in Table XVIII represent one proposed solution to the present inadequacy of the livestock system. The cow herd has been cut in half to reduce

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[1]See this thesis, page 7, par. 4.

TABLE XV

ESTIMATED COSTS AND RETURNS RESULTING FROM UTILIZATION OF SMALL GRAIN AND NATIVE PASTURE ON A 480 ACRE FARM IN NORTH CENTRAL OKLAHOMA UNDER THE PRESENT COW-CALF PLAN[1]

No. of A.U./yr.	24	Value/Animal	Total Value
No. of cows	16	$135.00	$2160.00
Replacements	4	135.00	540.00
Bulls	1	300.00	300.00
Calves	15	60.00	900.00
			$3900.00

Production Sold	Kind	No.	Weight	Price/Cwt.	Receipts
Cow	Culls	3	2700 lbs.	13.70	369.90
Replacement	Cull	1/2	400 lbs.	18.45	73.80
Bull	Cull	1/3	400 lbs.	16.45	65.80
Calves	Short yearlings	11	66000 lbs.	20.85	1376.10
					$1885.60

Variable Costs	Unit	No.	Price	Total Cost
Vet. expense	An.	36	.45	16.20
Minerals	An.	36	.20	7.20
Hauling and commissions	An. sold	15	3.00	45.00
Alfalfa Hay	Ton	25	25.00	625.00
Sorghum Hay	Ton	19	17.00	323.00
Bull	each	1/3	300.00	100.00
Total Variable Cost				$1116.40
Return to Pasture, Labor and Capital				769.20
Investment in Cattle (Av. 12 months)				$3900.00

[1]104 acres of native pasture stocked at the rate of 1:4.5 for 6 months. Is a cow-calf enterprise with calves born in March and April sold as good to choice feeder-stockers in late February or early March. Only the cow-calf herd is allowed to run on small grain pasture with a resulting grazing rate of 1:7.5 on 180 acres of small grain.

TABLE XVI

PRESENT TYPICAL PASTURING AND FEEDING PLAN FOR COW-CALF HERD ON A 480 ACRE FARM IN NORTH CENTRAL OKLAHOMA

Feed	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
Native Pasture	.000	.000	.000	.3[1]	1.0	1.0	1.0	.3	.1	.1	.000	.000	1:45 for 6 mo.
Small Grain Pasture	.8	.9	--	--	--	--	--	--	--	--	--	.9	
Crop Residue	--	--	--	--	--	--	--	--	.2	.2	.2	--	
Alfalfa Hay	.1 1620[2]	.05 810	1.0 16200	.7 11340	--	--	--	.2 3240	.3 4860	.3 4860	.4 6480	.05 810	25 T.
Sorghum Fodder	.1 1917	.05 959	--	--	--	--	--	.5 9585	.4 7668	.4 7668	.4 7668	.05 959	18 T.
Cattle Inventory	24 A.U. Cow-Calf Herd												

[1]Part of the total animal unit month requirement provided to the herd by different feed sources.

[2]Pounds of feed needed to supplement the available pasture.

TABLE XVII

ESTIMATED COSTS AND RETURNS RESULTING FROM UTILIZATION OF SMALL GRAIN AND NATIVE PASTURE ON A 480 ACRE FARM IN NORTH CENTRAL OKLAHOMA[1]

		Beginning of Period				Sales			
Kind	Period	No.	Wt.	Price	Value	No.	Wt.	Price	Value
Cows	12 mo.	8	900-1000	$135.00	$1080.00	1 cull	900	$13.70	$123.30
Rep'l Heifers	12 mo.	2	600-800	135.00	270.00	---	---	---	---
Calves	Spring calves sold Mar.1	8	---	---	---	6 stocker feeders	600	20.85	750.60
Bull	12 mo.	1/2	---	---	150.00	---	---	---	---
Gd to Ch feeder stocker steers	Dec.-Feb.	40	550	19.05	4191.00	40 stocker feeders	685	20.85	5712.80
TOTAL SALES									$6586.70

Investment in Cattle - $1750.00 for 9 months
7650.00 for 3 months

Weighted Average for the 12 months - $3225.00

Variable Costs	Unit	Amount	Price	Total Cost
Steers	Lb.	22,000	$19.05	$4191.00
Alfalfa Hay	Ton	8	25.00	200.00
Sorghum Hay	Ton	13	17.00	221.00
Vet Expense				
Cow Herd	An.	19	.45	8.55
Steers	An.	40	.30	12.00
Minerals	An.	59	.20	11.80

TABLE XVII (Continued)

Variable Costs	Unit	Amount	Price	Total Cost
Hauling and Commission				
Cow Herd	An. sold	8	3.00	24.00
Steers	An. sold	40	7.00	280.00
Bull	An.	1/6	300.00	50.00
Death loss	2 percent of steer sales			114.00
Total Variable Costs				$5112.35
Returns to Pasture, Labor and Capital				$1474.35

[1]The present plan as explained in the preceding budget is cut in half here to reduce grazing intensity on the native grass. Additional steers are purchased in November to utilize small grain pasture. Gains are 1.5 lbs. on small grain stocked at 1 A.U. to 5 acres. Feed requirements are based on T.D.N. requirements plus a margin for flexibility. A dry forage, named sorghum hay here, is fed when cattle are on small grain pasture. Alfalfa hay feeding is provided for when wheat cannot be grazed due to unfavorable weather.

the grazing intensity on native. Additional steers are purchased in November to utilize small grain pasture. It was determined that about 40 steers weighing 550 pounds could be grazed in most years on the 180 acres of small grain assumed. These would gain about 1.5 lbs. per day for the 90 day period, December through February. Prices used are for good to choice quality cattle though lower qualities might well be used under varying price situations.

The difference in returns to land, labor and capital between this plan and the present are attributed to lower feed expenses and fuller utilization of small grain pasture. Part of the saving in feed expense comes about by the reduction of stocking rate so that feeding is not

TABLE XVIII

PASTURE AND FEED PLAN FOR COMBINED COW-CALF AND FEEDER-STOCKER PLAN ON A 480 ACRE FARM IN NORTH CENTRAL OKLAHOMA

Feed	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
Native Pasture	.000	.000	.000	.000	1.0[1]	1.0	1.0	1.0	1.0	1.0	.000	.000	1:9 for 6 mo.
Small Grain Pasture	.8	.9									.5	.9	
Crop Residue											.4 --		
Alfalfa Hay	.005 2000[2]	.005 2000	.5 4050	.5 4050	-- --	-- --	-- --	-- --	-- --	-- --	.05 2000	.005 2000	8 Tons
Sorghum Fodder	.195 6000	.095 4000	.5 5000	.5 5000	-- --	-- --	-- --	-- --	-- --	-- --	.05 2000	.095 4000	13 Tons
Cattle Inventory: Stocker-Feeder	40	40										40 hd.	
Cow-Calf Herd	12 A.U. Cow-Calf Herd for entire year												

[1] Part of total Animal Unit month requirement provided to the herd by different feed sources.

[2] Pounds of feed needed to supplement the available pasture.

necessary during the six months, May through October. Saving is realized too in March and April as there are only twelve A.U. to feed instead of the 24 in the present plan. The saving on feed in November comes in two ways, only one of which, the reduction in numbers requiring feed, can be credited to the change in livestock systems. Use of barley rather than oats reduces the hay requirement by providing early pasture but this cannot be attributed to the differences between livestock systems. The fuller utilization of small grain pasture comes as a result of buying additional animals to use available pasture resulting in greater gains per acre. Table XIX summarizes the differences between the plans.

The third alternative does away with a cow herd all together. Twenty steers weighing 350 pounds are purchased in May to put on native pasture. This is a stocking rate about like that for the cow herd in the preceding alternative. These steers gain .95 lbs. per day on native grass during the summer, thus after 210 days weigh 550 lbs. This period includes November, during which early barley pasture, crop residue and hay are used to carry animals until small grain pastures start in December. In the final chapter the crop residue is replaced by hay in systems where sorghum and alfalfa are not grown. In the event of a very unfavorable summer for grass, all or part of these steers could be sold and others purchased later if small grain pasture is available. This gives flexibility at a lower cost than was possible under the plans previously discussed as the product would be readily salable at any time. In late November additional animals, normally 40, would be purchased for winter grazing. The sixty would weigh 685 pounds by March with a rate of gain of 1.5 pounds per day. Due to the seasonally high

TABLE XIX

ESTIMATED COSTS AND RETURNS RESULTING FROM UTILIZATION OF SMALL GRAIN AND NATIVE PASTURE ON A 480 ACRE FARM IN NORTH CENTRAL OKLAHOMA USING A BUY-SELL[1] TYPE LIVESTOCK OPERATION

Kind	Inventory - (Beginning of Period) for Period	No.	Wt.	Price	Value	Sales No.	Wt.	Price	Value
Gd. to Ch. feeder stocker steers	May-Feb.	20	350	22.91	1603.70	20	685	20.85	2856.40
"	Dec-Feb.	40	550	19.05	4167.20	40	685	20.85	5712.80

Investment in cattle average $1850.00 for 7 months
7416.20 for 3 months

Weighted average for 10 months = $3519.86

Variable Costs:	Unit	Amount	Price	Total Cost
Steers	Lb.	7000	22.91	1603.70
Steers	Lb.	22000	19.05	4191.00
Alfalfa-Hay	Ton	4	25.00	100.00
Sorghum fodder	Ton	8	17.00	136.00
Vet. expense	Animal	60	.40	24.00
Minerals	Animal	60	.15	9.00
Hauling and Commissions	Animal	60	7.00	420.00
Death loss	2 percent of steer sales			171.38
				$6655.08
Returns to Pasture, Capital and Operator's Labor				1914.12

[1]Native stocking rate, 1:10 for 6 months. Buy for native in May and graze until November or later. Sell in late February to early March. Buy 350 lb. calves which gain .95 lb. for 210 days, May to November. Buy 40 additional steers weighing 550 lbs. when and if wheat pasture is available. Graze the 60 head until March 1 and sell 685 lb. feeders. Gain on small grain is 1.5 lbs. per day for 90 days. Stocking rate is 1:5 or 3.0 acres per steer. Alfalfa hay fed during estimated 10 days when small grain cannot be pastured. Sorghum hay is fed free choice to better utilize protein content of small grain pasture.

TABLE XX

PASTURE AND FEEDING PLAN FOR A STOCKER-FEEDER PROGRAM ON A 480 ACRE FARM IN NORTH CENTRAL OKLAHOMA

Feed	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
Native Pasture	.000	.000	.000	.000	1.0[1]	1.0	1.0	1.0	1.0	1.0	.000	.000	1:10 for 6 mo. Steers=.5A.U.
Small Grain Pasture	.8	.9	--	--	--	--	--	--	--	--	-- .5	.9	
Crop Residue	--	--	--	--	--	--	--	--	--	--	.4	--	
Alfalfa Hay	.005 2000[2]	.005 2000	-- --	-- --	-- --	-- --	-- --	-- --	-- --	-- --	.05 2000	.005 2000	4 Tons
Sorghum Fodder	.195 6000	.095 4000	-- --	-- --	-- --	-- --	-- --	-- --	-- --	-- --	.05 2000	.095 4000	8 Tons
Cattle Inventory: Stocker -60 Feeder	60	0	0	20	20	20	20	20	20	20	60		

[1]Part of total animal unit month requirement provided to the herd by different feed sources.

[2]Pounds of feed needed to supplement the available pasture.

price in May,[2] a three cent loss in price is taken on the 20 animals purchased then. A small gain in price is obtained on the fall purchased cattle. The loss is a cost of flexibility in the operation but the gain in returns to land, labor and capital indicate the desirability of the plan. Gains in this plan over previous ones are the result of feed savings and efficiency of the steers. It is true of the steer operation that gains put on the animals can be sold. In order for a cow herd to compete with efficiency of the steers, productivity of feeds must be carefully controlled. That is, gains forthcoming from feeds and pasture are profitable only if they show up directly or indirectly in weight and quality of the salable product.

Table XXI is useful in analysis of the major differences between the livestock systems. The most important difference is the feed requirement. Thus if assumptions relating to these feed requirements are very far wrong, the effect on results might be significant. It is probable that the most extreme error which could be made with regard to feed is that feed costs are the same between all plans. Line three of Table XXI gives a comparison of the systems with this being the case. The systems maintain their relation to each other but with lesser degree of difference. Capital required is considered to be a major point upon which the farmer would base a choice of system. Line four indicates that capital requirements are not greatly different for the plans on the average. It is true that in the winter periods a high investment is necessary with the buy-sell operation. A charge is included in variable costs for death loss.

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[2]James S. Plaxico and Jackson L. James, "Beef Cattle Prices," Oklahoma Experiment Station Bulletin No. B-486, pp. 9-17.

This was based on the death percentage used for 16 year pasture records kept at the Woodward Experiment Station. This percentage has been doubled due to the concentration of animals in cold weather. A charge is included for vaccination with penicillin as this may be necessary when buying and selling cattle. A cow herd requires some level of capital risk throughout the year. As this is not an annual expenditure, it is sometimes regarded as less risky than the buy-sell operation which requires an annual cash outlay. It should be realized that the continued investment in cows does constitute allocation of dollar resources the same as purchase of steers.

TABLE XXI[1]

A COMPARISON OF LIVESTOCK SYSTEM ALTERNATIVES FOR A 480 ACRE FARM IN NORTH CENTRAL OKLAHOMA

	Present (Cow-calf)	Cow-Calf Buy - Sell	Buy-Sell
Returns to fixed factors	769.20	1474.35	1914.12
difference from present	--	705.15	1144.92
Feed Costs	948.00	421.00	236.00
difference from present	--	527.00	712.00
Returns to fixed costs (feed excluded)	1717.20	1895.35	2150.01
Average investment - amount	3900.00	3225.00	3519.86
- period	12 months	12 months	10 months
Variable costs excluding cattle purchased	1016.40	921.35	860.38

[1]Source of data are Tables XV, XVII, XIX of this thesis. The alternative systems are explained in the respective tables.

Another basis upon which the farmer might select his livestock system is the amount and quality of labor and/or management required. The practice of buying cattle of a specifically desired kind and quality requires both skill and time. Though many farmers would have the time and skill, this may be a valid criticism of the proposed systems. To lessen the economic weight of this criticism, a charge has been made in each of the buy-sell operations for costs of purchase. This was made on the basis of order buyer charges for selecting a class of cattle desired. Hauling charges are also included. It is probable that greater operational skill is required with a cow-calf herd than a steer-heifer operation.

These comments conclude consideration of the farmer criteria set forth in the beginning. Final choice of a system is dependent upon the farmer's weighting of the criteria's importance. In any case, it seems that the shift away from cow-calf herds results in maximization and/or minimization of the relevant criteria.

A choice the farmer must make is between a cash crop such as barley and a land use involving direct utilization of the crop by livestock. These would include mostly pasture crops since forage crops were assigned a value relative to alfalfa and compared in Chapter IX. Small grain pasture is the alternative to be evaluated here. It is compared with a cash barley crop which, along with oats, is the most profitable cash crop after wheat.

Table XXII provides the data necessary for the small grain pasture mixture evaluation. Returns resulting from the decision to graze a mixture, rather than combine barley, come in a number of ways. The first but most uncertain way is from earlier pasture in the fall. This results from presence of barley in the mixture and early planting. It is valued

TABLE XXII

ESTIMATED COSTS AND RETURNS RESULTING FROM UTILIZATION OF AN ACRE OF SMALL GRAIN AS A PASTURE CROP ON A 480 ACRE FARM IN NORTH CENTRAL OKLAHOMA

Returns	Gain	Price	Value
Early pasture	15 lbs.	$21.25	3.19
Higher stocking rate	5 lbs.	21.25	1.06
Spring grazing	113	21.25	24.01
Price advantage			2.74
Total returns to one acre			$31.00

Variable Costs:	Unit	Amount	Price	Cost
Pasture costs	Acre	1	9.62	9.62
Vet expense	steer	1	.20	.20
Minerals	steer	1	.10	.10
Sorghum hay	Cwt.	2	.60	1.20
Death loss (2 percent of the steer value, $163.67)				3.20
				$14.32
Net returns to one acre of land plus necessary labor and capital				$16.68

in the budget as 30 additional days grazing in the fall at a stocking rate of 1 A.U. per five acres with a rate of gain of 1.5 pounds per day. For the steers used in the plan this would result in 15 pounds of gain per acre.[3]

Due to the use of a mixture, planted early especially for pasture, somewhat higher stocking rates could be expected during the usual grazing period, December 1 through March 1. One A.U. to 4.5 acres of small grain mixture is used as a stocking rate. This results in additional income over that forthcoming from small grain planted for grain. Whereas the gain expected from one acre is 45 pounds for the 90 day period at a stocking rate of 1 to 5, the gain would be 50 pounds at the rate of 1 to 4:5. This is a net of 5 pounds of beef to credit to the mixture.

The period, March 1 to May 15, provides most of the returns for this alternative. Here the stocking rate is 1 A.U. to 1.4 acres of 1.0 acre for the steers used, which are .7 of an A.U. The gain in beef forthcoming is 1.5 pounds per day on 1.0 acres. There is then a net gain of 113 pounds over 75 days. The total additional beef forthcoming is 15 / 5 / 113 = 133 pounds.

Data by Plaxico and James indicate that traditionally a gain in price per pound would be obtained by waiting from March to May to sell the class of cattle used. The class used, as in previous budgets, is good to choice feeder-stocker steers bought in the fall weighing 500 pounds, and in this case, sold in May weighing 785 pounds. The prices, using 1950-55 levels, would be $20.85 if the animal were sold in March and $21.25 if sold in May.

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[3] 1 A.U.:5 acres is comparable to .6 A.U.:3 acres. The 500 pound steers then at 1.5 pounds per day would gain 45 pounds on 3 acres in 30 days or 15 pounds per acre in 30 days.

Assuming a 685 pound steer is sold in March under a plan where grain is harvested, this additional $.40 per hundred times 685 pounds is a credit for the pasture mixture crop.[4]

Table XXII shows selected variable cost items relating to this alternative. Costs are allocated to one acre according to the stocking rate. The returns forthcoming are enumerated and given a value. The residue remaining is $16.68 from which rent on the land (or interest and taxes), labor and capital costs are still to be paid. In comparing this alternative with barley, we may refer back to Chapter IV and find the corresponding figure of $21.33 for barley. It is therefore unprofitable to adopt the grazing alternative. It should be pointed out that the grazing rates are strictly estimates of average rates over a period of years. They may therefore vary a great deal. It is evident though that a stocking rate to allow competition with cash barley must be heavy.

Utilization of crops other than small grain for pasture has not been budgeted here. This decision was reached after the small grain pasture mixture made a weak showing as a substitute for a cash small grain crop. Since other crops are less profitable than small grains, due to area adaptation, it is evident that pasture crops likely have the same relationship. The possibility of complimentarity between inputs should not be overlooked. That is some combinations of time of buying cattle and a pasture crop may result in additional profit over that otherwise possible. An attempt to take advantage of complimentarity is made in the organization of whole farm systems of resource use.

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[4]685 pounds x $.40 = $2.74 is the credit for the price advantage with a one steer per acre stocking rate.

CHAPTER VI

COMPARISON OF PRESENT AND ALTERNATIVE FARMING SYSTEMS

All tables, budgets and discussion thus far were designed to provide data for this chapter. The stage has now been reached in the planning process where comparisons of resource uses can be made on a whole farm basis. Previous chapters have allowed comparisons between alternative enterprises and practices.

Again, the established farmer criteria for allocation of resources can be used. These are profitableness, amount of risk assumed, flexibility allowed and capital or labor requirements. The procedure will be to combine enterprises into different farm organizations in such a way as to result in varying degrees of maximization and minimization of the criteria. It is not possible to compare all resource combinations by the budgeting process because of time limitations. It is intended that the three farm organizations budgeted be those most useful to a farmer faced with making immediate resource use decisions.

The data for the following budgets are obtained from the various crop and livestock alternatives budgeted previously. For example, cash production costs for barley are obtained by multiplying per acre costs computed in Chapter IV by number of acres of barley in the plan. Total sales for a crop are obtained similarily. Livestock expenses and receipts are determined by use of the livestock budgets in Chapter V. Some adjustment for numbers of animals is necessary when working with

the "buy-sell - cash grain" alternative due to the increased amount of winter pasture. These same data can be used by farmers or other agricultural workers in comparing other possible resource use systems. Adjustments can be made where necessary to fit particular situations such as larger farms, less fertile soils and personal preferences.

A partial budget of the present typical farm organization is presented in Table XXIII. This organization was discussed in Chapter III. It is described as a "cow-calf - roughage - cash grain" system. Observed weaknesses in this system, measured by degree of farm family goal attainment, have been indicated throughout this thesis. These observations are the bases of changes in alternatively proposed systems.

Table XXIII also contains a budget of the present organization with improved practices. These practices were outlined in Chapter IV for the specific crops involved. Typical changes are use of fertilizer, selection of higher quality or adapted seed and adjustment of seeding dates. This budget is prepared to measure the effect of adoption of recommended practices, thus the present land uses are held constant with the exception of a few feed crop acres.

Grazing intensity is regarded as a practice, thus the present heavy stocking rate on native grass was corrected. This was done by cutting the usual size of cow herd in half. The reduction in cow herd size results in under utilization of small grain pasture unless additional animals are purchased. For this reason stocker-feeder steers are purchased in the fall depending on the availability of pasture. As a result of the decrease in cow numbers, less hay is needed and the excess is sold. Forage sorghum acres not needed for hay production are converted to grain sorghum.

TABLE XXIII

THREE ALTERNATIVE CROPPING SYSTEMS FOR A 480 ACRE FARM IN NORTH CENTRAL OKLAHOMA

	Crop					
	Wheat	Oats	Grain Sorghum	Alfalfa	Forage Sorghum	Total
Alternative: Present with Present Practices "Cow-Calf - Cash Grain - Roughage"						
Acres	216	90	20	21	13	360
Production	3240 bu	1890 bu	280 bu	25.2 T	19.5 T	---
Amount Sold	3240 bu	1818 bu	170 bu	---	---	---
Receipts $	5994	1454	207	---	---	7655
Cash expense $	1106	430	64	227	168	1995
Present with Improved Practices "Cow-Calf - Cash Grain - Roughage"						
Acres	216	90	23	21	10	360
Production	3672 bu	3150 bu	391 bu	33.6 T	16.0 T	---
Amount Sold	3672 bu	3078 bu	281 bu	25.6 T	3	---
Receipts $	6793	2462	343	640	51	10289
Cash expense $	1486	590	69	389	135	2669
"Buy-Sell - Cash Grain"		Barley				
Acres	216	144	---	---	---	360
Production (Bu)	3672	3744	---	---	---	---
Amount Sold (Bu)	3672	3574	---	---	---	---
Receipts $	6793	3895	---	---	---	10688
Cash Expense $	1486	995	---	---	---	2481

TABLE XXIV

THREE ALTERNATIVE LIVESTOCK SYSTEMS FOR A 480 ACRE FARM IN NORTH CENTRAL OKLAHOMA

	Cattle					
	Cows	Replacements	Bulls	Calves	Feeder Stockers	Total
Alternative						
Present with Present Practices "Cow-Calf Cash Grain - Roughage"						
Number	16	4	1	15	--	--
Product sold	cull	cull	cull	600 lb. feeder	--	--
Amount sold	3	1/2	1/3	11	--	--
Value $	370	74	66	1376	--	1886
Present with Improved Practices "Cow-Calf - Cash Grain - Roughage"						
Number	8	2	1/2	8	40	--
Product sold	cull	--	--	600 lb. feeder	685 lb. feeder	
Amount sold	1	--	--	6	40	
Value $	123	--	--	751	5713	6587
"Buy-Sell - Cash Grain"						
Number	--	--	--	--	72	--
Product sold	--	--	--	--	685 lb. feeder	--
Amount sold	--	--	--	--	72	--
Value $	--	--	--	--	10,283	10,283

The third alternative in Table XXIII is called a "buy-sell - cash grain" system. The plan is to select the most profitable crop, excluding wheat, and to grow it to the exclusion of all others. The crop used is barley; however, oats would be equally as profitable except for the additional grazing afforded by barley. The present cow-calf system is replaced by a buy-sell steer operation. Steers are bought in May to utilize native pasture and again in November to utilize small grain pasture. Use of land to produce the less profitable forage crops is avoided by growing barley and buying hay with a portion of the receipts.

The three farming systems budgeted are summarized in Table XXV. This table will be useful for reference in the following system comparisons. These comparisons are made by considering in order the previously named farmer tests.

Differences in returns between present systems with present and improved practices emphasize the importance of the better practices. Use of fertilizer, fall seeding of oats and adjustment of pasture stocking rates account for most of the $2000 increase in returns to capital, labor and land. An additional $900 can be obtained by deletion of lower profit crops such as grain sorghum and forages and substitution of barley. Part of the $900 is attributed to elimination of the cow-herd in favor of a buy-sell operation. The additional returns possible are not necessarily sufficient reason for adoption of one system over another; thus the other farmer choice criteria are considered.

A farmer may prefer a lower but more certain income rather than a potentially higher but more uncertain one. This introduces the consideration of risk.

Questions concerning risk might be:

1. What are the chances of losing different levels of capital or income in some time period such as a year?
2. What would be the consequences if a possible loss should occur? (Consequences relating to family welfare and ability to continue farming efficiently are important considerations.)
3. Could the potential loss be reduced in some way without a proportionately large decrease in income potential?

In budgeting the various crops, yields were used which include good, average and poor years. Therefore, if a plan is made covering a period such as five or ten years, the occasions when losses are experienced should be offset by high profit years. Concern in consideration of risk then is on shorter periods of time when unusual conditions may endanger the capital position of the farmer.

The crops used in the proposed "buy-sell - cash grain" plan actually have less risk associated with them than the summer crops used in the present plan. This is true because droughts, the major weather factor, would normally hurt summer crops worse than the cool season ones. In the rare event of a very dry fall and winter and wet summer, summer catch crops can be used. The additional acres of small grains used in the proposed plan would not be important enough in the farmers income to endanger his economic welfare in the event of hail or storm loss. The additional cash input necessary with improved practices adds to the certainty of small grains.

The possibility that the proposed steer operation may be more risky than the cow-herd has been previously discussed. This possible risk is associated with investment per unit of time rather than with the general

TABLE XXV

SUMMARY OF THREE ALTERNATIVE ORGANIZATIONS OF A 480 ACRE FARM ON KIRKLAND-RENFROW-TABLER SOILS IN NORTH CENTRAL OKLAHOMA

	Present "Cash Grain - Cow-Calf - Roughage	Present With Improved Practices	"Buy-Sell - Cash Grain"
Crop Sales	$7,655.00	$10,289.00	$10,688.00
Livestock Sales	1,886.00	5,587.00	10,283.00
Total Sales	9,541.00	16,876.00	20,971.00
Variable Costs			
Crop	1,995.00	2,669.00	2,481.00
Livestock[1]	68.00	500.00	1,118.00
Livestock Purchased	100.00	4,241.00	7,052.00
Annual Cash Outlay	2,163.00	7,410.00	10,651.00
Annual Cash Outlay Excluding Livestock Purchased	2,063.00	3,169.00	3,599.00
Return to Capital, Labor and Land used in Specified Enterprises	7,378.00	9,466.00	10,320.00
Difference from Present		2,088.00	2,952.00
Estimated Livestock Investment		1,750.00(9 mo.) 7,650.00(3 mo.)	1,850.00(7 mo.) 7,416.00(3 mo.)
Weighted Average for 12 months (Livestock Investment)	3,900.00	3,225.00	(10 months) 3,600.00

[1]Livestock variable costs were obtained by adjusting the costs given in Table XV, XVII and XIX for the correct number of animals.

practice of buying and selling. Charges are included in the budgets as insurance against certain possible losses. For example, costs were included for order buyers, vaccination and death loss. Longer periods of time would thus balance out favorable and unfavorable occurances but the short-run critical period must be faced. The amount of capital required with the "buy-sell" is concentrated in the winter months rather than throughout the year as is the case with a cow herd. This may constitute high risk in the mind of one farmer but not to another, depending on his confidence in his ability to manage the animals properly during the high investment period.

The exact amount of risk and income desired must be selected by individuals directly concerned. There are some measures which can reduce the possible magnitude of risk. Seeding part of the acres in fall oats sacrifices pasture but could be beneficial in years of heavy insect infestation. Number of cattle purchased can be based on some "risk-capital" restriction rather than pasture availability. This would result in a sacrifice of potential income. Moisture conditions may also be such in some years that fertilizer should not be used.

Flexibility is defined as the ability to shift resource uses with relatively low losses of capital or income. The "buy-sell - cash grain" alternative has more flexibility than the present plans due chiefly to the livestock systems. As is true with the present plan, a summer crop may be tried in the event of a small grain failure. The cattle operation is flexible in that numbers can be readily adjusted to the feed supply. Steers or heifers are readily salable at any time. A cow herd cannot normally be reduced at short notice without a sacrifice in price. This is true because cow value is composed of both breeding and beef value. An emergency sale usually results in a price based on beef value alone.

Under the present system the cow herd is often fed during periods of scarce pasture as an alternative to selling. This does not allow taking advantage of feed-cattle price ratios which vary from year to year. In many years the feed or money invested in feed could be used more profitably in alternatives other than the cow herd.

From the longer run point of view the flexibility of the three systems are similar. Machinery for farming small grain is maintained at about the same level as is now found on most farms. As items such as self-propelled combines depreciate to the state where they need to be replaced, careful consideration of the alternative of hiring custom operators should be made.

Annual cash requirements are quite different between plans. About $8000 of additional cash expenses are necessary under the most profitable plan. Of this, about $7000 is used for purchase of cattle. This does not represent a net addition to capital needed as from $3500 to $4500 are presently invested in cattle during a year. The net additional capital is then about $3500. The additional returns are in part payment for the increased capital requirement.

As was mentioned in the discussion on flexibility, more capital is not required in the form of machinery or buildings. Haying equipment now on the farm is not needed under the "buy-sell - cash grain" alternative. The use of fertilizer requires investment of approximately $200 in a drill fertilizer attachment.

The addition of 54 acres of small grain could possibly be less profitable than another crop under same machinery-labor situations. If this acreage requires the hiring of custom operators for combining, it would result in a three dollar per acre additional cost. Since barley and/or

oats were more profitable than alfalfa because of their pasture production, the value of the pasture would have to exceed three dollars in this situation. It would normally be worth at least this amount. It is not the usual case that labor and machinery would be fully utilized.

As is true under present plans, labor is hired for combining and plowing under the proposed plan. Drilling at the proper time is stressed so that some labor or custom work might be hired at that time. Handling of cattle would be concentrated during the winter when alternative uses for labor are few.

The newly enacted Conservation Reserve Program offers still another alternative for use of land resources. Insofar as present labor and capital investments represent fixed costs to the farmer, and he has limited alternatives for operating funds, it would be more profitable to farm the land until Conservation Reserve payments reach at least fifteen dollars per acre per year. This assumes some payment for sacrifice of leisure and for risk, as the per acre returns from barley are actually more than twenty dollars.

CHAPTER VII

SUMMARY AND CONCLUSION

Farm programs designed to reduce farm output have necessitated a reallocation of resources on wheat farms in north central Oklahoma. Farmers have land, labor and other production factors formerly used in the production of wheat for which alternative employments must be selected. This study was undertaken to provide guides for farmers faced with such reallocation whereby they may select resource use plans which will lead to the most satisfactory results under existing circumstances.

This thesis applies to farms located on Tabler, Kirkland and Renfrow soils which lie generally in eastern Garfield and Grant counties, Kay and Noble counties. In range of the size studied, application to other farms will depend on similarity of resource input and product output.

The area was sampled by schedule during the summer of 1955 to determine the present usual resource employment and resulting outputs. Members of the Agronomy and Animal Husbandry Departments of Oklahoma Agricultural and Mechanical College provided estimates for alternative resource uses such as increasing fertilizer and changing the livestock system. These estimates required application of experimental results to the situation on farms in the area.

A 480 acre farm on Tabler, Kirkland and Renfrow soils was used as a "typical" farm. It was thought that this farm was representative of many one man, commercial wheat farms of the area. It was considered to have

360 cultivated acres, 216 of which comprised the wheat allotment. It was assumed that the remaining acreage was allocated to oats, alfalfa and sorghum and that the present livestock system was a cow-calf herd.

A comparison of resource use alternatives within and between crop enterprises was made in Chapter IV. This involved evaluation of present practices such as tilling, seeding rates, seed quality, use of fertilizers and timing. An estimate of the result of using present practices, as well as recommended practices, was made by determining the relevant variable costs associated with the practice. Production resulting from the combinations of present or proposed practices was estimated by agronomists. With the application of appropriate prices representing short-run expectations, a comparison of net returns to fixed production factors was made for alternative sets of production practices. The "returns to land, labor and capital" were used to compare crop enterprises. Wheat appeared to be most profitable. Barley and oats were more profitable than alfalfa due to the possibility of winter grazing. Forage crops did not prove as profitable as the cash crops.

Livestock practices and alternatives were evaluated in Chapter V. One hundred and four acres of native range and 180 acres of small grain pasture were assumed as the fixed resources to be utilized by livestock. Capital and labor were implicitly assumed to be unlimited; however, feeder operations were excluded. The present cow-calf system, a cow-calf - buy-sell system, and a strictly buy-sell system were compared on the basis of return expectations, risk, flexibility and capital or labor requirements.

The "buy-sell" type operations appeared to be about $1100 more profitable than the "cow-calf" and $400 more profitable than the combination

of the two. This additional profit was adjudged to come from a reduction in feed requirements (fitting livestock plan to the available pasture) and more efficient use of feeds (pounds of beef sold per pound of feed or pasture consumed). An additional capital requirement was experienced with the buy-sell operations which may be interpreted as an addition to risk by some farmers. The buy-sell operation adds greatly to flexibility as cattle numbers may be adjusted to match variable feed supplies.

The final step of the study was to combine livestock and crop enterprises into the farm unit of 480 acres. The alternative organizations compared were "cow-calf - cash grain - roughage" (present plan), "cow-calf - cash grain - roughage" (present plan with improved practices) and "buy-sell - cash grain". The present plans differed only by practices and the analysis indicated that improved practices resulted in an additional $2000 returns to fixed factors over the present plan with present practices. The "buy-sell - cash grain" alternative provided highest return expectations.

Profitability was only one of the criterion on which farmers were assumed to make resource employment decisions; therefore, risk, uncertainty, and capital and labor requirements were evaluated for the three plans. The inclusion of barley in the buy-sell alternative added to the certainty of the operation as its yield is less variable than that of alternative summer crops. A "buy-sell" livestock operation would not necessarily be more risky than a "cow-calf" operation is under the price situation assumed. The average capital requirement increase in the more profitable plans may constitute an increase in risk to some farmers. Flexibility is increased by adopting either of the two more profitable plans over the present one.

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APPENDIX A

APPENDIX TABLE I

COEFFICIENTS OF VARIABILITY FOR BARLEY AND OAT GRAIN YIELDS[1]

	BARLEY						OATS			
	Stillwater			Cherokee			Stillwater		Cherokee	
	Harbine	Ward	Tencow	Harbine	Ward	Tencow	Wintok	Forkedeer	Wintok	Forkedeer
1941	31.3	30.9	34.0	-	-	-	39.3	45.4	-	-
1942	14.0	23.9	13.8	-	-	-	-	-	-	-
1943	22.9	18.5	23.7	-	-	-	28.7	30.3	-	-
1944	54.8	54.6	61.6	-	-	-	-	85.6	-	-
1945	46.7	39.7	47.3	-	-	-	68.3	73.7	-	-
1946	28.6	30.3	23.3	44.3	58.9	62.3	59.6	69.2	-	-
1947	39.4	41.8	37.9	65.1	65.5	72.2	61.3	64.3	90.5	95.6
1948	22.6	23.6	23.0	52.7	40.2	44.2	51.7	47.9	45.0	41.7
1949	40.0	37.5	30.9	73.0	51.1	53.3	43.5	50.0	66.4	97.8
1950	38.8	40.5	38.8	0	0	0	30.9	48.4	25.9	30.5
1951	21.5	24.3	22.7	0	0	0	22.7	33.6	0.0	0.0
1952	55.4	49.6	59.5	55.3	61.8	68.9	28.9	31.9	85.8	79.3
1953	53.6	54.7	49.7	47.4	44.1	42.2	75.8	67.5	-	-
1954	12.1	13.2	12.7	17.4	38.0	36.2	19.2	26.2	57.5	58.4
1955	9.6	10.0	6.6	15.1	28.1	32.3	11.3	12.1	0.0	0.0
Number of Years	15	15	15	10	10	10	13	14	8	8
Average Yield	32.75	32.87	32.37	37.0	38.8	41.2	41.63	49.01	46.39	47.91
Standard Deviation	15.63	14.15	16.74	26.73	23.46	25.45	20.26	20.96	35.35	36.24
Coefficient of Variation	47.7	43.0	51.7	72.2	60.5	61.2	48.66	42.76	76.2	75.6

[1]These data were provided by Dr. A. M. Schlehuber, Oklahoma Agricultural and Mechanical College Agronomy Department; however, part are contained in: Schlehuber, A. M., et al, Oat Variety and Cultural Tests in Oklahoma 1925-1947, Oklahoma Experiment Station Bulletin 367, p. 8. Also, Johnson, T. H. and A. M. Schlehuber, Harbine, A New Combine Variety.

APPENDIX TABLE II

"PRICES PAID BY FARMERS" USED IN THE STUDY

Item	Unit	Price
Gasoline	Gallon	.17
Lubricant	Pound	.15
Motor Oil	Gallon	1.00
Labor	Hour	1.00
Baling	Bale	.18
Superphosphate	Ton	35.00
Lime	Ton, applied	4.60
Barley seed[1/]	Bushel	1.51
Oat seed	Bushel	1.20
Wheat seed	Bushel	2.25
Alfalfa seed	Pound	.27
Sweet Sudan seed	100 pounds	8.00
Atlas Sargo seed	100 pounds	10.00
Rye seed	100 pounds	3.00
Vetch seed	Pound	.17
Redlan Kafir	100 pounds	6.00
Stock salt	100 pounds	1.50
All cattle	100 pounds	18.53

1/ All seed prices include cost of treating and cleaning.

APPENDIX TABLE III

"PRICES RECEIVED BY FARMERS" USED IN THE STUDY

Item	Unit	Price Received
YEARLY AVERAGE 1950-55		
Feeder Stocker Steers		
Good & Choice 500#	100#	22.03
500- 800#	100#	20.05
800-1050#	100#	19.59
Slaughter Heifers, Good 700-900#	100#	18.46
Slaughter Cows	100#	13.69
Slaughter Bulls	100#	16.44
Wheat 1/-	Bushel	1.85
Oats	Bushel	.80
Barley	Bushel	1.09
Grain Sorghum	Bushel	1.22
Alfalfa Hay	Ton	25.00

1/-1956 Support Price

APPENDIX TABLE IV

LABOR[1] AND MACHINERY[2] REQUIREMENTS FOR VARIOUS OPERATIONS IN NORTH CENTRAL OKLAHOMA

Operation	Size of Equipment	Hours per acre
Moldboard Plow	3-14	.64
Moldboard Plow	3-16	.59
Moldboard Plow	4-14	.51
Moldboard Plow	4-16	.42
One Way Plow	6 ft.	.36
	9 ft.	.33
Spring Tooth Harrow	12 ft.	.27
Spring Tooth Harrow	16 ft.	.19
Spike Tooth Harrow	20 ft.	.12
Graham Hoeme	10 ft.	.29
Drill	8-16	.25
Combine (self propelled and haul)	14 ft.	.44
Combine (pull type and haul)	12 ft.	.52
Mow Hay	7 ft.	.29
Rake Hay	7 ft.	.27

[1]This does not include labor required to service the machine prior to operation. Data was obtained from schedules taken in connection with this study.

[2]Fenton, F. C. and G. E. Fairbanks, The Cost of Using Farm Machinery, Kansas Engineering Experiment Station Bulletin No. B-74, page 27-28 is a good reference for use in determining machinery costs.

APPENDIX TABLE V

ESTIMATED COSTS OF OPERATING VARIOUS FARM MACHINES
ON A 480 ACRE FARM (80% IN CULTIVATION)
IN NORTH CENTRAL OKLAHOMA

Item	Amount	Price	Cost Per Day	Cost Per Hour	Cost Per Acre
Self propelled combine, cost - $5300. Days used per year-7.2 (10 hr. days)					
Variable Costs.					
Gasoline	26.4 gal./day	.17	4.49	.45	.10
Oil	.66 gal./day	1.00	.66	.07	.02
Lubricants	.26%[1]	53.00	1.91	.19	.04
Repair & Maintenance	2.0	53.00	14.72	1.47	.32
Labor	day	12.00	12.00	1.20	.26
Total Variable Costs		--	--	--	.74
Three plow tractors, cost $2600. Days used per year - 36.1.					
Gasoline	26.6 gal./day	.17	4.52	.45	--
Oil	.89 gal/day	1.00	.89	.09	--
Lubricant	.7%	26.00	.50	.05	--
Repair & Maintenance	3.5%	26.00	2.52	.25	--
Total Variable Costs		--	8.43	--	--
Drill (8-16), cost - $600. Days used per year - 8.56 days.					
Tractor costs	--	--	8.43	.84	.21
Repair & Maintenance	1.2%	--	.85	.085	.021
Lubrication	.40	--	.40	.04	.01
Total Variable Costs		--	--	--	.24
Moldboard plow (3-14), Cost - $400. Days used per year 21.9.					
Tractor cost	--	--	8.43	.84	.54
Repair & Maintenance	9.%	--	1.64	.16	.10
Lubrication	.7%	--	.12	.05	.03
Total Variable Costs		--	--	--	.67
Spring Tooth Harrow (12 ft.), Cost - $160. Days used per year - 26.7.					
Tractor cost	--	--	8.43	.84	.21
Lubrication	.33%	--	.02	.01	.01
Repair & Maintenance	2.0%	--	.12	.01	.01
Total Variable Costs		--	--	--	.23
Spike Tooth Harrow, Cost - $120.					
Tractor cost	--	--	8.43	.84	.21
Total Variable Costs		--	--	--	.21

APPENDIX TABLE V (Continued)

Item	Amount	Price	Cost Per Day	Cost Per Hour	Cost Per Acre
Mower cost - $300, Days used per year - 3.1.					
Tractor cost	--	--	8.43	.84	.25
Repair & Maintenance	1.1%	--	1.06	.11	.03
Lubrication	.2	--	.20	.02	.01
Total Variable Costs		--	--	--	.29
Rake cost - $400, Days used per year - 3.					
Tractor cost	--	--	8.43	.84	.24
Repair & Maintenance	.66%	--	.89	.09	.02
Lubrication	.15	--	.22	.02	.01
Total Variable Costs		--	--	--	.27

[1]Percentages refer to percent of initial cost to be charged per year for the various costs as suggested by Kansas Engineer Experiment Station Bulletin 74.

VITA

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