# THE EFFECT OF STRONG ENFORCEMENT OF 160-ACRE LIMITATION IN 1902 RECLAMATION LAW IN THE ALTUS-LUGERT IRRIGATION PROJECT AREA


By

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THE EFFECT OF STRONG ENFORCEMENT OF 160-ACRE

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ALTUS-LUGERT IRRIGATION PROJECT AREA

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CHAPTER I

INTRODUCTION

Agriculture has greatly contributed to and interacted with economic growth in the United States. Particular characteristics of this growth are development of improved farm management systems, rapidly developing technology, and changes in the relative real prices of labor and capital. Consequently these factors have led to development of larger and more highly capitalized farming systems. Both the development of technology and the decline in the real cost of capital relative to labor encourage the replacement of farm labor with machines. Under intensive capitalized farming systems, one can assume that per unit costs of production are lower for larger farms than for smaller farms although fixed costs are higher for the farmer than for the latter. By expanding farm size, farmers may expect to increase their ability to pay for the more modern equipment that have incorporated improved technology. Lower per unit costs result from expansion of farm size so that machine capacity can be more fully utilized.

The 160-acres of irrigated land limitation adopted as law by the Bureau of Reclamation in 1902, however, if held to the original interpretation, works as a restriction on the expansion of irrigated cropland and the process of machanization in the ALTUS-LUGERT Irrigation District of Oklahoma. It is held by some that the goals of the 1902 Reclamation Act would be in conflict with lowering of costs of production. In the half century since the publication of the original law, it has been handled in the fashion of English common law, and interpreted, basically, as a "Dead Letter" law [Seckler and Young, 1978]. However, recent proposals by the Department of the Interior to enforce the long-neglected provisions, including the 160 acres of irrigated land limitation for recipients of federally subsidized water, have added fuel to the debate over the relationship between farm size and efficiency.

The purpose of this study is to determine the effect that strict enforcement of the 1902 Reclamation Act would have on returns to scale, and cost economies and diseconomies of farm size in the ALTUS-LUGERT Irrigation District of Oklahoma. Pursuant to this objective, some sub-objectives are:

1. To determine levels of farm income and resource use for a selection of typical crop combinations under no limitations on irrigated cropland.
2. To determine levels of farm income and resource use for a selection of typical crop combinations given dryland farming conditions.
3. To determine levels of farm income and resource use for a selection of typical crop combinations given a limitation on irrigated cropland.
4. To determine the required investment for a minimum machinery complement.
5. To determine the required labor for a selection of typical crop combinations.

6. To determine the break-even point for a selection of typical crop combinations.

This study includes five different crops (wheat, soybeans, grain-sorghum, cotton and alfalfa) which are used in combinations of typical crop patterns, and six farm sizes (160, 320, 480, 640, 960 and 1280 acres). This study will be organized as follows: first will be the review of literature, then procedure, description of the study region and data, results of analyses, summary and conclusions, and last will be the implications for further research.

CHAPTER II

# LITERATURE REVIEW

## The 1902 Reclamation Act

As Seckler and Young [1978] point out,

> Historically, the United States government has pursued policies which increase the productive capacity of the agricultural sector in order to assure an adequate food supply for consumers, to improve the economic well-being of the rural population, and to settle and secure new territories [p. 596].

The Reclamation Act of 1902 was established to carry through the above policies by providing inexpensive irrigation water.

In Section I this act appropriated the receipts from the sale and disposal of public lands in the western areas to be used in the construction of irrigation works for the reclamation of arid lands. In an attempt to assure widespread distribution of program impact, section five of the law defined the following duties and obligations of the entryman[a]:

> No right to the use of water for land and private ownership shall be sold for a tract exceeding 160 acres to any one individual landowner, and no such sale shall be made to any landowner unless he be an actual bonafide resident on the land, or occupant thereof residing in the neighborhood [32 Statutes at Large, 1903, p. 389].

### History of 160-Acre Limitation

The first major tool of agricultural development policy was the distribution of publicly owned lands to potential settlers at nominal prices [Seckler and Young, 1978]. This policy was in accordance with the Jeffersonian vision of a nation of small, independent landowners. Due to the effect of the Homestead Act of 1862, which offered 160 acres of land free to those who would live on it for five years, many people settled in the western areas, and it was found that crop production in the arid and semi-arid west was largely dependent on irrigation water. In order to meet that requirement, the Reclamation Act of 1902 opened the way to construct the irrigation works.

The government always had problems with the administration of the Desert Land Act and other legislation which distributed the public land. Great tracts of land were accumulated by absentee landowners who financed their employees in filing fraudulent claims and later obtained the land once the employee secured title [Hibbard, 1939]. Therefore, in the Reclamation Act, the government imposed limitation of 160 acres of irrigated land was a new land policy.

In this act, the 160 acres limitation was supplemented with a residency requirement and with antispeculation rules. The antispeculation rules required that

> Owners of land in excess of 160 acres must sell it at a preproject price, so as to prevent the original large owner from reaping the capitalized value of the federal subsidy to the detriment of the intended recipients of the subsidy [Seckler and Young, 1978, p. 577].

According to Sax [1967], the acreage limitation law, from the beginning, has been perhaps the most controversial aspect of the reclamation program, and numerous attempts at repeal have been launched.

Seckler and Young [1978] held that in the half-century since the publication of the original law, the Department of Interior has relied only to a limited extent upon formal, written rules and regulations for the interpretation and enforcement of the law. As a result, the interpretation of the law is at the discretion of the administration and the enforcement of the excess land was less than vigorous.

Recent Proposal Changes and Interpretation

In August 1975, the federal circuit court in San Francisco ruled that the U.S. Bureau of Reclamation shall forthwith promulgate rules and regulations on procedures and criteria to be used in the approval of excess land [Hinds, 1977, p. 3]. This order was in response to a suit filed by National Land for the People challenging procedures employed by the Bureau of Reclamation in the disposal of excess lands in the Westlands Irrigation District in the San Joaquin Valley of central California.

In compliance with that order, U.S. Senate Bills, S. 1812 and S. 2925, were introduced in 1978 to repeal and amend the acreage and residency requirement, and the Interior has twice recommended major revisions of current policy. The following two subsections introduce the proposed revisions and their effects on the distribution of benefits in the Westlands as indicated by Leveen and Goldman [1978].

Strict Enforcement of the Existing Law

Under these U.S. Senate Bills, all excess land would be sold prior to water deliveries at the true non-project price. Such a provision would effectively limit the ability of the original owners to capture project benefits. Since residency would be required, leasing arrangements would be eliminated, so absentee investors could not continue to own land, even if they presently own 160 acres or less. Families would be permitted to own no more than 320 acres, so the maximum windfall benefit allowed anyone would be $320,000 or about $20,000 per farm per year in addition to a normal return to management and labor of about $20,000 per year [LeVeen and Goldman, 1978]. Land prices would be restricted indefinitely, so these benefits would remain within the project and could not be captured by any single family in one generation. Provision of a random mechanism to allocate excess land would have ensured would-be farmers a more equal chance to obtain subsidy benefits.

U.S. Department of the Interior Proposals

The proposed regulation of August 1977 [U.S. Department of the Interior, 1977] and the modifications proposed in May 1978 would enlarge the acreage restriction to 640 acres per family, and allow an additional 320 acres of leased land per farm. Residency would be required of all landowners. The period for disposing of excess land would be shortened from 10 to 5 years. New standards to ensure better land value assessments would be employed, and buyers would be determined by some random method. Non-excess land could not be sold for market value until at least ten years after purchase.

These regulations would reduce the capture of windfall benefits by the original owners by at least 50 percent. Restricting leasing and imposing residency would effect a profound change in the structure of farming in areas like the Westlands. The increased access to land would be further aided by the proposed lottery, and the number of resident family farm operators would be perhaps as many as 500. However, the benefits would still be relatively concentrated since the purchaser of a typical 640 acres of excess land would be able to capture $332,000 in windfall benefits, in addition to about $81,000 in annual returns for labor and management [USDA, P. 18; U.S. Department of the Interior, 1977b].

Subsequent Controversy of Law and Its Interpretation

The level of conflict over the 160 acreage limitation has intensified in the last few years and "the controversy is essentially a controversy over the distribution" of the subsidized value of Federal water [Seckler and Young, 1978, p. 575]. The two parties, the pros and cons for the strict enforcement of the 160 acreage limitation, represent fairly distinct pecuniary and ideological positions. As Seckler and Young [1978] point out

> Opponents of the limitation are mainly those farmers now benefiting from nonenforcement of the limitation who demand the entrepreneurial freedom to acquire as much land and water (and subsidy) as their efforts and ingenuity permit, within the limits and rules of the free enterprise system [p. 575].

Opponents further argue that larger farms are essential for economic viability and low-cost food production. Proponents of rigorous enforcement of the limitation advocate a more wide-spread distribution of the opportunities provided by the reclamation program, and also expect to create a more desirable "rural community."

However, there is one point upon which the two parties agree. There are important gains in the efficiency of agricultural production as farms increase in size (at least up to a limit of very large sized farms) [Seckler and Young, 1978]. They say that

> proponents of the acreage limitation use this idea in support of their argument that without some kind of protection to the small family farmer, these farmers will be destroyed in the competitive struggle with large farmers, and opponents of the limitation use this idea to support their argument that if farms are artificially restricted to small sizes, the efficiency of food production will decline and food prices will, accordingly, rise [p. 581].

## Theoretical Concepts of Economies of Size, and Short-Run Versus Long-Run Average Cost Curve

Economies of size have to do with the relationship of changes in size of operation to average total cost per unit of product; they involve two time contexts, the short run and the long run. In the short run such physical factors as land, tractors and other machinery are fixed, and many of these associated costs are unchanged (fixed) for the production period; in the long run, enough time is available for changing (expanding) any one or all of these physical factors, so that not even the costs associated with these physical factors are fixed; they become variable.

In Figure 1, four short-run average cost curves are shown: "but this is really far from enough" and "many curves could be drawn between each of those shown" [Ferguson and Gould, 1975, p. 200]. These many curves generate a long-run average cost (LAC) curve which is useful as a planning device. Suppose a farmer thinks the output associated with point A in Figure 1 will be most profitable. He will operate the farm size represented by short-run average cost (SAC) curve for 160 acres "because it will enable him to produce his product at the least possible cost per unit" [p. 200]. With the farm size whose short-run average cost is given by SAC 160, "unit cost could be reduced by expanding out-

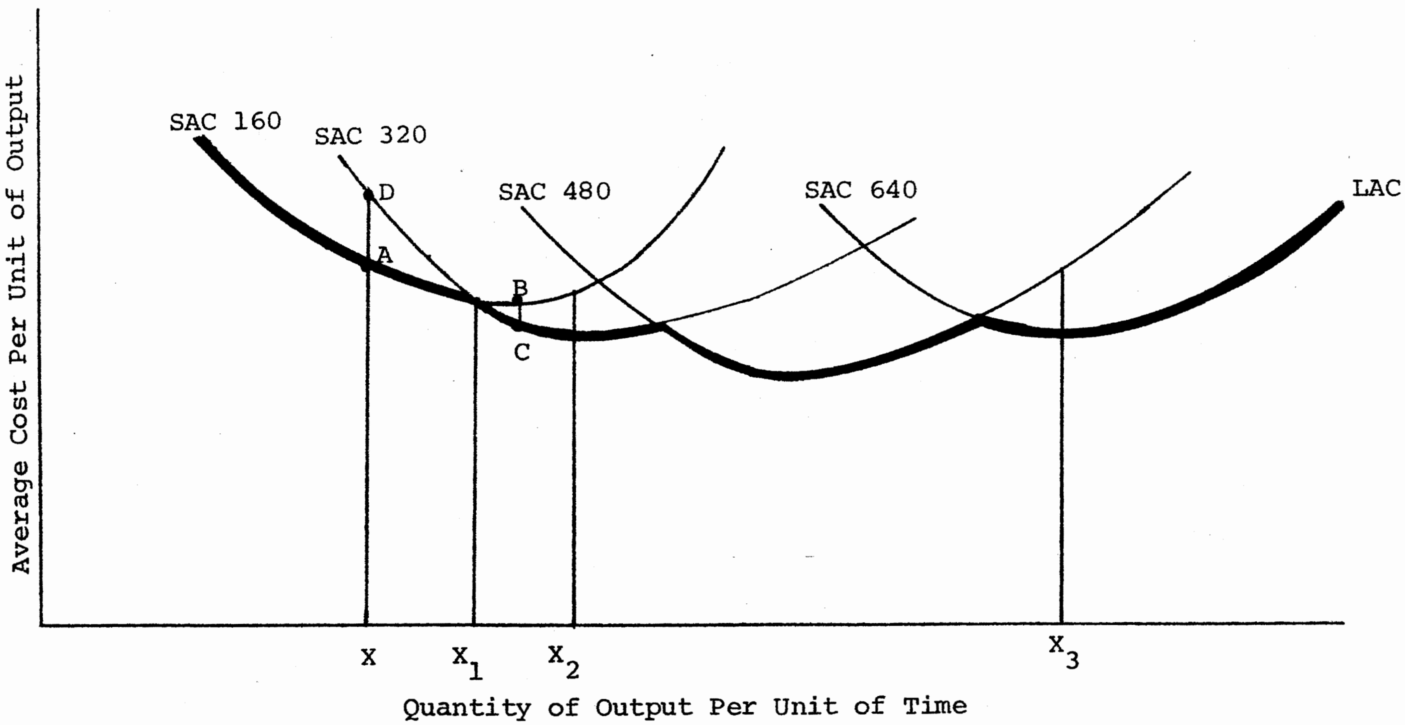


Figure 1. Hypothetical Short-Run and Long-Run Average Cost Curves

put to the amount associated with point B" [p. 200], the minimum point on SAC 160. If demand conditions were suddenly changed so this larger output were desirable, the farmer could easily expand his farm size and "he would add to his profitability by reducing unit cost" [p. 200]. Moreover, when establishing his future plans the farmer would decide to expand the farm size represented by SAC 320 because he could reduce unit costs even more.

Suppose in the first case the output level is to be X. Then, the farmer should operate the farm size represented by SAC 160, which will produce output X at a smaller cost per unit XA than one of the other three will. Costs would be XD per unit if SAC 320 were used. For output $X_1$ the farmer would be indifferent between SAC 160 and SAC 320; but for output $X_2$ he would prefer to operate SAC 320, and for output $X_3$ he would prefer SAC 640. From these four SAC curves the long-run average cost curve could be defined. It shows the least possible cost per unit for producing various levels of output given that the farmer can expand and operate different size farms [Leftwich, 1970]. In Figure 1 the heavy portions of the SAC curves form the long-run average cost envelope curve.

The short-run and long-run average-cost curves are alike in that each has been drawn in a U-shape. However, the reasons why an SAC and a LAC are U-shaped are quite different. "SAC is U-shaped because the decline in average fixed cost is ultimately more than offset by the rise in average variable cost" [Ferguson and Gould, 1975, p. 208], and the average variable cost curve is U-shaped because of diminishing marginal returns. The U-shape of LAC occurs

> if firms become successively more efficient up to some particular size or range of sizes, and if they then become successively less efficient as the range of plant sizes from very small to very large is considered [Leftwich, 1970, p. 182].

The Study of Economies of Size in Agriculture

In light of the central importance of economies of size to the controversy over the limitation, it is necessary to determine the optimum size of a farm under current technical and economic conditions. Hall and LeVeen held that a relationship can exist between farm size and economic efficiency either because there are economies of scale in the physical production function of the farm or because relative prices are such that cost savings result from increasing size [1978]. They also defined that efficiency associated with physical economies of scale can be characterized as technical efficiency, while efficiency associated with the adjustment of factor use and output mix to relative prices can be characterized as allocative efficiency. Allocative inefficiency is a traditional concern of economics. However, under the present intensive capitalized farming system, technical efficiency--which shows the relationship of fixed assets to production efficiency--has been considered more often in economic analysis.

In analyzing the impact of farm-size restriction, the relevant criterion is whether the long-run average cost curve declines as size increases. If farm-size policies restrict farm size to the declining portion of the long-run average cost curve, the result will be an economic loss in society brought about by a reduction in production efficiency and an increase in average costs of the product [Hall and LeVeen, 1978].

The traditional view of the long-run cost situation for American farming operations is presented in Figure 2 below.

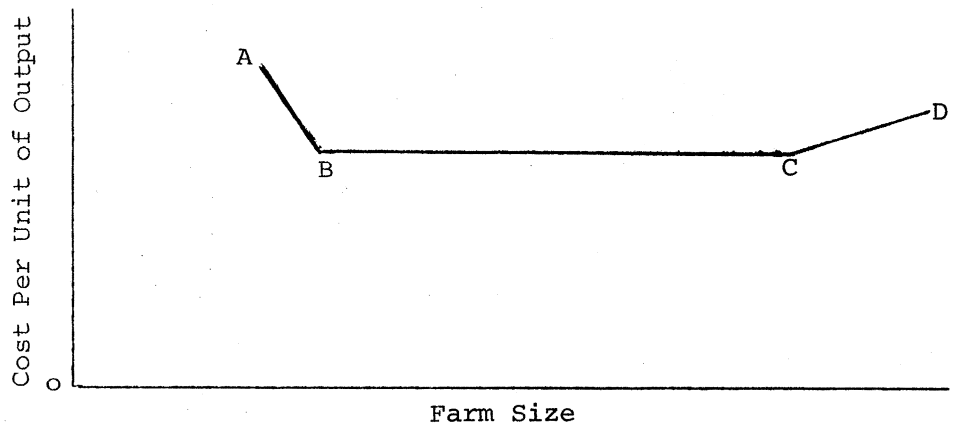


Figure 2. Hypothetical View of Long-Run Costs for the Traditional Farm Firm

For this illustration, the vertical axis is cost of production per unit of output and the horizontal axis is farm size, in acres. The section of the graph from point A to B represents a decline in per unit costs as farm size expands. These cost reductions result from: 1) specializing and dividing of labor, 2) technological factors, and 3) financial advantages [Ferguson and Gould, 1975]. The economies of scale of technological factors can be attained by fully utilizing machines and by less cost of purchasing and operating larger machines which are available as farm size expands. For most farming situations, it has traditionally been assumed that point B can be reached relatively quickly. The segment from point B to point C represents a region of constant, or very slightly declining costs. This segment is usually assumed to hold for a very wide range of farm sizes. The third segment of Figure 2, from point C to point D, represents a region of increasing per unit costs. This section of the graph corresponds to a farming situation where farm size expansion has proceeded too far. Diseconomies of scale for this situation are usually attributed to limitation of management input or allocative inefficiency of management.

Many studies support the theoretical cost structure of Figure 2. Scoville [1951] has used a budgeting approach in his study of size in relation to the utilization of machinery, equipment, and labor on Nebraska corn-livestock farms. Resources on each of four different farm sizes were recognized "to represent as good a combination of resources as can be planned for the particular size of unit" [p. 9]. The possible resource efficiencies for different size units were then examined. Savings resulting from increased production efficiencies appeared to be very moderate and a point was established on the short-run average cost curve for each farm size by converting the total cost to its corresponding average cost per size of unit. The four points thus established may approximate points on the economy-of-scale curve within a range where the curve is essentially horizontal, but they may deviate considerably at levels of output where economies or diseconomies are marked. Madden [1967] analyzed fifteen studies of economies of scale for grain, dairy, and livestock production in 1967. He concluded that,

> in most of the farming operations examined, a modern and fully mechanized one-man or two-man operation can produce efficiently and profitably, achieving all or nearly all of the economies of size [p. 35].

A study by Fellows, Frick, and Weeks [1952] also used budgeting to estimate the economies-of-scale curve for New England dairy farms. In their study four different sizes of farms were selected and the least-cost (short-run) combinations were determined for each. Total costs were calculated on the basis of fixed and variable costs. The slope of the average-cost curve to the left and right of the lowpoint was estimated by determining unit cost when milk production per farm was varied by using different levels of concentrate feeding. From these estimates of the short-run average-cost curves for each farm size, the long-run or economy-of-scale curve was easily constructed as the traditionally smooth envelope curve, tangent to the individual average-cost curves. Bachman and Jones [1950] who have studied the differences in production efficiency between farm sizes assumed that larger farms generally are more efficient than smaller ones. They maintained that the most noteworthy characteristics that would make for greater efficiency of production on the larger units are, 1) the differences in the amount of land and capital available for combination with the available labor resources, 2) differences in the kinds of machinery, and equipment, and 3) differences in management. In a study of farm size in relation to resource use, Moore and Hedges [1963] deal primarily with how farm size variations interact with changes in costs and irrigation water quantities affect farm resource use and earnings. Moore and Hedges' study shows clear-cut evidence of how economies arise as farm sizes increase from 80 to 1280 acres.

Given the theoretical structure of Figure 2, an obvious question relates to the continued existence of farming operations which are smaller than a size corresponding to point B in Figure 2. Castle, Becker, and Smith [1972] provide five possible justifications for the existence of these smaller farming units: 1) a lack of knowledge of potential cost reductions from size expansion, 2) the conservative nature of the farmer or limited capital resources, 3) a lack of farmer profit motivation, 4) a conflict between size expansion and other family goals, at the particular point of the life cycle of the farm firm, and 5) a greater return to labor in alternative employment, especially for part-time farmers.

FOOTNOTE

[a]"Entryman" is defined as the farmer who owned or purchased the lands in the federally subsidized irrigation district.

# CHAPTER III

# PROCEDURE

This section of the study is concerned with the budgeting procedures used to analyze the economies of scale for the six different farm sizes examined in this study. The topics discussed in this section will include: 1) the assumptions used in the budgeting procedure, 2) crop combinations, 3) selected machinery groups, and the basis of the machinery hour calculation for each farm size, 4) the process of machinery hour calculation, 5) the limit of maximum hours used annually, and 6) derivation of the production costs.

## Assumptions

Several simplifying assumptions are necessary to allow the development of the costs and returns of various crop combinations. These assumptions are: 1) land and labor are unlimited in supply (at market prices) and above average managerial capacity is available for the large farm sizes, 2) sufficient irrigation water would be available to a farm on irrigated land, 3) the farmer owns most of the machinery and machine rental is not used except for custom combining, hauling, haying, and stacking, 4) the farmer pays current market prices for all inputs and machines and all crops are sold for cash at specified price levels, and 5) yields per acre and physical inputs per acre are constant while machinery size is allowed to vary with farm size.

## Crop Combinations

A total of 20 cropping systems--five crops and 15 of their combinations--are selected to study the trends of the costs and returns with changing farm size. These cropping systems are as follows:

1. Grain sorghum
2. Cotton
3. Soybeans
4. Wheat
5. Alfalfa
6. Wheat - Grain Sorghum
7. Grain Sorghum - Soybeans
8. Wheat - Soybeans
9. Cotton - Grain Sorghum
10. Cotton - Soybeans
11. Wheat - Alfalfa
12. Cotton - Alfalfa
13. Cotton - Wheat
14. Wheat - Alfalfa - Grain Sorghum
15. Wheat - Cotton - Grain Sorghum
16. Alfalfa - Wheat - Cotton
17. Cotton - Soybeans - Alfalfa
18. Wheat - Soybeans - Grain Sorghum
19. Wheat - Cotton - Soybeans
20. Grain Sorghum - Soybeans - Cotton

## Machinery Groups and the Bases From Which Machinery Hours are Calculated

### Machinery Groups

Two machinery groups are considered for deriving the machinery complements for each cropping system. Machinery Group 1 and Group 2 include all required machines for each cropping system for 160 and 480 acres, respectively. The machinery required, its size and initial list price are shown in Table I and II.

### The Basis From Which Machinery Hours are Calculated

Table III shows the basis of machinery hours calculation for each farm size. Machinery requirements for all farm sizes are made up from combinations of machine Groups 1 and 2.

## The Process of Machinery Hours Calculation

The number of hours the machine must be operated to cover one acre for all operations (hours/times over) is derived to calculate the total necessary machine hours for a given farm size. Equation (1) is used to compute this value for pull type implements and some self propelled machines [Kletke, 1975].

$$\text{Hours Per Acre} = \frac{1.0}{(\text{Speed} \times \text{Width} \times \text{Eff.})/8.25} \qquad (1)$$

where speed = the speed the machine travels over the area expressed in miles per hour,

TABLE I

MACHINERY GROUP 1 (160-ACRE FARM)

| Equipment | Width (Feet) | Initial List Price ($) |
|---|---|---|
| Tractor (100 hp.) | | 23,360 |
| Pickup (0.5 Ton) | | 6,300 |
| 4 Row Cultivator | 13.3 | 3,000 |
| Moleboard Plow | 5.3 | 2,950 |
| Tandem Disk | 15.0 | 5,000 |
| Chisel | 17.0 | 6,600 |
| 4 Row Planter | 13.3 | 3,700 |
| Row Crop Sprayer | 13.3 | 2,000 |
| 5 Row 2 Bar Lister | 13.3 | 800 |
| Rotary Mower | 6.0 | 900 |
| Self-propelled Combine | 20.0 | 39,000 |
| Truck (2.0 Tons) | | 16,000 |
| Springtooth | 24.0 | 2,000 |
| Self-propelled Swather | 14.0 | 14,000 |
| Drill | 26.6 | 6,850 |
| 2 Row Stripper | 6.6 | 10,300 |
| Trailer | 8.0 | 1,800 |

TABLE II

MACHINERY GROUP 2 (480-ACRE FARM)

| Equipment | Width (Feet) | Initial List Price ($) |
|---|---|---|
| Tractor (150 hp.) | | 33,600 |
| Pickup (0.5 Ton) | | 6,300 |
| 6 Row Cultivator | 20 | 3,950 |
| Moleboard Plow | 7.5 | 5,500 |
| Offset Disk | 18 | 6,200 |
| 6 Row Planter | 20 | 5,200 |
| 7 Row 2 Bar Lister | 23.3 | 1,200 |
| Rotary Mower | 13.3 | 3,750 |
| Chisel | 23 | 6,600 |
| Row Crop Sprayer | 13.3 | 3,750 |
| Self-propelled Combine | 24 | 49,000 |
| Truck (2.0 Tons) | | 16,000 |
| Springtooth | 54 | 5,400 |
| Self-propelled Swather | 16 | 19,000 |
| Drill | 40 | 10,850 |
| 2 Row Stripper | 6.6 | 10,300 |
| Trailer | 8.0 | 1,800 |

TABLE III

THE BASIS OF MACHINERY HOURS CALCULATION FOR EACH FARM SIZE

| Farm Size | Basis |
|---|---|
| 160 | Group 1 |
| 320 | Twice of Group 1 Hours |
| 480 | Group 2 |
| 640 | Extended Hours of Group 2 |
| 800 | 0.4 of Group 1 and 0.6 of Group 2 |
| 960 | 0.4 of Group 1 and 0.6 of Group 2 |
| 1120 | Extended Hours of Group 2 |
| 1280 | Extended Hours of Group 2 |

width = the number of feet covered by the implement,

eff. = the field efficiency of the machine.

Field efficiency is the ratio of the actual capacity of a machine to its theoretical capacity [Kletke, 1975].

The hours per acre determined by Equation (2) is used to calculate the total hours.

Total Machine Hours = Hours/Acre x Times Over x Farm Size (2)

## Maximum Annual Machine Hours

The maximum number of hours any machine can be used annually is equal to the average number of hours the machine can be used each year it is owned. The number of machines required to complete the total necessary hours of machine work is calculated by dividing the total necessary hours of machine work by the maximum machine hours used annually for the machine. The number of machines required and their subsequent numbers of hours are used to derive the hourly machinery costs which are allocated on a per acre basis. Table IV shows the maximum machine hours used annually for each machine type.

## Derivation of Costs

In the budgeting procedure, data from Extension agents and the Oklahoma State University Budgets are used to estimate input-output relationships and prices. Based on these data, the total cost functions are estimated for each cropping system from which costs per acre are derived. The cost functions presented in the latter section do not in clude a rent or cost for land in the calculation of total costs. The inclusion of one specific cost for land would make the results of the analysis difficult to use in many locations because of the extreme vari-

TABLE IV

THE MAXIMUM MACHINE HOURS USED ANNUALLY FOR EACH MACHINE TYPE

| Equipment | Hours Used Annually |
|---|---|
| Tractor | 850 |
| MB Plow | 125 (250 Two Crops) |
| Cultivator | 200 |
| Disk | 200 |
| Chisel | 200 |
| Planter | 100 |
| Lister | 100 (150 Two Crops) |
| Mower | 100 (150 Two Crops) |
| Sprayer | 150 |
| Drill | 100 |
| Springtooth | 200 |
| Self-propelled Swater | 350 |
| Stripper | 120 |
| Pickup | 500 |
| Trailer | 60 |

ation in land prices in those locations.

## Derivation of the Machinery Costs

In the budgeting procedure, the computerized Oklahoma State University Budget Generator is used to estimate total machinery costs. Total machinery costs are divided into two components, fixed machinery costs and variable machinery costs.

### Fixed Machinery Costs Per Hour

Machinery fixed costs are those which do not vary with the amount of use and include certain machinery depreciation, interest on investment, insurance, and taxes.

Depreciation Cost Per Hour. The types of depreciation included as a fixed cost relate to a decline in machinery value resulting from obsolesence, rust, and corrosion. There are several methods generally acceptable for computing depreciation. The most common methods of calculting depreciation for tax purposes are the straight-line, declining-balance, and sum-of digits methods. The Oklahoma State University Budget Generator uses a modified double declining-balance method developed by Bowers [Kletke, 1975]. This method represents the actual decline in value incurred by the operator. Salvage value is obtained by the following equation:

$$\text{Salvage Value} = \text{RFV1} \times \text{XLP} \times \text{RFV2}^{\text{Years}} \qquad (3)$$

XLP is the initial list price of the machine and RFV1 and RFV2 are two variables which describe the declining-balance depreciation equation for machines. RFV1 is the first year correction factor and RFV2 is a component of the standard declining-balance equation. Using the salvage value calculated in Equation (3) above, depreciation cost per hour may now be computed according to Equation (4).

$$\text{Depreciation Cost Per Hour} = \frac{\text{(Purchase Price-Salvage Value)}}{\text{(Hours Used Annually x Years Owned)}} \quad (4)$$

Purchase price is the actual dollar amount paid for the machine, and those hours used annually are the average number of hours the machine is used each year it is owned.

Interest Cost Per Hour. Interest on investment is the annual interest charged on the unrecovered cost of machinery. Interest cost per hour is computed according to the following equation:

$$\text{Interest Cost Per Hour} = \frac{\text{(Purchase Price + Salvage Value) x Interest Rate}}{\text{(2.0 x Hours Used Annually)}} \quad (5)$$

The term:

$$\frac{\text{(Purchase Price + Salvage Value)}}{\text{(2.0 x Hours Used Annually)}}$$

is the average investment per hour of machine use.

Insurance Cost Per Hour. Insurance cost per hour is computed according to the following equation:

Insurance Cost/Hour = Avg. Investment Per Hour Used x Insurance Rate. (6)

Tax Cost Per Hour. The cost of taxes per hour is based on the purchase price of the machine. Hourly tax costs are computed using the following equation:

$$\text{Tax Cost Per Hour} = \frac{\text{Purchase Price x Tax Rate}}{\text{Hours Used Annually}} \quad (7)$$

Variable Machinery Costs

The variable costs associated with the operation of machinery are those costs which vary directly with usage. Costs are computed for repairs, fuel and lubricants.

Repair Cost. Repairs are usually the most variable component of machinery costs. Repair costs are influenced by a number of items including: (1) Management, (2) maintenance level, (3) machinery variability, (4) variability in local costs for parts and labor, and (5) the effects of climate and soils [Kletke, 1975]. However, a set of equations were developed by Bowers and Larsen to estimate repairs.

$$\text{Total Accumulated Repairs} = \text{Initial List Price x RC1 x RC2 (Percent Life)}^{\text{RC3}} \quad (8)$$

$$\text{Percent Life} = \frac{\text{(Years Owned x Hours Used Annually)}}{\text{Hours of Life}} \quad (9)$$

$$\text{Repair Cost Per Hour} = \frac{\text{Total Accumulated Repairs}}{\text{(Hours Used Annually x Years Owned)}} \quad (10)$$

RC1 is the ratio of total accumulated repairs to initial list price for the entire life of the machine. RC2 and RC3 are two repair cost constants that go together to determine the shape of the repair rate curve. Hours of life is the total number of hours during the machine's expected mechanical life.

Fuel Cost. The equation used to compute fuel cost per hour was also taken from Bowers [Kletke, 1975]. Fuel cost per hour is computed according to the following equation:

$$\text{Fuel Cost/Hour} = \begin{pmatrix}\text{Fuel Consumption} \\ \text{Multiplier}\end{pmatrix} \times \begin{pmatrix}\text{Price Per Gallon} \\ \text{of Fuel}\end{pmatrix} \quad (11)$$

The fuel consumption multiplier is an estimate of fuel consumed per hour per $1000 of list price.

Lubricant Cost. Lubricant cost is assumed to be 15 percent of the cost of fuel [Kletke, 1975]. Equation (12) is used to estimate the cost of lubricants.

$$\text{Lubricant Cost Per Hour} = .15 \times \text{Fuel Cost Per Hour} \quad (12)$$

# CHAPTER IV

## DESCRIPTION OF THE STUDY REGION AND DATA

This section of the study presents a description of the study area, farm situation, and data selected for this analysis.

### The Study Area and Farm Situation

The Altus-Lugert Irrigation District consists of 47,602 irrigated acres located in Jackson and Greer counties, Oklahoma, Figure 3. Nearly all of the soils in the project area are slowly permeable with respect to the passage of water through them. Drainage facilities, which serve as adequate outlets for groundwater, irrigation waste water and natural surface runoff were installed along with irrigation works. Soil types range from very light sandy loam to heavy clay loan with heavy subsoil. The heavier clay soils are found in the Southern areas of the project. Light sandy loams are predominate in the Northern section. Depth of soil and its alkali content vary considerably throughout the project area, but both are adaptable to irrigated agriculture, and the project lands are suited to the production of livestock feed and fiber crops.

Intermittent irrigations are made between April 1 and November 1, depending upon rainfall and soil moisture conditions. Rainfall may vary widely in any one year from the mean annual precipitation of about 25 inches. Extremes range from about 14 inches to about 50 inches.

Land in the study area is owned by 440 different individuals. Of

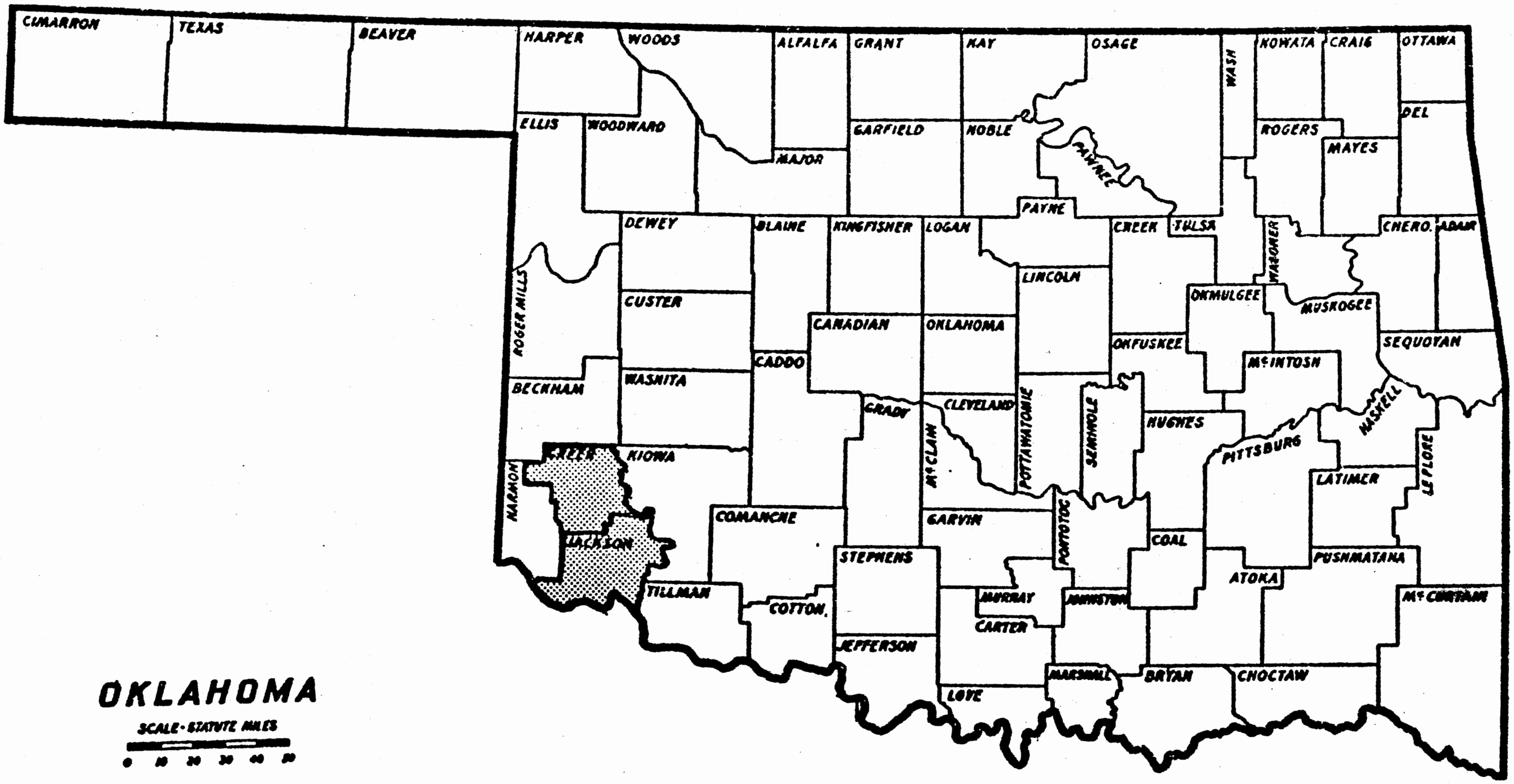


Figure 3. Map of Oklahoma With Shaded Area Indicating the Counties Included in This Study

this number, there are 303 which are classified as residents; thus, there are 137 nonresident owners, or approximately 31 percent of the total. Of the total number of owners, only 14 operate their land; thus 74.1 percent of the owners lease their land to other operators. Of the 128 lessees in the District, many lease more than 160 acres of project land [Provence, 1977].

## Data

Five irrigated crop budgets (wheat, cotton, grain sorghum, soybeans and alfalfa) and four dry land crop budgets (wheat, cotton, grain sorghum and alfalfa) developed by the Oklahoma State University Extension Service personnel were used for developing new budgets of 20 cropping systems for each farm size. Most of the data of inputs and outputs in the new budgets were based on the information supplied by the initial budgets.

An example of a initial budget developed by the Oklahoma State University Extension Service is shown in Table V. The example is for Irrigated cotton in Southwest Oklahoma. This budget is on a per acre basis and is organized by one production category and four major categories of cost.

The first category is production, which includes total production in units, price per unit, quantity, and value of the product. The production of cotton lint is in terms of pounds per acre. The budget shows 650 pounds of cotton lint produced per acre, a price received of 57 cents per pound and a total value of cotton lint produced equal to $370.50 per acre.

The second category is operating inputs which is the same as "the

TABLE V

AN EXAMPLE OF A INITIAL BUDGET

IRRIGATED COTTON ALTUS-LUGERT PROJECT — 93683151
CLAY LOAM FLOOD IRRIGATION — 01/10/79
CUSTOM HARVEST — SOUTHWEST

| CATEGORY | UNITS | PRICE | QUANTITY | VALUE | YOUR VALUE |
|---|---|---|---|---|---|
| PRODUCTION: | | | | | |
| COTTON LINT | LBS. | 0.570 | 650.000 | 370.50 | ________ |
| COTTON SEED | CWT. | 3.500 | 10.400 | 36.40 | ________ |
| TOTAL RECEIPTS | | | | 406.90 | ________ |
| OPERATING INPUTS: | | | | | |
| COTTON SEED | LBS. | 0.350 | 25.000 | 8.75 | ________ |
| HERBICIDE | ACRE | 10.000 | 1.000 | 10.00 | ________ |
| NITROGEN (N) | LBS. | 0.190 | 60.000 | 11.40 | ________ |
| PHOSPH (P205) | LBS. | 0.160 | 57.000 | 9.12 | ________ |
| INSECTICIDE | ACRE | 6.000 | 7.000 | 42.00 | ________ |
| PROCESSING | CWT. | 1.250 | 22.000 | 27.50 | ________ |
| BAG, TIES, CKOFF | BL. | 9.600 | 1.300 | 12.48 | ________ |
| HAND HOEING | HR. | 3.000 | 1.000 | 3.00 | ________ |
| COTTONPICKER | LBS. | 0.080 | 650.000 | 52.00 | ________ |
| IRRIGATION COST | ACRE | 18.000 | 1.000 | 18.00 | ________ |
| TRACTOR FUEL & LUBE | ACRE | | | 6.12 | ________ |
| TRACTOR REPAIR COST | ACRE | | | 3.58 | ________ |
| EQUIP. REPAIR COST | ACRE | | | 2.81 | ________ |
| TOTAL OPERATING COST | | | | 206.76 | ________ |
| RETURNS TO LAND,LABOR,CAPITAL,MACHINERY, OVERHEAD,RISK,AND MANAGEMENT | | | | 200.14 | ________ |
| CAPITAL COST: | | | | | |
| ANNUAL OPERATING CAPITAL | | 0.100 | 53.797 | 5.38 | ________ |
| TRACTOR INVESTMENT | | 0.100 | 56.184 | 5.62 | ________ |
| EQUIPMENT INVESTMENT | | 0.100 | 50.027 | 5.00 | ________ |
| TOTAL INTEREST CHARGE | | | | 16.00 | ________ |

TABLE V (Continued)

| | | | | | |
|---|---|---|---|---|---|
| RETURNS TO LAND, LABOR, MACHINERY, OVERHEAD, RISK AND MANAGEMENT | | | | 184.14 | ________ |
| OWNERSHIP COST: (DEPRECIATION, TAXES, INSURANCE) | | | | | |
| TRACTOR | HR. | | | 6.87 | ________ |
| EQUIPMENT | HR. | | | 7.81 | ________ |
| TOTAL OWNERSHIP COST | | | | 14.68 | ________ |
| RETURNS TO LAND, LABOR, OVERHEAD, RISK AND MANAGEMENT | | | | 169.46 | ________ |
| LABOR COST: | | | | | |
| MACHINERY LABOR | HR. | 4.000 | 1.863 | 7.45 | ________ |
| OTHER LABOR | HR. | 3.000 | 0.400 | 1.20 | ________ |
| IRRIGATION LABOR | HR. | 5.000 | 2.214 | 11.07 | ________ |
| TOTAL LABOR COST | | | 4.477 | 19.72 | ________ |
| RETURNS TO LAND, OVERHEAD, RISK AND MANAGEMENT | | | | 149.74 | ________ |
| LAND CHARGE OR RENT: | | | | | |
| LAND INVESTMENT | ACRE | 0.0 | 0.0 | 0.0 | ________ |
| LAND TAXES | ACRE | | | 0.0 | ________ |
| TOTAL LAND CHARGE | | | | 0.0 | ________ |
| RETURNS TO OVERHEAD, RISK AND MANAGEMENT | | | | 149.74 | ________ |

PROVENCE

12/20/78 0000010000

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PROGRAM DEVELOPED BY DEPT. OF. AGRI. ECON. OKLAHOMA STATE UNIVERSITY

typical definition of variable costs" [Casey, Jobes and Walker, 1977, p. 6]. This category contains the cost of those variable inputs that require a cash outlay by the producer during the crop year and would not be incurred without the production of that crop. The second page of the budget shown in Table VI indicates the use pattern of those inputs listed as operating inputs. It tells in which month and what quantity the resource item is used. The "total operating cost is subtracted from total receipts and the residual is returns to Land, Labor, Capital, Machinery, Overhead, Risk and Management" [p. 7].

The third category in the budget contains the payments for capital invested in the production of this enterprise. It includes two basic kinds of capital. The first one is Annual Operating Capital which is the capital required for the operating inputs which are listed in the first section of the budget. The remaining capital charges are for intermediate term investment in machinery, equipment and livestock.

A total interest charge on the capital invested is computed and subtracted from "Return to Land, Labor, Capital, Machinery, Overhead, Risk and Management". The residual is "Return to Land, Labor, Machinery, Overhead, Risk, and Management".

The fourth major category is labeled Ownership Cost and includes depreciation, taxes, and insurance. A detailed breakdown of ownership charges is shown on page two of the budget in Table VI. By subtracting ownership costs from the previous residual, a "Return to Land, Labor, Overhead, Risk and Management" is obtained.

The last category is for Labor Cost. Since it is difficult to separate operator labor and hired labor, "labor is specified at the

## TABLE VI

## THE SECOND PAGE OF THE INITIAL BUDGET

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| IRRIGATION WATER | INCH | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 10.00 | 8.00 | 0.0 | 0.0 | 0.0 | 0.0 | 19.00 |

MACHINERY FIXED AND VARIABLE COSTS PER HOUR

| MACHINE | CODE | DEPR | INSUR. | TAX | TOTAL FIXED | REPAIR | FUEL | LUB. | TOTAL VARIABLE | INT. | HR/TIME |
|---|---|---|---|---|---|---|---|---|---|---|---|
| TRACTOR(3) | 3 | 2.94 | 0.17 | 0.43 | 3.54 | 1.89 | 2.64 | 0.40 | 4.93 | 2.82 | 1.00 |
| TRACTOR(4) | 4 | 3.38 | 0.20 | 0.50 | 4.08 | 2.12 | 3.17 | 0.48 | 5.77 | 3.34 | 1.00 |
| ROTARY MOWER | 82 | 5.76 | 0.25 | 0.70 | 6.71 | 5.48 | 0.0 | 0.0 | 5.48 | 4.12 | 0.16 |
| ROLLOVER MB PLOW | 35 | 8.60 | 0.41 | 1.12 | 10.14 | 1.12 | 0.0 | 0.0 | 1.12 | 6.90 | 0.23 |
| OFFSET DISK | 41 | 4.50 | 0.20 | 0.56 | 5.26 | 1.07 | 0.0 | 0.0 | 1.07 | 3.35 | 0.12 |
| 7R 2RAR LISTER | 71 | 0.79 | 0.04 | 0.10 | 0.92 | 0.86 | 0.0 | 0.0 | 0.86 | 0.61 | 0.11 |
| 6ROW PLANTER | 56 | 5.40 | 0.24 | 0.67 | 6.31 | 2.04 | 0.0 | 0.0 | 2.04 | 4.01 | 0.12 |
| 6ROW CULTIVATOR | 31 | 2.80 | 0.13 | 0.35 | 3.28 | 1.13 | 0.0 | 0.0 | 1.13 | 2.10 | 0.14 |
| SPRAYER | 64 | 6.37 | 0.29 | 0.80 | 7.46 | 1.72 | 0.0 | 0.0 | 1.72 | 4.81 | 0.18 |
| CHISEL | 48 | 3.35 | 0.15 | 0.42 | 3.92 | 2.78 | 0.0 | 0.0 | 2.78 | 2.50 | 0.08 |

| OPERATION | ITEM NO. | DATE | TIMES OVER | LABOR HOURS | MACHINE HOURS | FUEL,OIL,LUB., REPAIR PER ACRE | FIXED COSTS PER ACRE |
|---|---|---|---|---|---|---|---|
| ROTARY MOWER | 4.82 | JAN | 1.00 | 0.193 | 0.160 | 1.89 | 3.03 |
| ROLLOVER MB PLOW | 4.35 | FEB | 0.33 | 0.090 | 0.075 | 0.56 | 1.88 |
| CHISEL | 4.48 | FEB | 0.67 | 0.064 | 0.053 | 0.48 | 0.77 |
| TRACTOR(3) | 3 | FEB | 0.08 | 0.096 | 0.080 | 0.39 | 0.51 |
| OFFSET DISK | 4.41 | MAR | 2.00 | 0.278 | 0.230 | 1.71 | 3.86 |
| SPRAYER | 64 | MAR | 1.00 | 0.0 | 0.181 | 0.31 | 2.22 |
| 7R 2RAR LISTER | 4.71 | APR | 1.00 | 0.128 | 0.106 | 0.76 | 1.03 |
| 6ROW PLANTER | 4.56 | APR | 1.00 | 0.149 | 0.123 | 1.03 | 2.28 |
| 6ROW CULTIVATOR | 4.31 | MAY | 1.00 | 0.173 | 0.143 | 1.07 | 1.93 |
| 6ROW CULTIVATOR | 4.31 | JUN | 1.00 | 0.173 | 0.143 | 1.07 | 1.93 |
| 6ROW CULTIVATOR | 4.31 | JUL | 2.00 | 0.346 | 0.286 | 2.14 | 3.87 |
| 6ROW CULTIVATOR | 4.31 | AUG | 1.00 | 0.173 | 0.143 | 1.07 | 1.93 |
| TOTAL | | | | 1.863 | 1.721 | 12.47 | 25.25 |

| COLUMN | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| NAME OF MACHINE | CODE | WIDTH (FEET) | INITIAL LIST PRICE | SPEED (MPH) | FIELD EFFIC-ENCY | RC1 | RC2 | RC3 | HOURS USED ANNUALLY | YEARS OWNED | REV1 | REV2 | PURCHASE PRICE | FUEL TYPE | HOURS OF LIFE | HP |
| TRACTOR(3) | 3. | 125.0 | 27500. | 4.5 | 0.88 | 1.25 | 0.000631 | 1.60 | 600. | 10.0 | 0.680 | 0.920 | 25750. | 3. | 12000. | 125. |
| TRACTOR(4) | 4. | 150.0 | 33600. | 4.5 | 0.88 | 1.15 | 0.000631 | 1.60 | 600. | 10.0 | 0.680 | 0.920 | 30200. | 3. | 12000. | 150. |
| 6ROW CULTIVATOR | 31. | 20.0 | 3950. | 3.8 | 0.76 | 1.00 | 0.000251 | 1.80 | 100. | 10.0 | 0.600 | 0.885 | 3500. | 0. | 2000. | 0. |
| ROLLOVER MB PLOW | 35. | 9.0 | 6200. | 4.5 | 0.90 | 1.80 | 0.002510 | 1.30 | 50. | 10.0 | 0.635 | 0.895 | 5600. | 0. | 5000. | 0. |
| OFFSET DISK | 41. | 18.0 | 6200. | 4.8 | 0.83 | 0.60 | 0.000251 | 1.80 | 100. | 10.0 | 0.600 | 0.885 | 5600. | 0. | 2000. | 0. |
| CHISEL | 48. | 32.0 | 9280. | 4.1 | 0.80 | 0.60 | 0.000251 | 1.80 | 200. | 10.0 | 0.600 | 0.885 | 8350. | 0. | 2000. | 0. |
| 6ROW PLANTER | 56. | 20.0 | 5200. | 5.0 | 0.67 | 0.65 | 0.000631 | 1.60 | 70. | 10.0 | 0.600 | 0.885 | 4700. | 0. | 1200. | 0. |
| SPRAYER | 64. | 20.0 | 4600. | 3.8 | 0.60 | 0.65 | 0.000251 | 1.80 | 50. | 10.0 | 0.600 | 0.885 | 4000. | 0. | 1000. | 0. |
| 7R 2RAR LISTER | 71. | 23.3 | 1200. | 5.0 | 0.67 | 1.00 | 0.000251 | 1.80 | 100. | 10.0 | 0.600 | 0.885 | 1000. | 0. | 1200. | 0. |
| ROTARY MOWER | 82. | 13.3 | 3750. | 4.8 | 0.81 | 1.80 | 0.002510 | 1.30 | 50. | 10.0 | 0.560 | 0.885 | 3500. | 0. | 1000. | 0. |

PROVENCE MACHINERY COMPLEMENT 6
EQUIPMENT COMPLEMENT 6
12/20/78 0000010000 PRICE VECTOR 6

BREAKEVEN PRICES
IF 650.00 LBS. COTTON LINT ARE PRODUCED:

| | |
|---|---|
| TO COVER VARIABLE INPUTS | 0.318 |
| TO COVER VARIABLE INPUTS AND INTEREST | 0.343 |
| TO COVER VARIABLE INPUTS AND LABOR | 0.348 |
| TO COVER VARIABLE INPUTS INTEREST AND LABOR | 0.373 |
| TO COVER ALL COSTS EXCEPT LAND OVERHEAD RISK AND MANAGEMENT | 0.396 |

TABLE VI (Continued)

BUDGET IDENTIFICATION NUMBER 936831510 656 6 — ANNUAL CAPITAL MONTH 11 — BUDGET RECORD NUMBER 330, BUDGET FILE 1

IRRIGATED COTTON ALTUS-LUGERT PROJECT — 93683151
CLAY LOAM FLOOD IRRIGATION — 01/10/79
CUSTOM HARVEST — SOUTHWEST

| LINE | 1 JAN | 2 FEB | 3 MAR | 4 APR | 5 MAY | 6 JUN | 7 JUL | 8 AUG | 9 SEP | 10 OCT | 11 NOV | 12 DEC | 13 PRICE | 14 WEIGHT | 15 UNIT CODE | 16 ITEM CODE | 17 TYPE | 18 CONT |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PRODUCTION | | | | | NUMBER OF UNITS | | | | | | | | | | | | | |
| 1 COTTON LINT | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 650.00 | 0.0 | -1.000 | 0.0 | 12. | 93. | 2. | 0. |
| 2 COTTON SEED | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 10.40 | 0.0 | 3.500 | 0.0 | 16. | 193. | 2. | 0. |
| OPERATING INPUTS | | | | | RATE/UNIT | | | | | | | | PRICE | NUMBER UNITS | UNIT CODE | ITEM CODE | TYPE | CONT |
| 11 COTTON SEED | 0.0 | 0.0 | 0.0 | 25.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.350 | 0.0 | 12. | 193. | 3. | 0. |
| 12 HERBICIDE | 0.0 | 0.0 | 1.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -1.000 | 0.0 | 7. | 258. | 3. | 0. |
| 13 NITROGEN (N) | 0.0 | 60.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -1.000 | 0.0 | 12. | 211. | 3. | 0. |
| 14 PHOSPH (P2O5) | 0.0 | 57.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -1.000 | 0.0 | 12. | 214. | 3. | 0. |
| 15 INSECTICIDE | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 2.00 | 3.00 | 2.00 | 0.0 | 0.0 | 0.0 | 6.000 | 0.0 | 7. | 240. | 3. | 0. |
| 16 PROCESSING | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 15.00 | 7.00 | 0.0 | 1.250 | 0.0 | 16. | 291. | 3. | 0. |
| 17 BAG, TIES, CKOFF | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1.00 | 0.30 | 0.0 | 9.600 | 0.0 | 6. | 281. | 3. | 0. |
| 18 HAND HOEING | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1.00 | 0.0 | 0.0 | 0.0 | 0.0 | 3.000 | 0.0 | 8. | 391. | 3. | 0. |
| 19 COTTONPICKER | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 650.00 | 0.0 | 0.080 | 0.0 | 12. | 374. | 3. | 0. |
| 20 IRRIGATION COST | 0.0 | 0.0 | 0.0 | 0.0 | 0.20 | 0.20 | 0.20 | 0.20 | 0.20 | 0.0 | 0.0 | 0.0 | 18.000 | 0.0 | 7. | 419. | 3. | 0. |
| MACHINERY REQUIREMENTS | | | | | | TIMES OVER | | | | | | | XXXXX | XXXXX | POWER UNIT | MACH CODE | TYPE | CONT |
| 38 ROTARY MOWER | 1.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 4. | 82. | 4. | 0. |
| 39 ROLLOVER MB PLOW | 0.0 | 0.33 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 4. | 35. | 4. | 0. |
| 40 OFFSET DISK | 0.0 | 0.0 | 2.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 4. | 41. | 4. | 0. |
| 41 7R 20AR LISTER | 0.0 | 0.0 | 0.0 | 1.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 4. | 71. | 4. | 0. |
| 42 6ROW PLANTER | 0.0 | 0.0 | 0.0 | 1.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 4. | 56. | 4. | 0. |
| 43 6ROW CULTIVATOR | 0.0 | 0.0 | 0.0 | 0.0 | 1.00 | 1.00 | 2.00 | 1.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 4. | 31. | 4. | 0. |
| 44 SPRAYER | 0.0 | 0.0 | 1.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0. | 64. | 4. | 0. |
| 47 CHISEL | 0.0 | 0.67 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 4. | 48. | 4. | 0. |
| 48 TRACTOR(3) | 0.0 | 0.08 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0. | 3. | 4. | 0. |
| 49 ACIN IRRIG WATER | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 10.00 | 8.00 | 0.0 | 0.0 | 0.0 | 0.0 | | | | | | |
| 50 OTHER LABOR | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.20 | 0.20 | 0.0 | 0.0 | 0.0 | 0.0 | | | | | | |

MONTHLY SUMMARY OF RECEIPTS AND EXPENSES

| CATEGORY | UNIT | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC | TOTAL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| TOTAL RECEIPTS | ACRE | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 406.90 | 0.0 | 406.90 |
| TOTAL EXPENSES | ACRE | 1.89 | 21.99 | 12.02 | 10.54 | 4.67 | 4.67 | 17.74 | 25.67 | 15.60 | 28.35 | 63.63 | 0.0 | 206.76 |
| RETURNS TO LAND, LABOR, CAPITAL, MACHINERY, OVERHEAD, RISK, AND MANAGEMENT | | | | | | | | | | | | | | 200.14 |
| ANNUAL CAPITAL | DOL. | 0.16 | 1.99 | 2.99 | 3.87 | 4.26 | 4.65 | 6.13 | 8.26 | 9.56 | 11.93 | 0.0 | 0.0 | 53.80 |

LABOR REQUIREMENTS BY MONTH

| | | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC | TOTAL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MACHINERY LABOR | HR. | 0.19 | 0.25 | 0.28 | 0.28 | 0.17 | 0.17 | 0.35 | 0.17 | 0.0 | 0.0 | 0.0 | 0.0 | 1.86 |
| IRRIGATION LABOR | HR. | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1.23 | 0.98 | 0.0 | 0.0 | 0.0 | 0.0 | 2.21 |
| OTHER LABOR | HR. | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.20 | 0.20 | 0.0 | 0.0 | 0.0 | 0.0 | 0.40 |
| TOTAL LABOR | HR. | 0.19 | 0.25 | 0.28 | 0.28 | 0.17 | 0.17 | 1.78 | 1.36 | 0.0 | 0.0 | 0.0 | 0.0 | 4.48 |

bottom of the budget so any analysis needed can be made" [Casey, Jobes, and Walker, 1977, p. 8]. By subtracting labor cost from the previous residual the remainder is "Return to Land, Overhead, Risk and Management".

Most of the data in the modified budgets used in this study for the 20 cropping systems were based on the information supplied by the initial budgets listed on Table VII.

Some of the information on the original budgets was modified to reflect the farming situations in the Altus-Lugert Irrigation District. Those modifications are as follows:

1. Due to high competition for the custom operators during harvesting season, cotton farmers are assumed to have their own trailers and strippers instead of hiring custom operators.

2. The average irrigation costs are estimated to be $1 per Acre inch of irrigation water for the irrigated cropping systems.

3. Since there is a large variation in yields according to farmer's cotton farming experience, 600 pounds of lint per acre is assumed as an average yield.

4. Annual tractor hours are calculated by summing the hours of use of each machine pulled by that tractor. This sum is multiplied by 110 percent, which considers a 10 percent time loss for moving the tractor to and from the fields, and implement hook-up time.

5. Alfalfa hay farmers are assumed to hire custom haying and stacking instead of having their own machines.

TABLE VII

INITIAL BUDGET NAMES, NUMBERS AND DATES

| Budget Name | Budget Number | Date |
|---|---|---|
| Irrigated Wheat | 76681731 | 06/01/78 |
| Irrigated Grainsorghum | 73681561 | 01/11/78 |
| Irrigated Alfalfa | 81682191 | 01/06/78 |
| Irrigated Soybean | 98600540 | 01/06/78 |
| Irrigated Cotton | 93683151 | 01/11/78 |
| Dryland Wheat | 76601204 | 06/01/78 |
| Dryland Alfalfa | 81602004 | 01/06/78 |
| Dryland Cotton | 93602904 | 01/06/78 |
| Cryland Grainsorghum | 73601104 | 01/06/78 |

CHAPTER V

# EMPERICAL RESULTS AND ANALYSIS

This section presents the results from the budgeting analysis, i.e., cost and return structure, capital investment, labor requirement, break-even prices and the ratio of return on investment for the various farm sizes and cropping conditions. The costs and returns estimated under specific situations are presented first.

## Costs and Returns

Total costs are obtained by subtracting estimated net return from estimated total revenue of products for each of the different farm sizes based on the machinery combinations presented in Table III.

In general, per acre total costs decline as more acres are operated, because while variable costs of inputs per acre are constant and fixed machinery costs per acre decline as acreage increases. The source of reduction in machinery costs can be distinguished in two ways: 1) from utilizing more fully the capacity of a set of machines and 2) from economies of scale gained by increasing machine size. Even though variable input costs per acre are constant as more acres are operated, a decline in machinery cost will cause total cost per unit of product to decrease because yields per acre are assumed constant.

However, as machinery size increases with farm size, total cost per unit might increase as the increase in machinery cost becomes greater than the increase in the efficiency of that larger machine. This total cost per unit increase, which is indicated by the lumpiness on Figures 4, 5, and 6 appears especially on farm sizes of 480- and 960-acres, due largely to the change in machinery size; that is, a change from 4 row equipment to 6 row equipment is made for the 480 acre farm size and from 6 row equipment to 4 row and 6 row combination is made for the 960 acre farm size.

In order to make an easy comparison between systems, the cropping systems are divided into three groups depending on the number of crops in the system. Group A: one-crop rotations; Group B: two-crop rotations; and Group C: three-crop rotations. Each cropping system is compared with other cropping systems within the group and finally a comparison is made between groups of cropping systems.

## Costs for Irrigated Farm Situations

### One-Crop Rotation

This group includes five different irrigated single crops, i.e., wheat, cotton, grain sorghum, soybeans, and alfalfa.

As presented in graphic form, Figure 4 contains curves for total cost per acre for each of the five crops. The overall trend of curves is concave from the top; as farm size increases, total cost per acre decreases. There are some exceptions which indicate lumpiness of total cost per unit as farm size moves to higher levels. For example, the total cost per acre for cotton at a farm size of 960 acres, and for alfalfa and soybeans at a farm size of 480 acres show a slight increase over the previous farm sizes. The reason for this lumpiness is that the increase of total cost per unit is greater than the increased efficiency

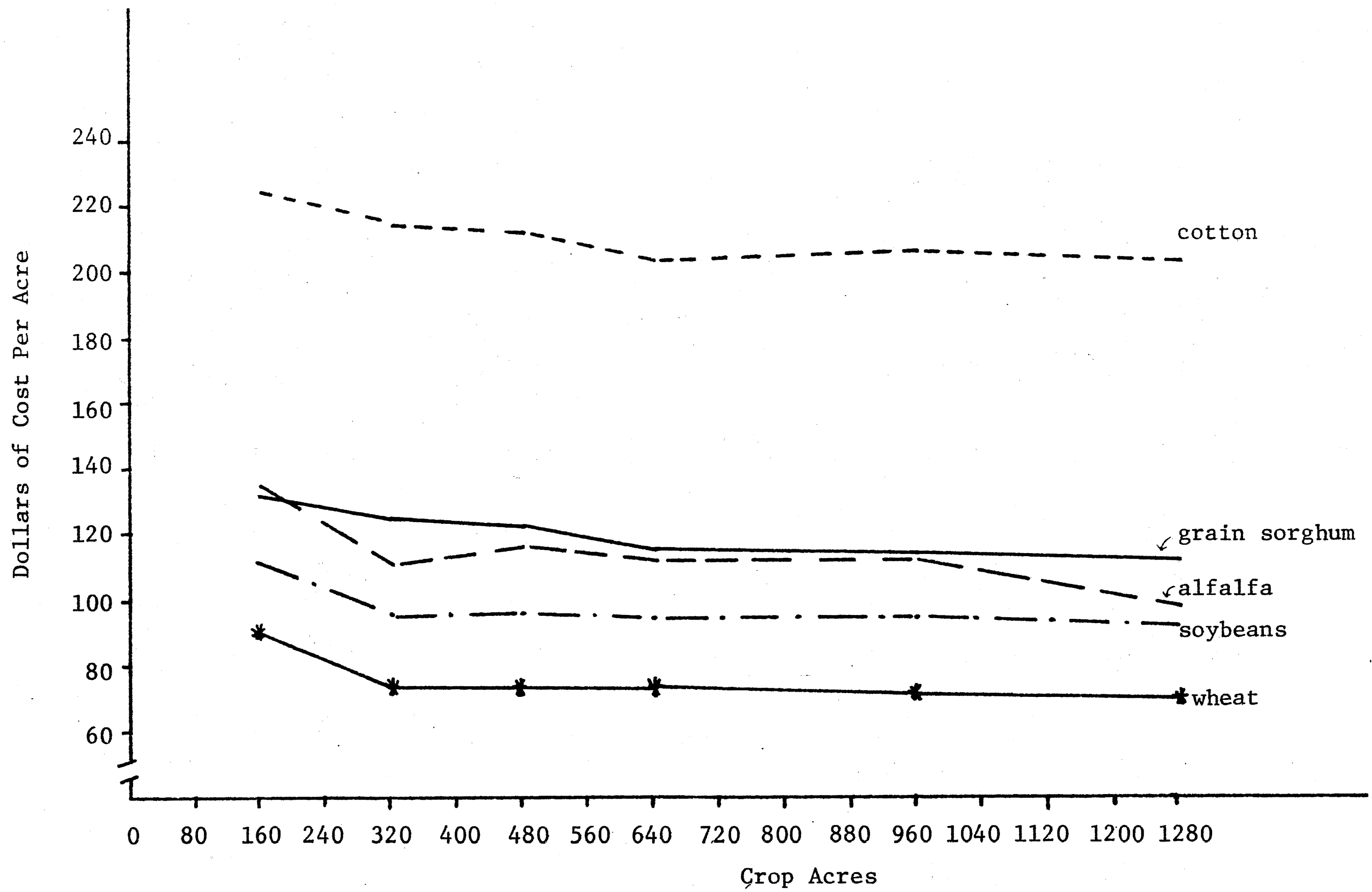


Figure 4. Average Total Cost Per Acre for Six Selected Farm Size of One-Crop Rotation Based on a Minimum Machinery Requirement and Irrigated Cropping Systems

gained by using larger machinery complements as farm size increases; that is, in Figure 1 discussed earlier, the farmer operates at point D instead point A.

Sharpest cost reductions occur between the 160 acres and 320 acres. Although the cost economies are obtained by varying farm size, cost savings tend to diminish as farm sizes increase (see Figure 4). Among the single-crop rotation systems, cotton requires the highest total cost per acre, followed by grain sorghum and alfalfa, while wheat shows the lowest total cost per acre requirement.

## Two-Crop Rotation

This group includes eight different two-crop combinations, where each crop occupies half of the given farm size.

Figure 5 shows curves for total cost per acre for each farm size. Because of crop combinations, the lumpiness of total costs per acre are smoothed out. This smoothing occurs due to the use of some of the same machines being used for both crops. For example, the total cost per acre of the wheat-grain sorghum combination approached the mean total cost per acre of each single-cropping system. However, the total cost of the two-crop rotation systems is always higher than the mean of the total costs per acre of each single cropping system. Table VIII (see Appendix) shows that the total cost per acre for grain sorghum and wheat are \$134.14 and \$91.54, respectively. The total cost per acre of \$119.89 for the wheat-grain sorghum combined cropping system is higher than the average of the total cost per acre for each one-crop rotation system which is \$112.84.

In comparing the rate of decline of total costs per acre between

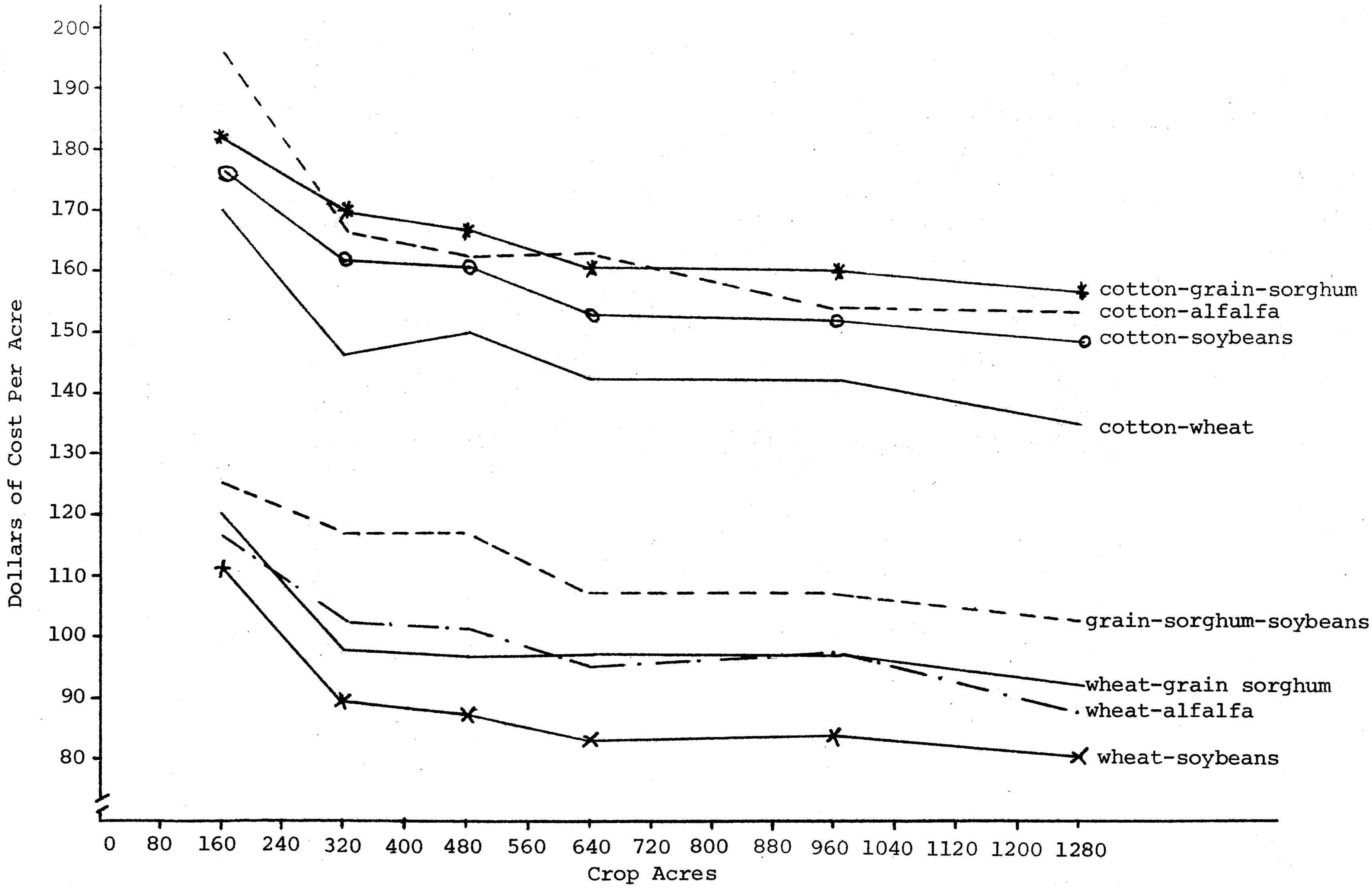


Figure 5. Average Total Cost Per Acre for Six Selected Farm Sizes of Two-Crop Rotations Based on a Minimum Machinery Requirement and Irrigated Cropping Systems

the extreme farm sizes of 160 acres and 1280 acres, the wheat-soybeans cropping system shows the highest percentage reduction in costs--a reduction of 27 percent, from $110.82 at a farm size of 160 acres to $80.36 at a farm size of 1,280 acres. The cotton-grain-sorghum cropping system results in the smallest percentage reduction in cost per acre, declining only 14 percent--$182.48 at a farm size of 160 acres to $157.00 at a farm size of 1280 acres.

Farm operators who choose any cropping system using cotton must pay a higher level of total cost per acre than farm operators who choose any other cropping system. A wheat-soybeans cropping system shows the lowest level of total cost per acre among all two-crop rotation systems (see Figure 5).

Three-Crop Rotation

Figure 6 shows the seven different curves representing total costs per acre for a three-crop rotation.

As is the case in a two-crop rotation, total costs per acre of a three-crop rotation approaches the average of total cost per acre for each single cropping system. Also, the total cost per acre of each three-crop rotation is higher than the mean of total costs per acre for each single cropping system.

The percentage decline of total cost per acre between extreme farm sizes, 160 acres and 1280 acres, for the wheat-alfalfa-grain-sorghum combination achieves the highest percentage decline, which is 33 percent, while the grain-sorghum-soybeans-cotton combination attains the lowest percentage decline, which is 18 percent.

The curves in Figure 6 include three cases of lumpiness of total

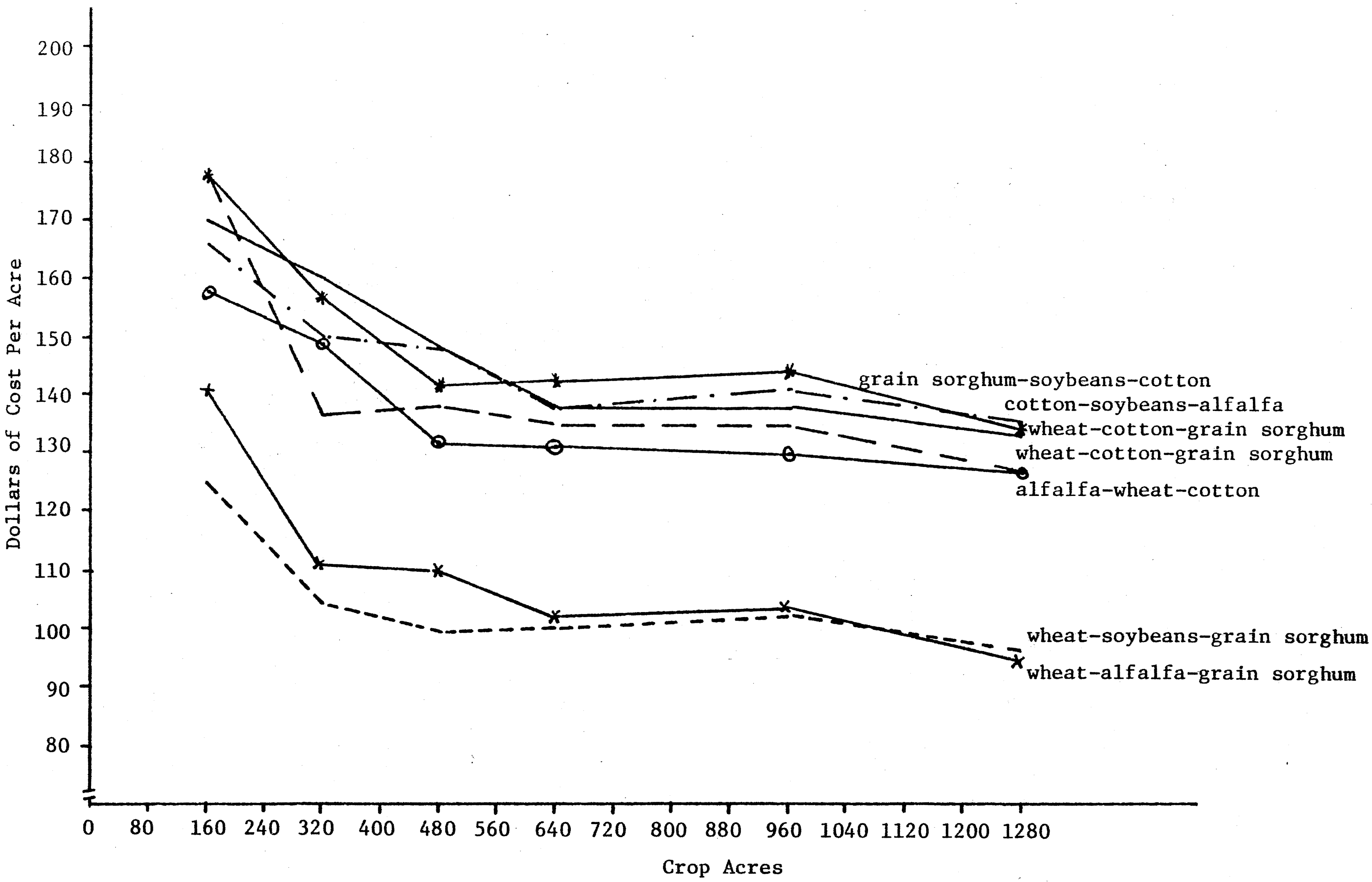


Figure 6. Average Total Cost Per Acre for Six Selected Farm Sizes of Three-Crop Rotations Based on a Minimum Machinery Requirement and Irrigated Cropping Systems

costs per acre, such as wheat-cotton-grain-sorghum, wheat-alfalfa-grain-sorghum at 960 acres and alfalfa-wheat-cotton at 480 acres.

### Comparisons Between Rotation Systems

As cropping systems are changed from one-crop rotations to two-crop and three-crop rotations, two basic changes occurred in the total costs per acre. The first change is that the mean percentage decline in total costs per acre is greater for the three-crop rotation system than the two-crop rotation system. Likewise, the mean percentage decline in total costs per acre is greater for the two-crop rotation system than the one-crop rotation system. The mean percentage decline in total costs per acre between extreme farm sizes increased from 16.8 percent in the one-crop rotations to 20.15 percent in the two-crop rotations and 24 percent in the three-crop rotations, respectively. Second, the range in cost per acre for any given farm size is smaller for the three-crop rotations than the two-crop rotations. Likewise, the range in cost per acre for any given farm size is smaller for the two-crop rotations than the one-crop rotations.

## Costs for Dryland Farming Situations

Since soybean production is not viable under dryland conditions in the study area, only the other four crops and eight of their combination cropping systems are considered.

### One-Crop Rotation

Figure 7 includes the four curves representing total cost per acre for one-crop systems. In general, like for those farm sizes included

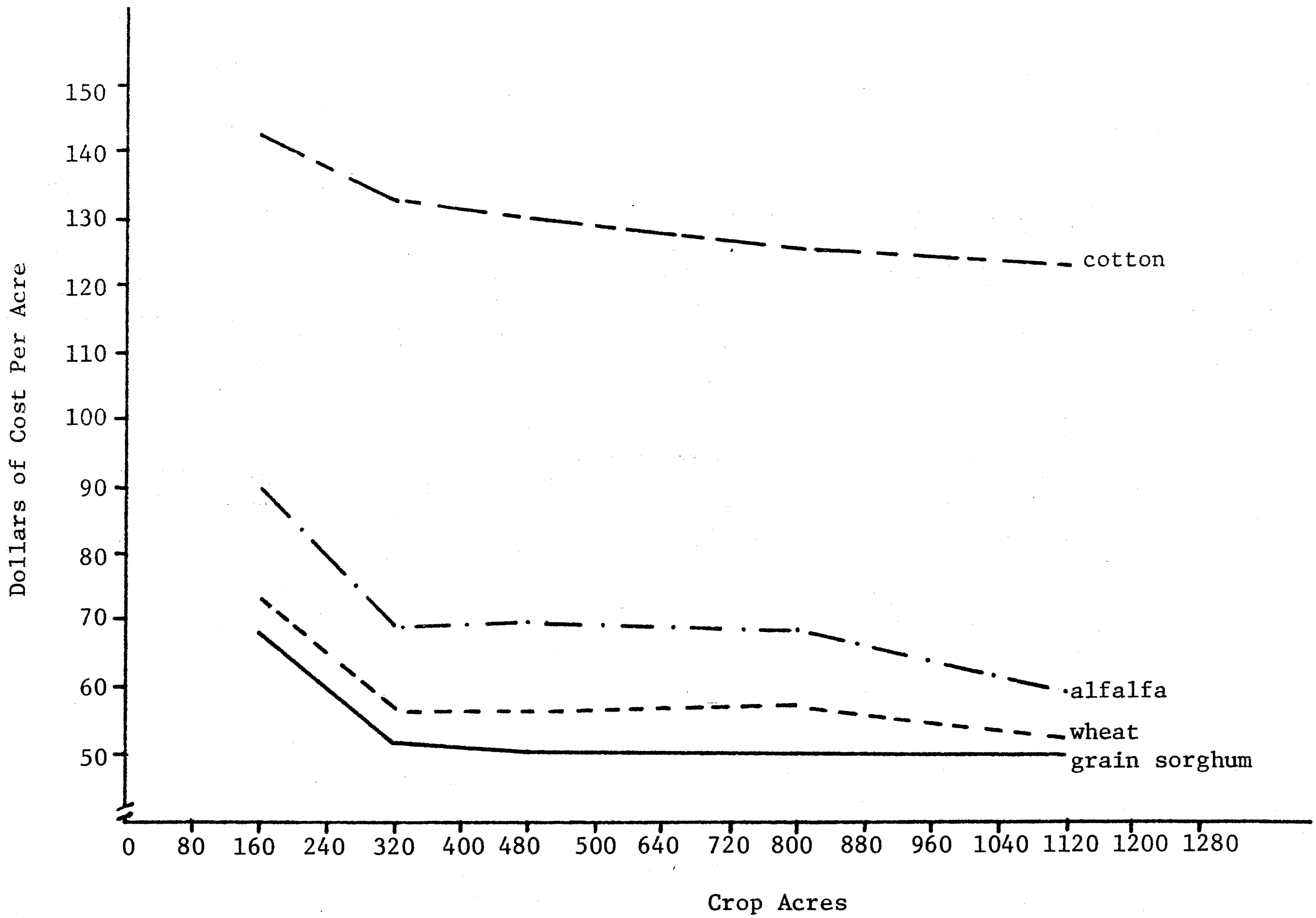


Figure 7. Average Total Cost Per Acre for Five Selected Farm Sizes of One-Crop Rotations Based on a Minimum Machinery Requirement and Dryland Cropping Systems

in the irrigated farm situations, the sharpest cost reduction occurred between a farm size of 160- and 320 acres, and then the rate of decline in cost decreased as farm sizes increased (see Figure 7).

Among the four single-crop rotation systems, cotton kept the highest total cost per acre, followed by alfalfa and wheat. Grain sorghum, which has the second highest total cost per acre under the irrigated farm condition dropped to the lowest cost requirement because the number of machines required under the dryland farm situation dropped to only four as compared to the nine for the irrigated grain sorghum farming.

When comparing the percentage decline of total costs between extreme farm sizes, alfalfa shows the highest reduction in cost--a reduction of 34 percent, from \$89.60 at a farm size of 160 acres to \$59.57 at a farm size of 1280 acres. Cotton shows the smallest cost reduction--a reduction of 14 percent, from \$142.68 at a farm size of 160 acres to \$123.15 at a farm size of 1280 acres (see Table IX).

## Two-Crop Rotation

Five different two-crop rotation systems are considered in Figure 8. Under dryland farming the yields per acre are much lower when compared to irrigated farm situations. Thus, for some cropping systems, the total receipts could not cover the total costs, relatively at small farm size. For example, the two rotations, wheat-grain sorghum and cotton-wheat, on a farm size of 160 acres show negative returns to "Land, Overhead, Risk and Management". This means that total costs are greater than total receipts.

Just like for the one-crop rotation, most of the cost reduction of two-crop rotation took place between farm sizes 160- and 320 acres,

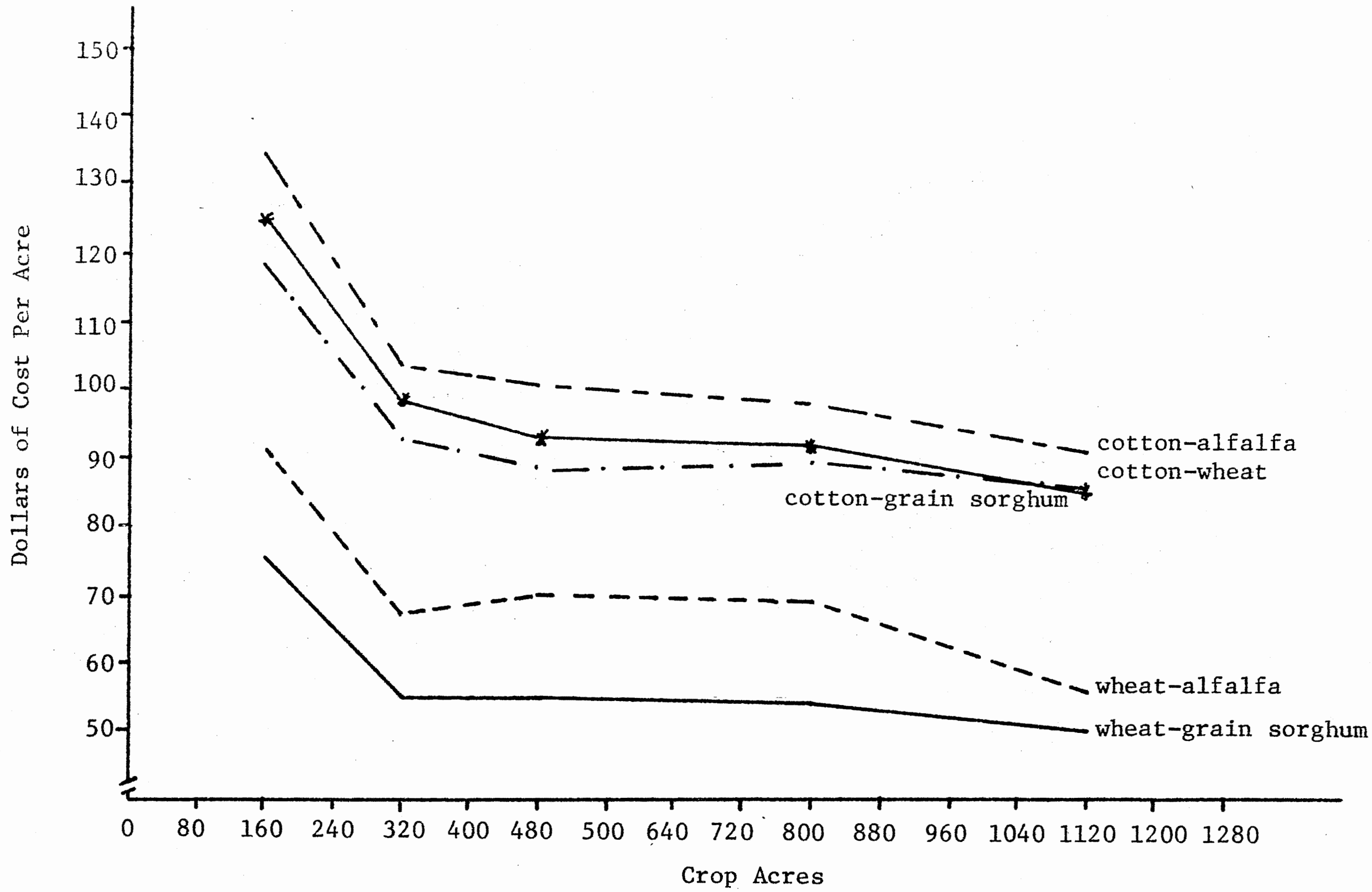


Figure 8. Average Total Cost Per Acre for Five Selected Farm Sizes of Two-Crop Rotations Based on a Minimum Machinery Requirement and Dryland Cropping Systems

however, a slight decline in cost occurred at large farm sizes, between 800- and 1120 acres, except for the wheat-grain sorghum cropping system.

In comparing the percentage decline of total cost between extreme farm size, 160 acres and 1120 acres, the wheat-grain sorghum cropping system shows the highest cost reduction--a decline of 33 percent, from $75.48 at a farm size of 160 acres to $50.34 at a farm size of 1120 acres.

## Three-Crop Rotation

This group includes only three different three-crop combinations, and each crop in the system takes one-third of the given farm size. Figure 9 shows curves of total cost per acre for each cropping systems. Each curve kept almost the same pattern of trend and constant vertical distances between cost curves through farm size variation. The cost curve for alfalfa-wheat-cotton is at the highest level, followed by wheat-cotton-grain sorghum and wheat-alfalfa-grain sorghum.

## Comparisons Between Rotation Systems

As is the case of the irrigated cropping situations, the average percentage decline of total cost per acre between extreme ranges decreased as cropping systems are changed from one-crop rotations to two-crop and three-crop rotations. The average percentage decline of total cost per acre between extreme ranges are 74.5 percent for one-crop rotations, 67.6 percent for two-crop rotations, and 66.3 percent for three-crop rotations, respectively. Among all cropping systems, the one-crop rotation of cotton has the highest level of total cost per acre.

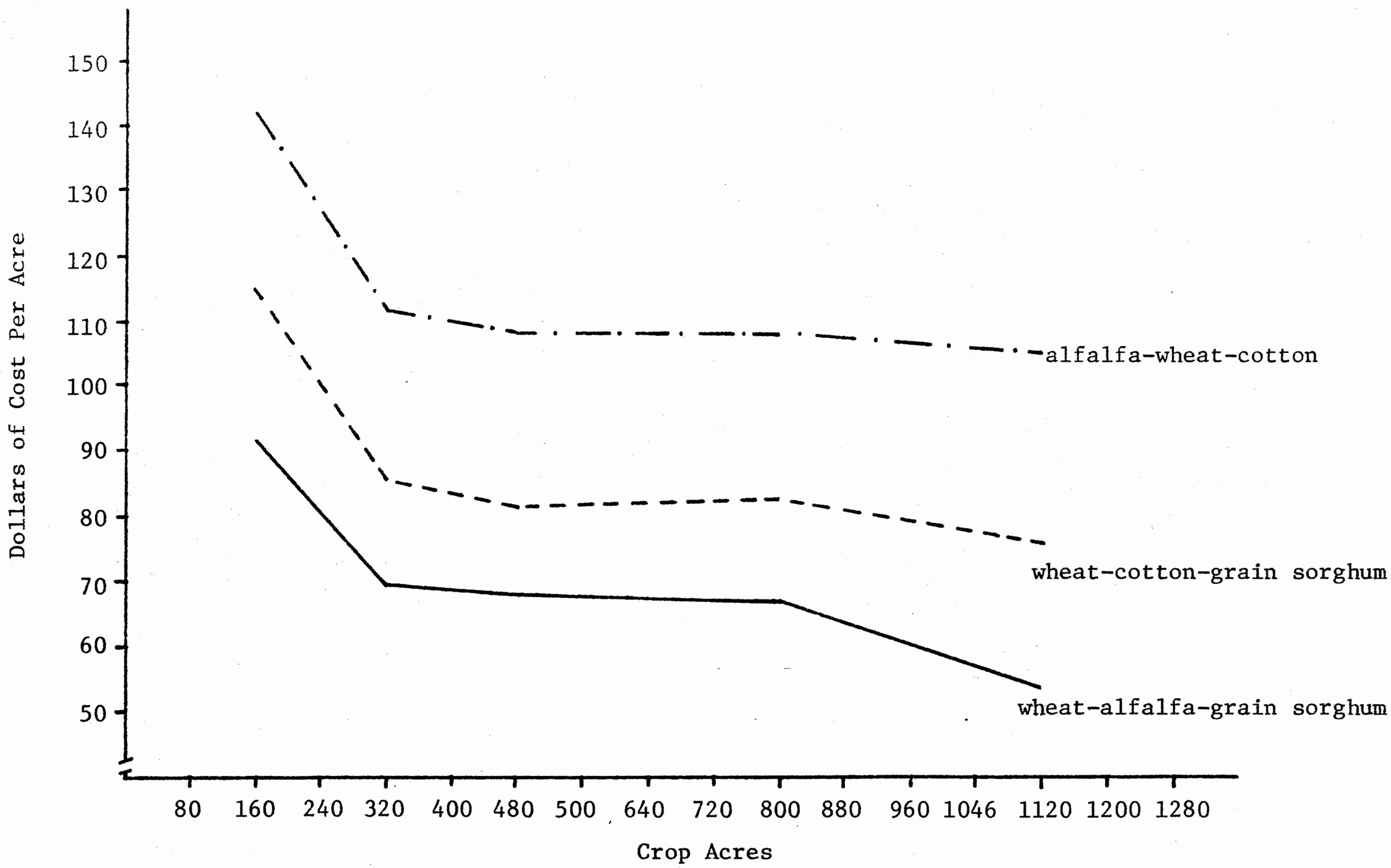


Figure 9. Average Total Cost Per Acre for Five Selected Farm Sizes of Three-Crop Rotations Based on a Minimum Machinery Requirement and Dryland Cropping Systems

## Return From Irrigated Farm Situation

In this study the use of the term "return" implies the "Return to Land, Overhead, Risk and Management", therefore, the meaning of return is close to the profit concept except the latter excludes the "Return to Land". Figures 10, 11 and 12 include curves for return per acre for each cropping system based on the number of crops in the rotation.

In general, return per acre increases as farm size increases. The reason of the increased return associated with large farms is that large farms are economically more efficient than small farms, due to economies of scale.

When comparing the curves of returns for crops, alfalfa shows the highest level of return, and the difference of returns between alfalfa and other crops is very wide. The difference of returns between cropping systems reduces or disappears as crop systems include two- and three-crops in the rotation. When considering the rate of increase in return between extreme farm sizes, wheat achieves a 46 percent increase from $45.96 at 160-acres to $67.23 at 1280 acres (see Table X). This means that farm return increases 2¢ per acre on the average between extreme farm sizes. Since these returns are calculated by subtracting total costs from total receipts, the highest rate of return in wheat is just the other side of the coin of the highest decline of total cost in wheat.

## Return From Dryland Farm Situation

Figures 13, 14 and 15 contain curves representing the return per acre for dryland cropping systems. As in the case of the irrigated farm situation, in general return per acre increased as acres of crop

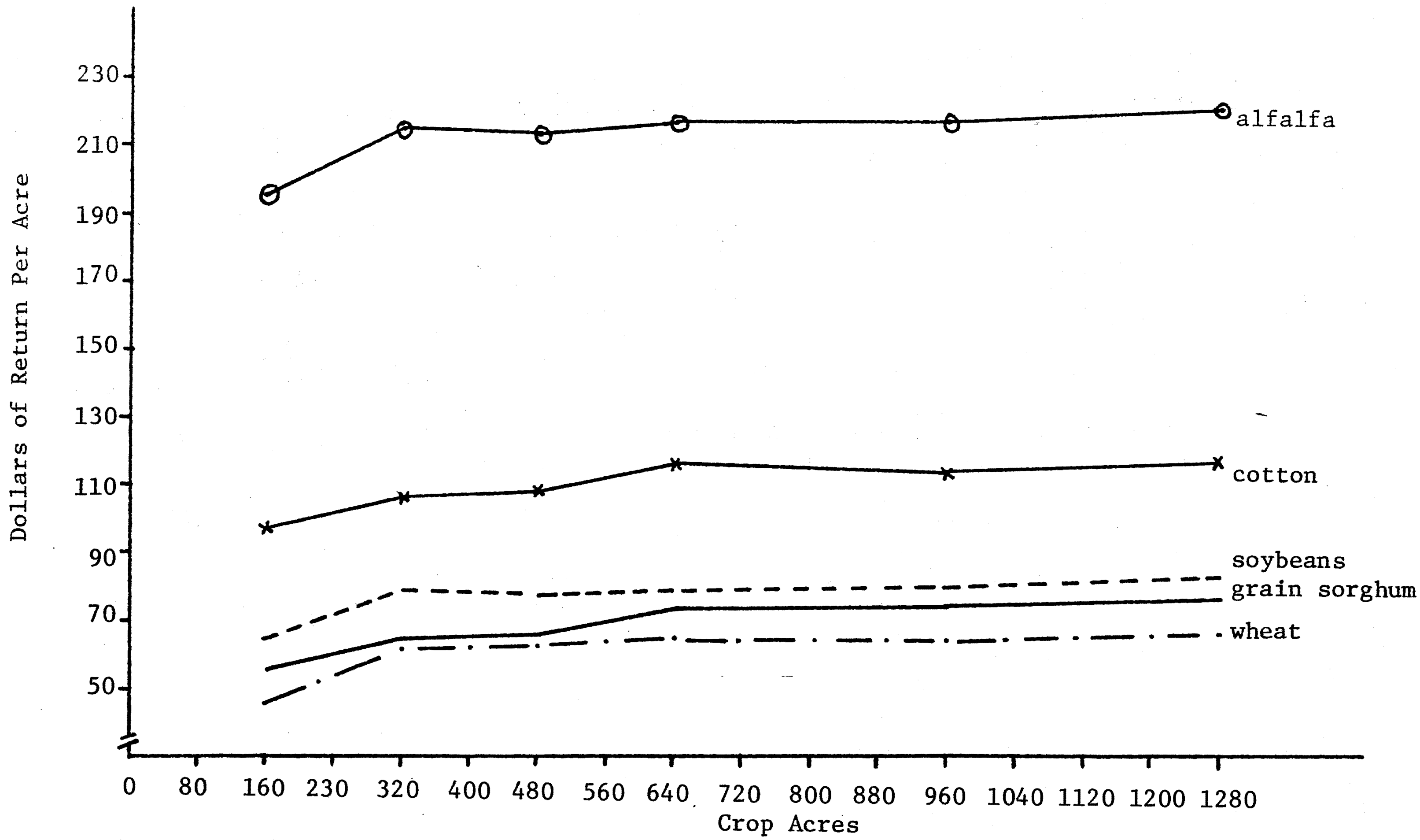


Figure 10. Return Per Acre to Land, Overhead, Risk, and Management for Six Selected Farm Sizes of One-Crop Rotations Based on Given Irrigated Cropping Systems

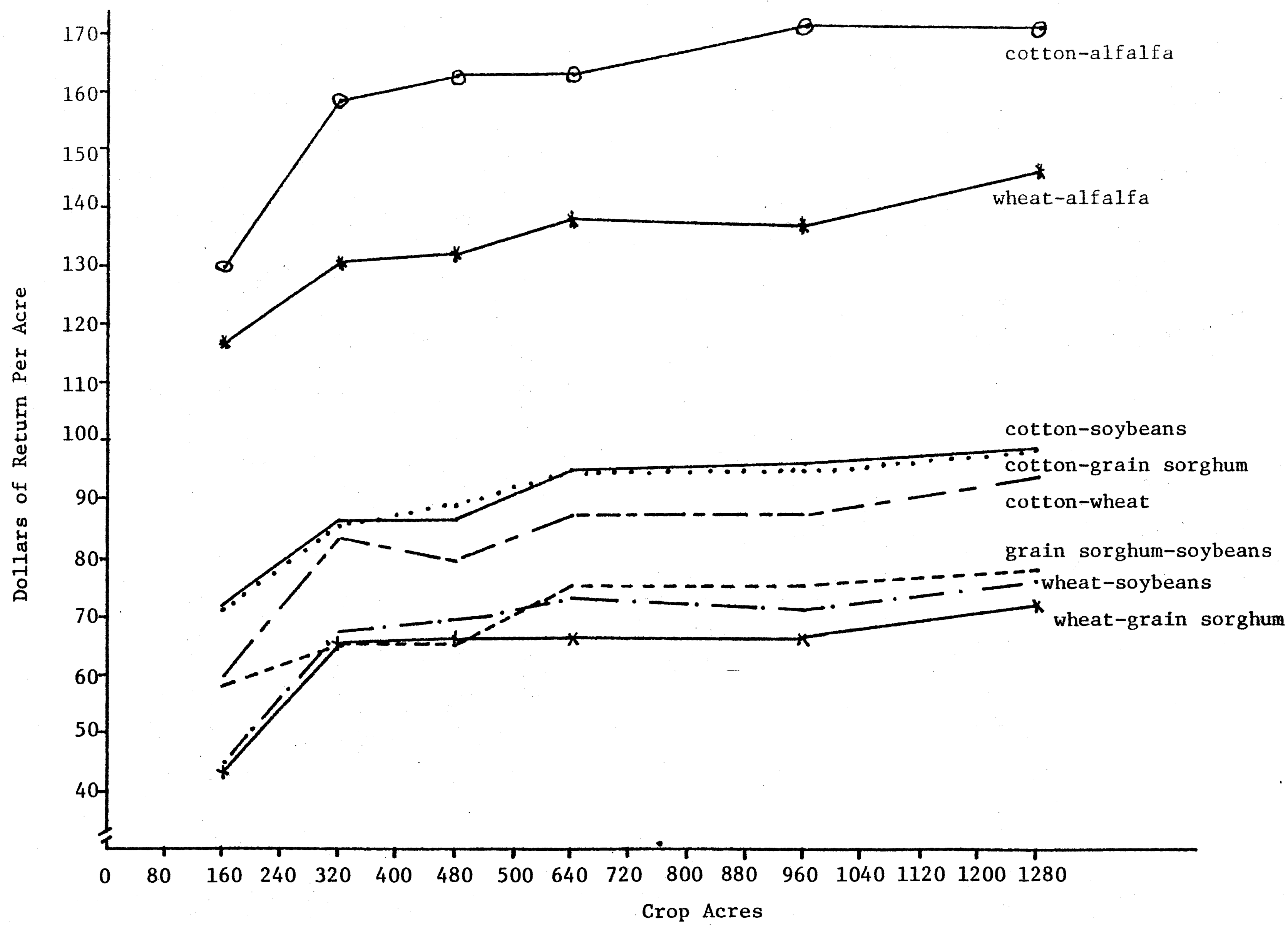


Figure 11. Return Per Acre to Land, Overhead, Risk, and Management for Six Selected Farm Sizes of Two-Crop Rotations Based on Given Irrigated Cropping Systems

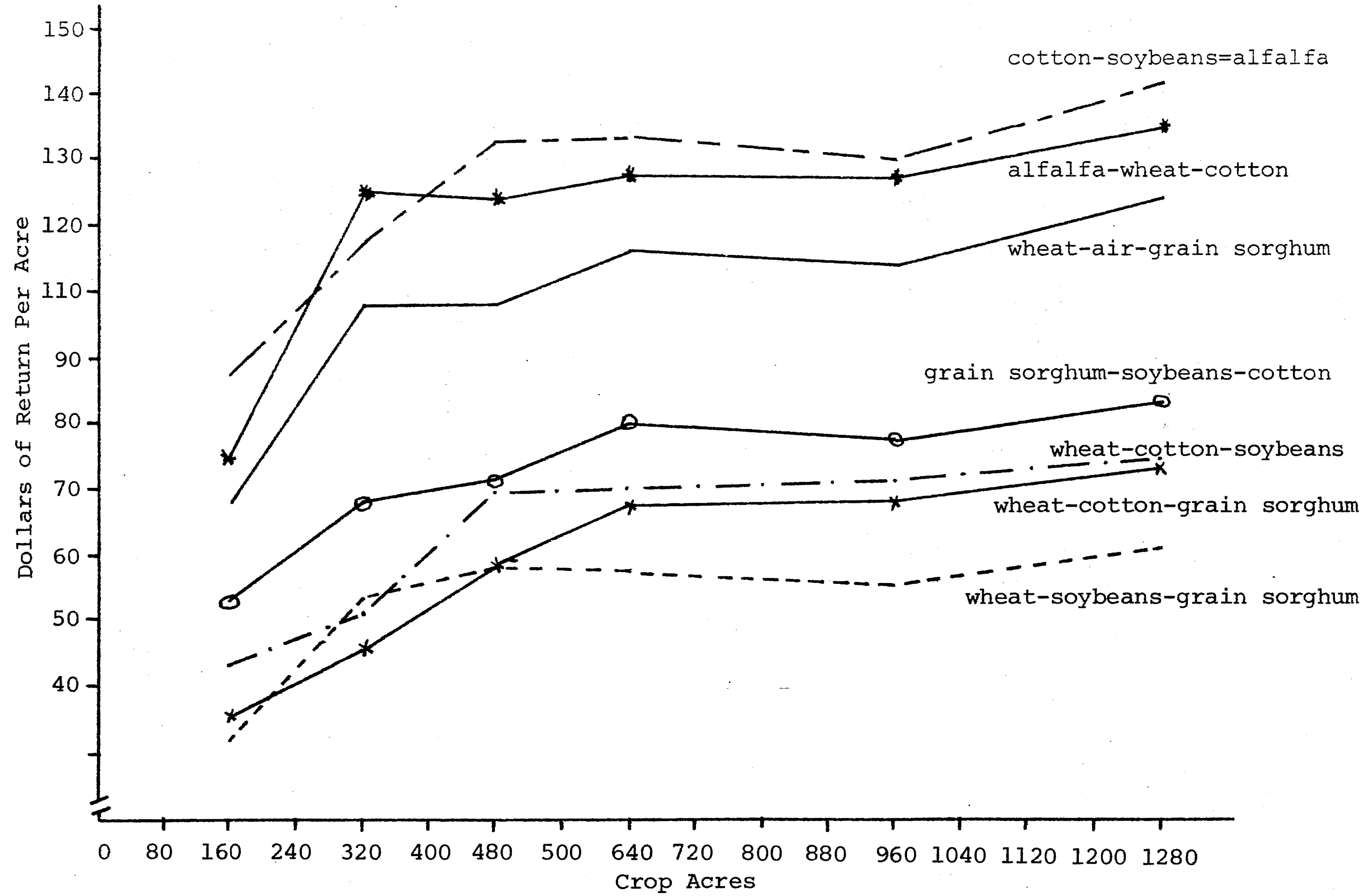


Figure 12. Return Per Acre to Land, Overhead, Risk, and Management for Six Selected Farm Sizes of Three-Crop Rotations Based on Given Irrigated Cropping Systems

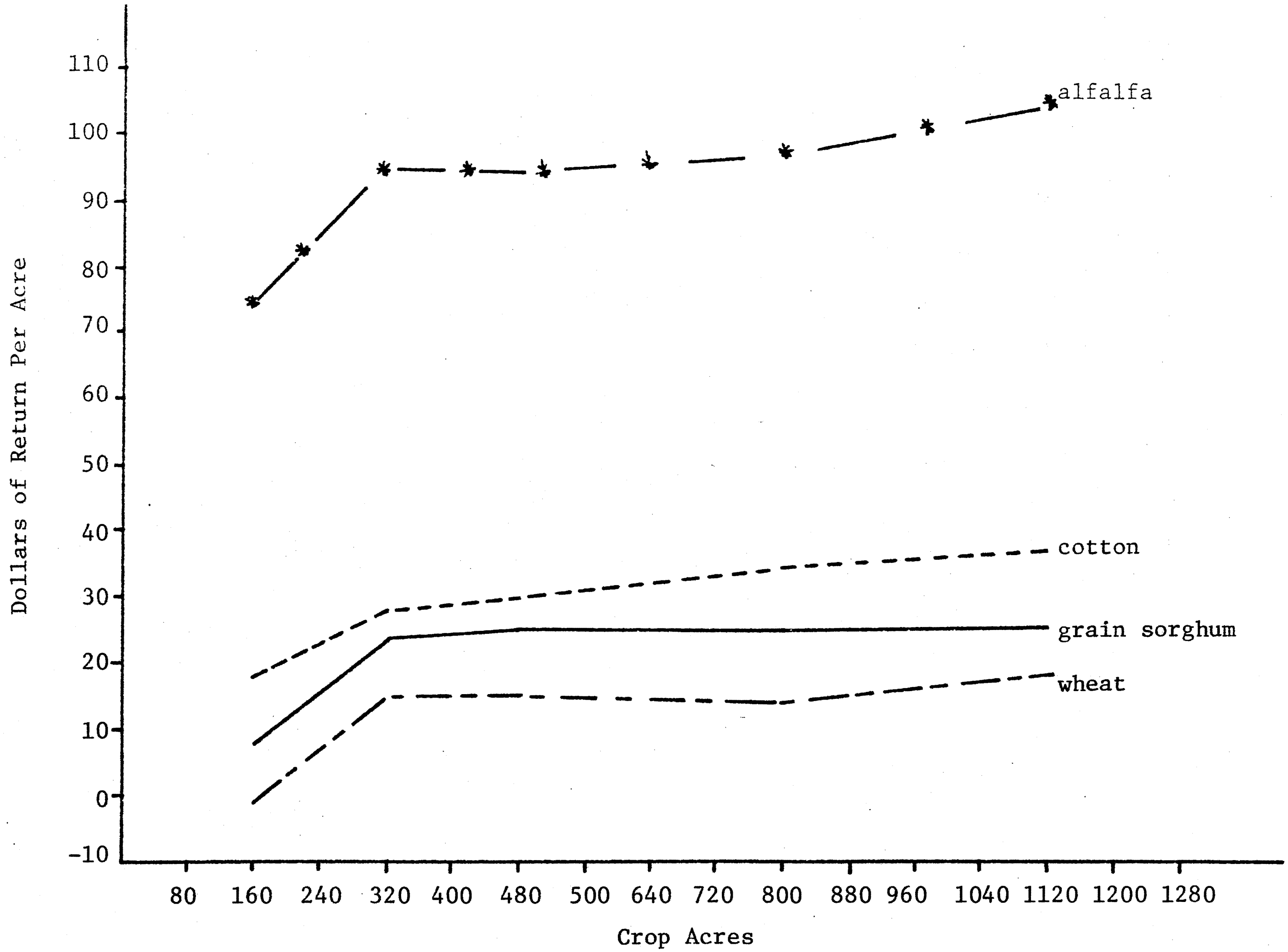


Figure 13. Return Per Acre to Land, Overhead, Risk, and Management for Five Selected Farm Sizes of One-Crop Rotations Based on Given Dryland Cropping Systems

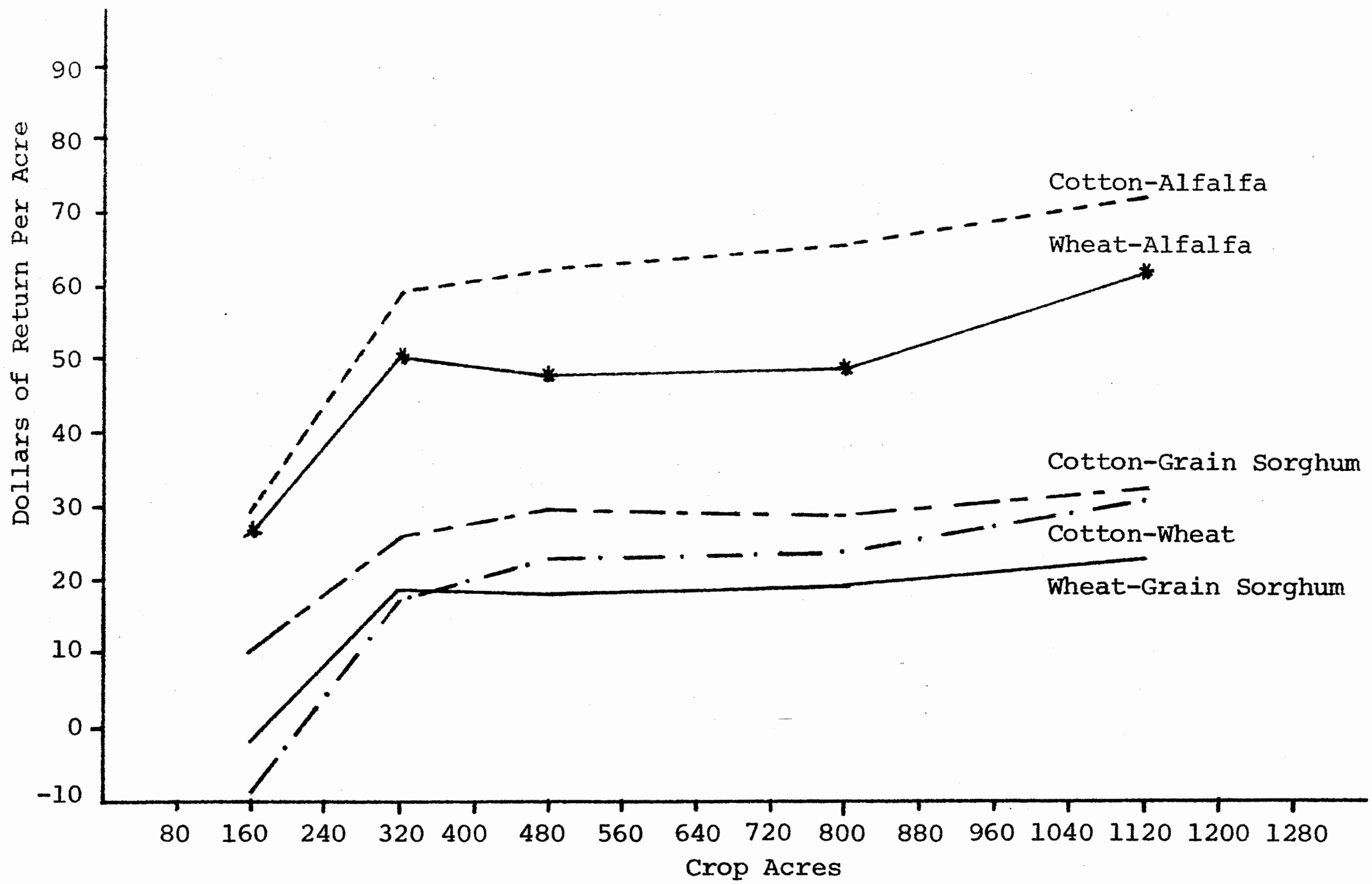


Figure 14. Return Per Acre to Land, Overhead, Risk and Management for Five Selected Farm Sizes of Two-Crop Rotations Based on Given Dryland Cropping Systems

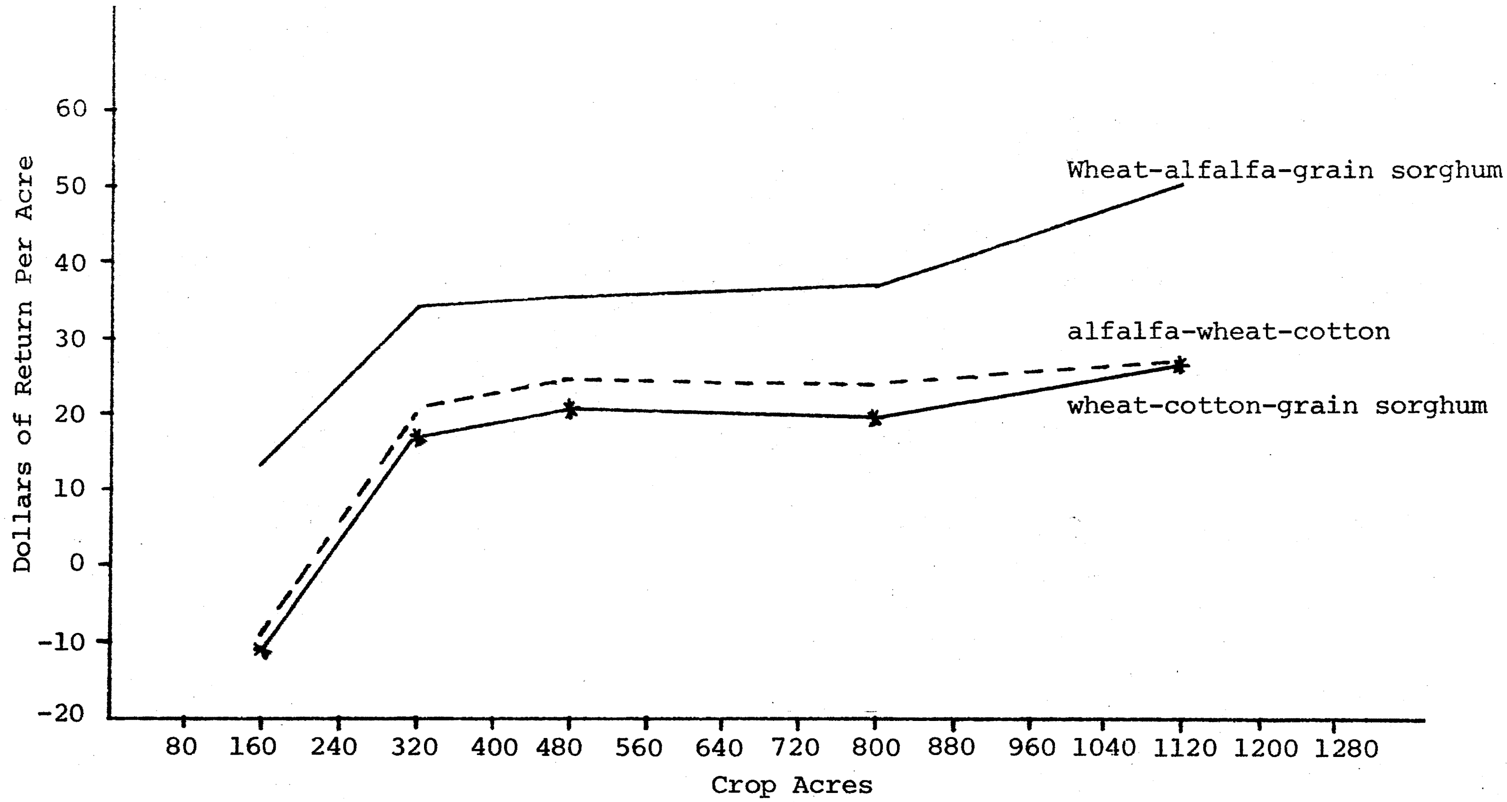


Figure 15. Return Per Acre to Land, Overhead, Risk, and Management for Five Selected Farm Sizes of Three-Crop Rotations Based on Given Dryland Cropping Systems

land increase for all the dryland cropping systems. In Figure 13 alfalfa shows the highest return with a trend of increasing returns per acre as farm size increases. Yields per acre at a small farm size under the dryland farm situation, are small comparing total costs. Five dryland cropping systems out of twelve result in negative returns as is shown in Table XI. Thus, farmers could not produce these crops on small dryland farms without losses because with these sizes of operations not only "Return to Land, Overhead, Risk and Management" but also other costs could not be covered. As can be seen in Figure 13, the curve which shows the return for wheat suggests that wheat farms should be larger than 171 acres in order to recover total costs. This curve starts below zero and intersects the horizontal axis at the 171 acre farm size.

## The Effect of Enforcement of Irrigated Land Limitation

### Costs and Returns

Costs and returns for the six farm sizes under 160 acres of irrigated land limitation and returns under 320 acres and 480 acres of irrigated land limitation are obtained by combining twelve dryland cropping systems with the same irrigated cropping systems. Data in Table XII show the production costs per acre for those farm sizes, considering the irrigated land limitation of 160 acres. Since the irrigated portion of each farm size is restricted to 160 acres, all land in addition to the 160 acres for each farm size is assumed to be operated under dryland farming conditions. For example, if a farm size is 320 acres, the first 160 acres can be operated with irrigation but the other 160 acres would be farmed without irrigation. Between the two farming situations, irrigation and dryland, production costs per acre of the former are higher than that of the latter as long as the irrigation water is not free. Therefore, it is obvious that production costs per acre decline as the percentage of the irrigated land in the total farm size decreases. This can be seen in Table XII. When comparing the percentage decline of production costs between extreme farm sizes, grain sorghum shows the highest reduction in cost--a reduction of 54.7 percent, from $134.14 at a farm size of 160 acres to $60.83 at a farm size of 1280 acres. The alfalfa, wheat, and cotton combination shows the smallest reduction--a reduction of 35.8 percent, from $177.93 at a farm size of 160 acres to $114.29 at a farm size of 1280 acres.

Table XIII shows returns per acre considering the irrigated land limitation of 160 acres. Under this limitation, a farmer who owns less than 160 acres of irrigated land does not lose at all by the limitation, and returns per acre for each cropping system are exactly the same as the returns per acre would otherwise be when there is no irrigated land limitation. However, a farmer who owns 320 acres will be forced to operate 160 acres under dryland farming conditions because of the limitation. In this situation the returns per acre for a 320 acre farm are calculated by using 50 percent of the returns per acre from a 160 acre farm with irrigation plus 50 percent of the returns per acre, from a 160 acre farm without irrigation. The data of returns per acre for other farm sizes are obtained by a similar method.

When comparing returns per acre between various farm sizes, the trends of returns show some inconsistency even though they are generally declining. Between farm sizes of 160 acres and 320 acres the returns per acre decline very much, largely because the percentage of the irrigated land changes from 100 percent to 50 percent. However between farm sizes of 320 and 480 acres the returns per acre increase in most cropping systems even though the percentage of irrigated land changes from 50 to 33.3 percent. The main reason for these increased returns per acre at a farm size of 480 acres is because there were large differences in returns per acre between a farm size of 160 acres and 320 acres under the dryland situation. The relative large amount of returns per acre from 320 acres of dryland out of a 480 acre farm size, contributed to the increased returns per acre under the 160 acre limitation.

As irrigated land limitations increase from 160 acres to 320 acres and 480 acres, the returns per acre of each different limitation increases accordingly. Table XIV shows the returns per acre under irrigated land limitations of 320 acres and 480 acres, respectively. By the same reason, as explained earlier in the case of 160 acres limitation, if farms are smaller than the irrigated land limitation, returns per acre are the same as the returns per acre when there is no limitation on irrigated land. The returns per acre data for total farm sizes of 960 acres and 1280 acres under two different irrigation limitations of 320 acres and 480 acres are not included in the table because of lack of information.

When comparing returns per acre for a farm size of 640 total acres, considering three different irrigated land limitations, the returns increased with the expansion of the limitation from 160 acres to 320 acres and from 320 acres to 480 acres. For grain sorghum on a farm size of 640 acres, for example, returns per acre increased from $32.96 as shown in Table XIII, given a limitation of 160 acres, to $44.31 as shown in Table XIV, given a limitation of 320 acres. Likewise, returns per acre increased as shown in Table XIV from $44.31 given a limitation of 320 acres to $52.04 given a limitation of 480 acres. These increases in returns per acre resulting from expanding the irrigated land limitation means that farmers can make additional returns by expanding irrigated farm size. The additional returns of $11.35 per acre of grain sorghum, obtained by expanding the irrigated land limitation from 160 acres to 320 acres, can be analyzed that a farmer can add an average of seven cents to returns for each additional acre of irrigated land. By the same reasoning, if the irrigated land limitation is increased from 320 acres to 480 acres, a grain sorghum farmer with 640 acres of land will make an average of five cents more returns for each additional acre of irrigated land.

Windfall Benefits From Federal Irrigation Water

By subtracting total returns for each dryland cropping system from total returns for each irrigated cropping system, windfall benefits from federal irrigation water can be calculated for each cropping system. Data in Table XV show the windfall gain, that is the additional total returns, which federal water provides to "Land, Overhead, Risk and Management" at three different levels of irrigated land limitations. As can be seen in Table XV the average additional total returns provided by federal water increase as the irrigated land limitation increases. However, per acre windfall benefits decline as the irrigated land limitation increases. Windfall benefits, or in other words average per acre additional returns provided by federal water are $73.25 given a limitation of 160 acres of irrigated land, $68.81 for a limitation of 320 acres of irrigated land, and $66.50 for a limitation of 480 acres of irrigated land respectively. The average windfall benefit of $11,720 for 160 acres of irrigated land is 58.6 percent of the $20,000 average windfall benefit in California area computed by LeVeen.

Costs of Limitation

The data in Table XVI show for each farm size those total returns given up when the 160 acres of irrigated land limitation is enforced. When only 160 acres of irrigated land is allowed, then a farmer who owns more than 160 acres is assumed to operate those acres of land in excess of 160 acres under dryland farming conditions. The costs of the 160 acres limitation are obtained by finding the differences in returns per acre between 1) all of the land being irrigated and 2) all land considering a limitation of 160 acres of irrigated land, and then these differences are multiplied by each farm size. Between rotation systems, as can be seen in Figure 16, there are few differences in the costs of the 160 limitation, except the three-crop rotation shows relatively higher costs of the limitation than either of the other two rotations.

When various limitations such as 160 acres, 320 acres, and 480 acres of irrigated land are imposed on a farm size of 640 acres, the total returns sacrificed by the various sizes of limitations decline as the irrigated land limitation increases. For example, the grain sorghum cropping system in Table XVII shows that the total return given up for a farm size of 640 acres declines from $19,539 given an irrigated land limitation of 320 acres, to $14,592 given an irrigated land limitation of 480 acres. These sacrificed returns are less than that of $26,803 given an irrigated land limitation of 160 acres, as shown in Table XVI.

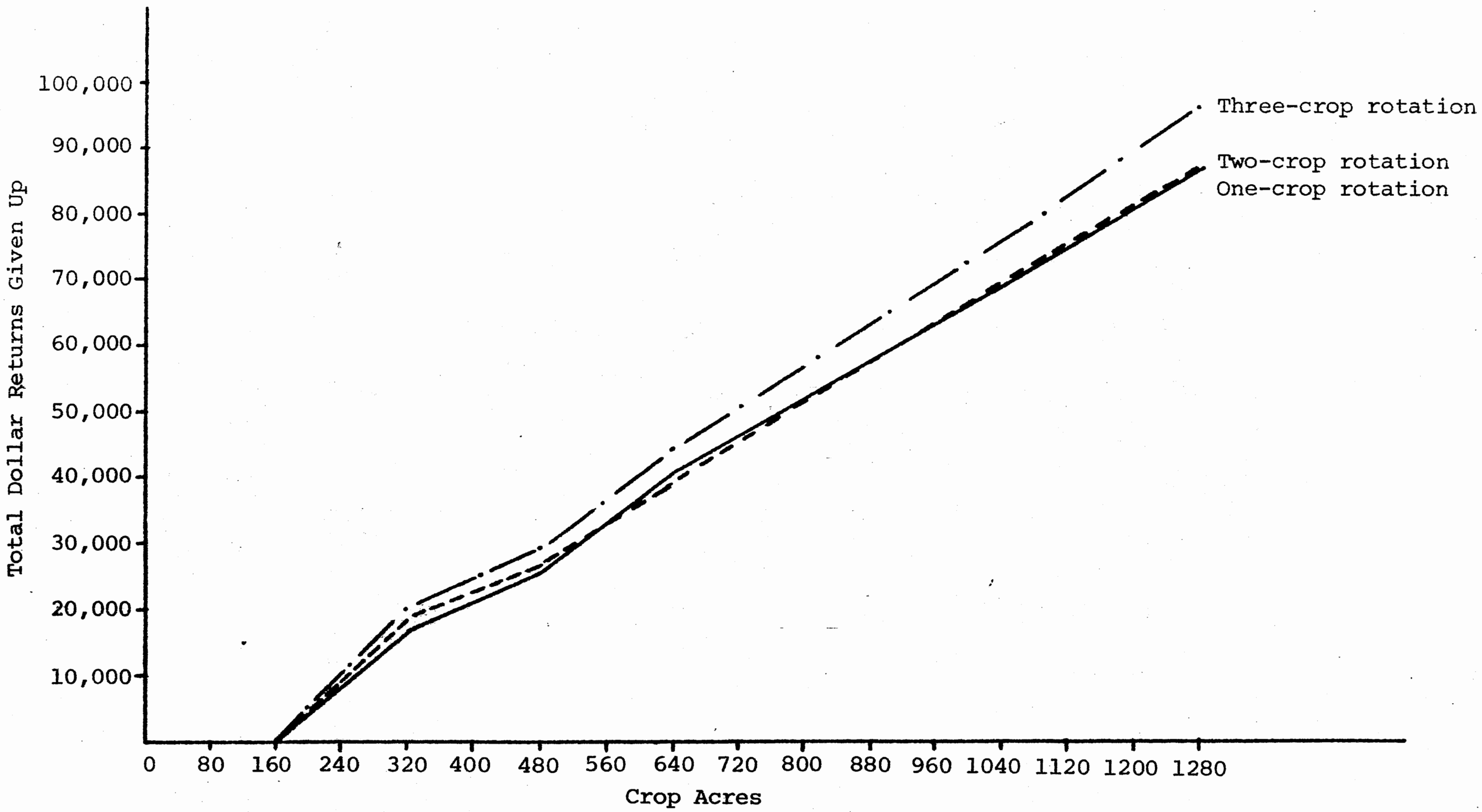


**Figure 16. Total Dollar Returns Given Up for the Three Different Rotations by the 160 Acres Limitation**

## Economies of Scale

### Cost of Gaining One Dollar Return

Economies of scale arise from decreasing costs per unit of production. Reduced costs per unit of production, or economies of scale, may result either from producing a greater volume of output for a given cost of inputs, or from purchasing large quantities of production input goods and services for lower prices, or from a combination of both. In the long run all inputs are variable and a farmer is able to reduce the cost per unit of production by shifting to a machinery combination which has a larger power unit and has a more effective field capacity on expanded farm sizes.

Total revenue and total cost data, when expressed as ratios of total cost to total revenue, suggest the existence and the importance of economies of scale under conditions of this study as can be seen in Table XVIII.

Figures 17, 18 and 19 show long-run cost curves. These curves show costs per dollar return as gross revenue increases. Costs per dollar return continuously decline over the range of these long-run cost curves for cropping systems. Most of the cost reduction occurs before the dollar return reaches $100,000 with the cost decreasing at a decreasing rate as the total return increases. Even though these long-run planning curves show continuous cost reductions throughout their entire length, lumpiness appears on some of the curves. These cases of lumpiness suggest that cost increases are greater than efficiency gained by shifting to larger or more efficient equipment at those particular larger farm sizes.

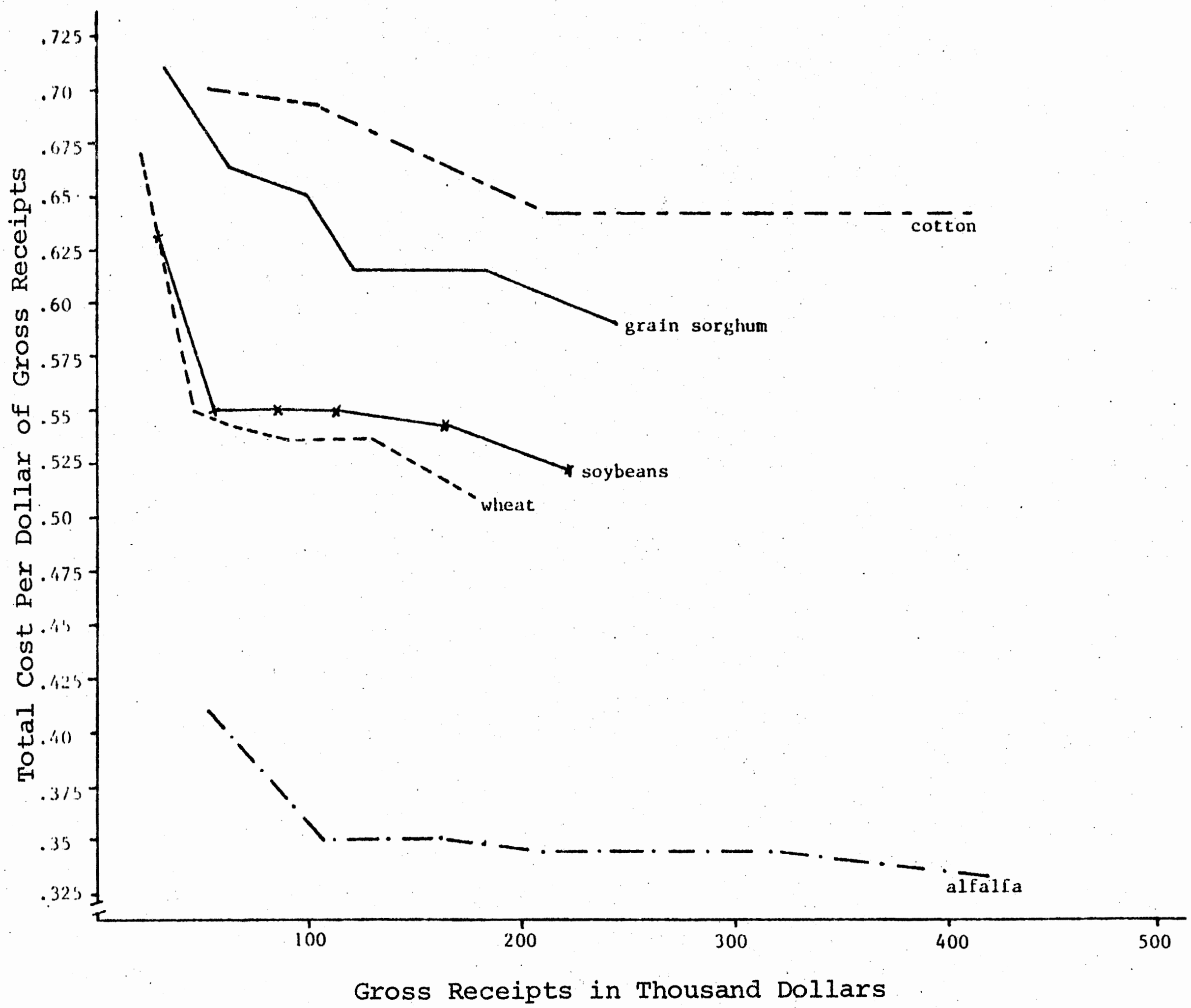


Figure 17. The Ratio of Total Cost to Gross Receipts Per Acre for Selected Farm Sizes of One-Crop Rotations Based on a Minimum Machinery Requirement and Irrigated Cropping Systems

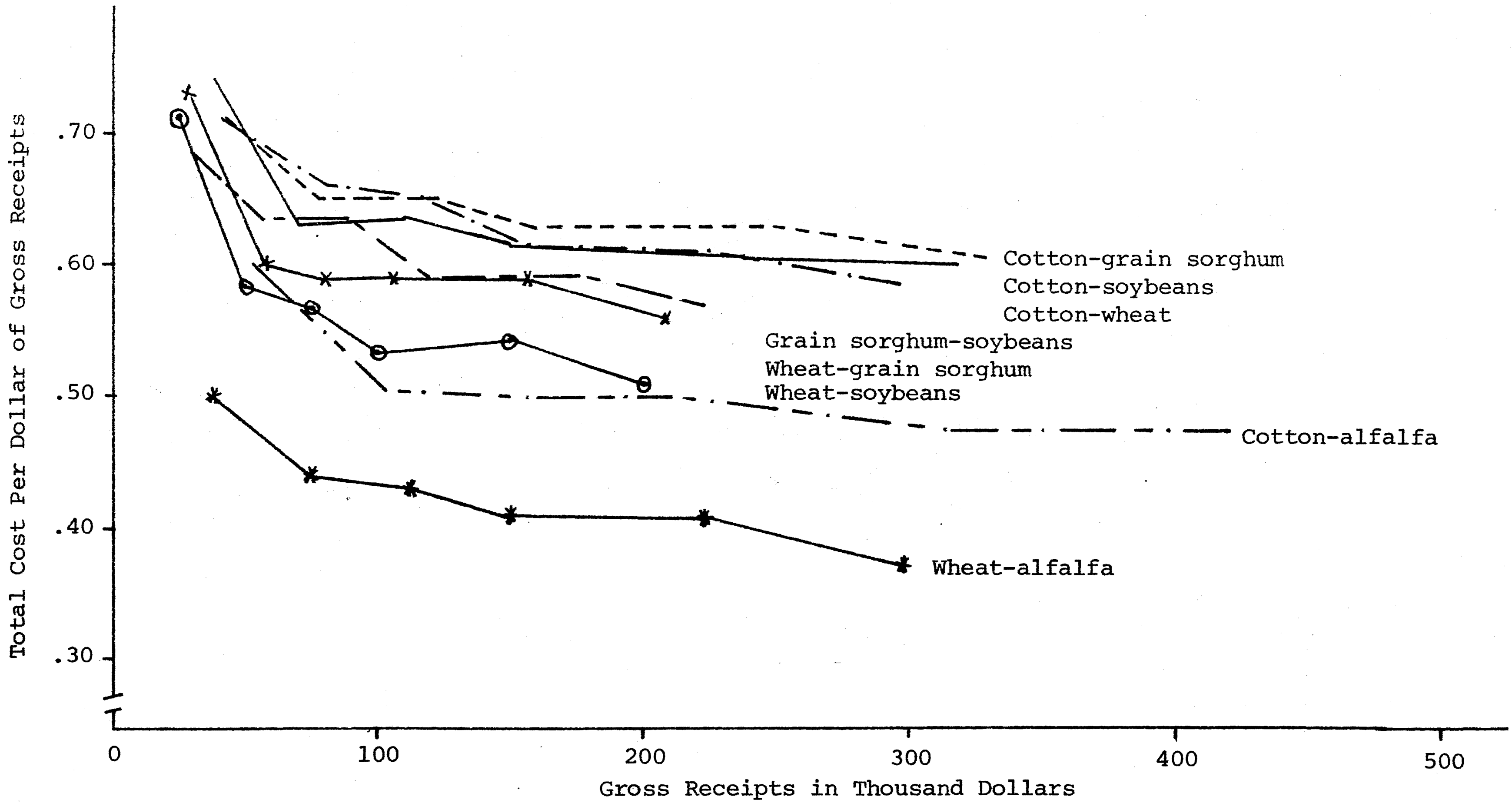


Figure 18. The Ratio of Total Cost to Gross Receipts Per Acre for Selected Farm Sizes of Two-Crop Rotations Based on a Minimum Machinery Requirement and Irrigated Cropping Systems

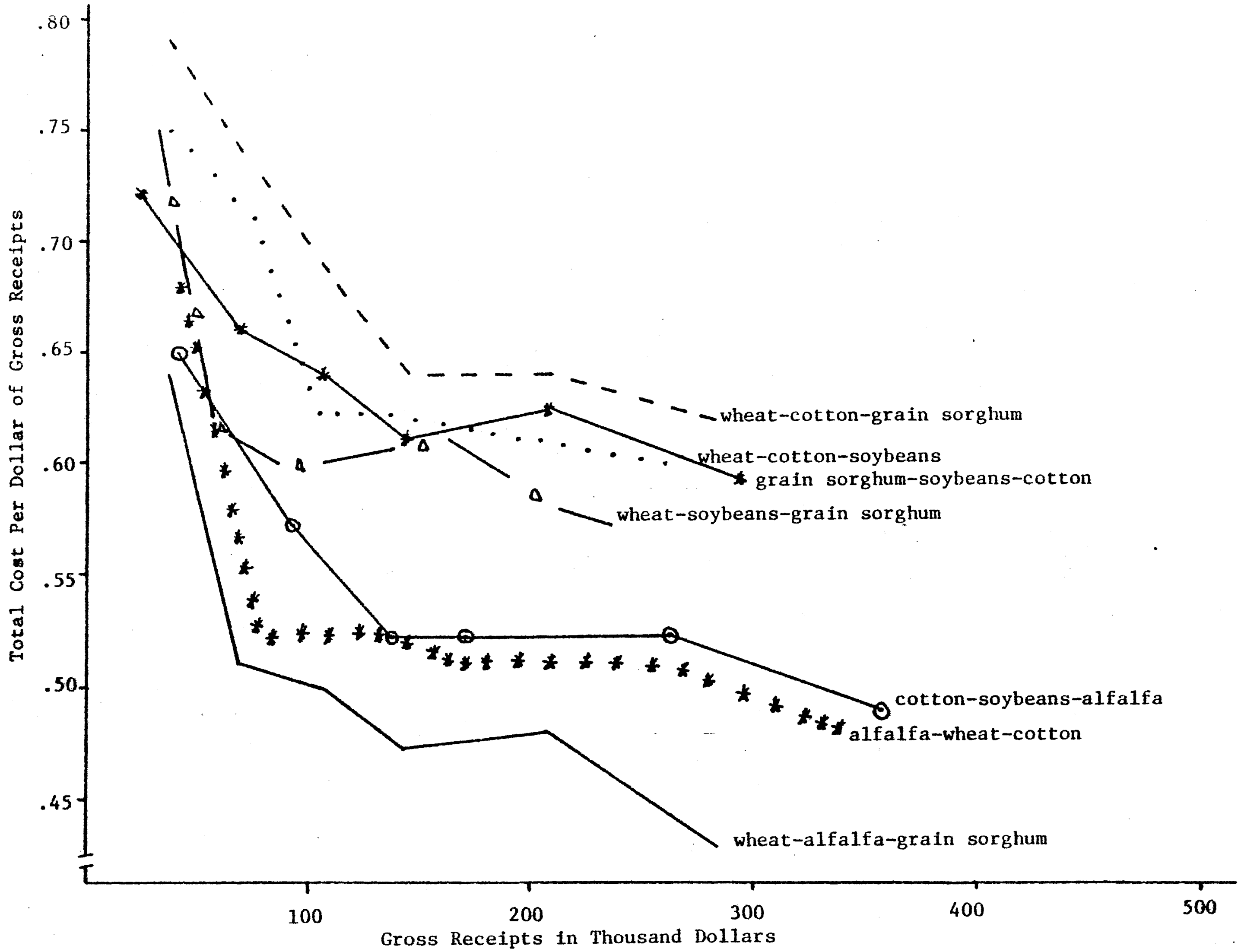


Figure 19. The Ratio of Total Cost to Gross Receipts Per Acre for Selected Farm Sizes of Three-Crop Rotations Based on a Minimum Machinery Requirement and Irrigated Cropping Systems

Among the crops, cotton show the highest level of cost per dollar return, while alfalfa has the lowest cost per dollar return.

Investment Requirement

Farms of larger size involve much greater investments, with consequent increases in the uncertainty and risk accompanying these larger capital investments. In this analysis, the capital investment per acre is compared with different farm sizes. This capital investment includes operating capital and intermediate capital investments. Intermediate capital includes investment in tractors and equipment, while operating capital includes the capital used for operating inputs.

The data presented in Tables XIX and XXIII reflect the dollar value of capital investment required per acre under irrigated and dryland farm situations for the indicated cropping systems.

In general, as can be seen in Table XX the annual operating capital requirement per acre does not change very much throughout the variations in farm size. However, the intermediate capital requirement per acre, such as tractors and equipment, shows a large change for farm sizes from 160 to 1280 acres. As defined before, annual operating capital cost is the cost of the capital used for operating inputs listed in the first section of the budget (see Table V). Since a constant operating input, except tractor fuel and lubrication, tractor repair cost and equipment repair cost, was assumed throughout all farm sizes, the slight changes in annual operating capital requirement is caused by the changes in the fuel, lubrication and repair cost of tractors and equipment which vary depending on hours of use.

The largest reduction in the intermediate capital requirement arises between a farm size of 160 and 320 acres. Between these farm sizes, most cropping systems obtain a 50 percent decline in intermediate capital requirement. Those reductions of capital requirement result from utilizing more fully the given machinery as farm size doubles.

The declining capital cost per acre changes to an increasing capital cost for some cropping systems at a farm size of 480 and 960 acres. The reason for this increase in capital requirement per acre is the lumpiness of the shift to a larger size of machinery combination for these expanded farm sizes.

In a comparison of the rate of decline of total capital investment per acre for the five irrigated crops between extreme farm sizes, alfalfa shows the highest reduction in capital requirement--a decline of 66 percent, from $179.90 at a farm size of 160 acres to $60.30 at a farm size of 1280 acres. The cotton cropping system has the smallest decline of capital requirement per acre--a decline of 30 percent, from $265.30 at a farm size of 160 acres to $184.60 at a farm size of 1280 acres. This pattern, of declining capital requirement per acre as farm size increases under irrigated farming, coincides with that of the dryland farming. The averages of declining capital requirements per acre between extreme farm sizes are 56.8 percent for irrigated farms and 63.7 percent for dryland farms, respectively.

## Dollar Return Per Dollar Investment

Returns per acre increase with farm size, however, these larger farms require much greater capital investment and more operating capital than smaller farms. Therefore, in order to further analyze farm returns, these returns should be associated with dollar cost of inputs and capital invested. Since constant physical inputs per acre are assumed throughout these farm size variations, returns related with capital investment will be studied.

The data presented in Tables XXVII and XXVIII are the ratios of return per acre to capital requirement per acre for the irrigated and dryland farming cropping systems studied. From these data, comparisons can be made of the economic productivity or efficiency of capital investment between farm sizes and cropping systems. For example, in a one-crop rotation grain sorghum returns 27.1¢ for each dollar of capital investment at a farm size of 160 acres, and the returns increase as farm size increase. Alfalfa has $1.085 as a "Return to Land, Overhead, Risk and Management" for each dollar of capital investment at a farm size of 160 acres and $3.663 at a farm size of 1280 acres. Based on the data in Tables XXVII and XXVIII, irrigated alfalfa shows the highest economic productivity per dollar of capital investment for all farm sizes. Since irrigated alfalfa has such high economic productivity, any cropping system combined with alfalfa also shows a relatively high economic efficiency of capital investment.

Under dryland farming situations the patterns of productivity of cropping system and farm size are almost the same as those for irrigated farms. However, there are a few negative ratios at a farm size of 160 acres which are caused by negative returns for those cropping systems.

## Labor Requirement Hours

Total labor hours include the hours of labor required for operation of machinery and irrigation equipment. The machinery labor hours are computed by multiplying total tractor hours by 1.1, and total labor for all self powered implements is computed by multiplying total time by 1.2. These factors reflect time required for adjusting equipment, lubrication, maintenance, etc. For an irrigated cropping system, the budget generating program calculates the number of hours of irrigation labor required by multiplying the number of acre inches of irrigation water used by the hours of labor required per acre inch.

Total labor hours is the sum of labor hours per month. Since the computer output provides the labor hours per acre, the total labor hours for a given farm size are calculated by multiplying labor hours per acre by the given farm size. Tables XXIX and XXX contain the total labor hours for each cropping system and different farm sizes.

In order to analyze the labor hours required each month, some assumptions of a farm labor situation which can be used as a criteria are as follows:

1. A farm is operated by a married couple, that is, the farm has available labor of a male and a female.

   a. From March to October a male works 10 hours a day and 6 days per week, and a female works 8 hours a day and 6 days per week, thus, the approximate available labor hours per month are 250 hours for a male and 225 hours for a female.

   b. From November to February a male works 8 hours a day and 5 days per week, and a female works 5 hours a day and 5 days per week, thus, the assumed labor hours per month are 160 hours by a male and 100 hours by a female.

2. If the labor hours required per month are over the possible family labor hours, hired labor is assumed.

3. If a farm needs hired labor in consecutive months, the hired

labor is regarded as full time, otherwise, part-time hired labor.

4. For every 20 hours of full-time hired labor, and 10 hours of part-time hired labor, one hour of management labor is subtracted from the husband labor hour to allow for hired labor management.

Based on these assumptions the labor hours of each cropping system which is in excess of the possible family labor hours can be analyzed. For example, the grain sorghum farm needs the part-time hired labor only for farm sizes over 960 acres and only in certain months because when the farm size is below 960 acres the farmer can operate the farm with the family labor only. The data in Table XXIX show that a grain-sorghum farm with 960 acres needs part-time hired labor in March and July. The part-time labor hours required (x) can be calculated by the following equation:

$$RL - (PFL - 0.1x) = x \qquad (13)$$

where, RL = required labor hours for the given month,

and, PFL = possible family labor hours in the given month.

Using Equation (13), the part-time hired labor hours required in March for the 960 acre grain-sorghum farm is

$$729.6 - (475 - 0.1x) = x$$

$$x = 231.4$$

The figure, 231.4 hours, tells that the farm needs 231.4 hours of part-time hired labor and the husband's labor hours will be decreased by the 23 hours required to manage the hired labor during March.

Likewise, the full-time labor hours required (y) can be computed by the following equation:

$$RL - (PFL - 0.2y) = y \tag{14}$$

From Equation (14) the full-time labor hours required in June and July for 1280 acre grain sorghum-soybean farm are:

$$780.8 - (475 - 0.2y) = y_1 \qquad y_1 = 255$$

$$678.4 - (475 - 0.2y) = y_2 \qquad y_2 = 170$$

The values of $y_1$ and $y_2$ mean that the farm needs at least a full-time hired labor and the husband's labor hours will be decreased by the 25.5 and 17 hours respectively during these periods.

The required labor hours in a given month are computed from the operation of machinery and irrigation equipments. However, a farmer can manage his labor hours by completing some of this necessary work in earlier months, or delaying it to later months. There are also other ways for a farmer to reorganize his work schedule and thus try to minimize the hired labor hours.

## Break-Even Prices

From a farm management point of view, one of the most important applications of financial statement analysis is the determination of the size of farm at which the farmer's total income will exactly equal its total costs. This is the farm size necessary for the farmer to avoid operating at a loss and is the point above which the farmer will begin to show a profit. This is called "break-even point" analysis and the associated price is called the "break-even price". This price can be used to compute the approximate profit which can be earned or, the approximate loss which will be suffered at various levels of farm sizes.

In this study, however, the total costs which should be covered by the break-even price are underestimated because the rent of land is not included in the total costs. Therefore, the break-even price levels calculated at various farm sizes are lower than the levels should be. The break-even prices for the various farm sizes declined primarily because of the declining total costs per acre as farm size increases. For example, the break-even price of milo per cwt declined from $2.68 at a farm size of 160 acres to $2.24 at a farm size of 1280 acres. The lower break-even price at the larger farm size means that a large farm can survive and operate at a lower product price level where a small farm should leave out that cropping system.

The break-even price of a single product is calculated by taking total costs per acre at a given farm size and dividing by the quantity of output. For example, the break-even price (p) of irrigated milo at a farm size of 160 acres is calculated by:

$$p = \frac{\text{Total Costs}}{\text{Quantity of Milo}} = \frac{134.14}{50} = \$2.68$$

The break-even prices, $p_1$ and $p_2$, or multiple products are calculated by taking total costs at a given farm size and dividing by their respective quantities of outputs, $q_1$ and $q_2$, then multiply the rate of value, $v_1$ and $v_2$, of each output to the total value produced by the cropping system. That is, the break-even prices, $p_1$ and $p_2$, of cotton lint ($q_1$) and cotton seed ($q_2$) at a given farm size of 160 acres are calculated by:

$$p_1 = \frac{v_1}{\text{Total Products Value}} \times \frac{\text{Total Costs}}{q_1}$$

$$= \frac{288}{321.6} \times \frac{224.13}{6} = \$2.44$$

$$p_2 = \frac{v_2}{\text{Total Products Value}} \times \frac{\text{Total Costs}}{q_2}$$

$$= \frac{33.6}{321.6} \times \frac{224.13}{9.6} = \$2.44$$

Tables XXXI and XXXII show the break-even prices of each product at various farm sizes.

CHAPTER VI

SUMMARY AND CONCLUSIONS

This study was designed to 1) determine an average total cost per acre for different cropping systems with varying farm sizes and appropriate machinery complements associated with those farm sizes, 2) compare the effect of different farm sizes on profitability of cropping systems, and 3) determine the effect of the strict enforcement of 160 acres limitation of irrigated land, according to the 1902 Reclamation Act. Generally speaking, American agriculture has been changing rapidly to larger and fewer farms, greater capital inputs with growing mechanization. This study is concerned with the present nature and extent of "economies of scale" which is hypothesized that these economies will not be achieved if the 160 acres of irrigated land limitation would be enforced as the law may be interpreted. Average total costs per acre are estimated for five irrigated crops and 15 of their combinations, and four dryland crops along with 8 of their combinations. The selected machinery complements include 4-row and 6-row machinery sizes and a combination of them. Machine hours used annually are calculated based upon the cropping system, farm size, and machine size associated with that farm size. Average total cost curves are derived as a function of crop acres to illustrate the nature and extent of cost economies of farm size. The range of crop acreage considered varies from 160 to 1280 crop acres for the irrigated farm situation, and 160 to 1120 crop acres for the dryland farm situation. Data from budgets developed by the Oklahoma State University Extension Service personnel are used as a bases to obtain each new budget. A fixed set of field operations for each cropping system, average weather, efficient management, and effective utilization of each machinery set are assumed in budgeting each cost. In order to determine the effect of enforcement of irrigated land limitation, costs and returns per acre for the six farm sizes under 160 acres of irrigated land limitation and returns per acre under 320 acres and 480 acres of irrigated land limitations are obtained by combining twelve dryland cropping systems with the same irrigated cropping systems. Windfall benefits from federal irrigation project water are calculated by subtracting total returns for each dryland cropping system from total returns for each irrigated cropping system. Based on the above three different irrigated land limitations total returns given up for twelve cropping systems and various farm sizes, when those limitations are enforced, are obtained.

The study results indicate that a reduction in average total cost per acre or an increase in "Return to Land, Overhead, Risk, and Management" per acre can be obtained by increasing farm size. For example, with irrigated grain sorghum, the average total cost per acre is $134.14 at a farm size of 160 acres, but it reduced to $112.14 at a farm size of 1280 acres. However, the extent of economies of size obtained are directly related with the necessary machinery size. Because of the change in machinery size with different farm sizes, that is, a change from 4-row equipment to 6-row at a farm size of 480 acres and from 6-row to a 4-row and 6-row combination at a farm size of 960 acres, the economies of size in those farm sizes are relatively smaller than that of other farm sizes. In some cropping systems lumpiness of economies of size occurred. This lumpiness caused by the increase in machinery cost becomes relatively or absolutely greater than the increase in the efficiency of that larger machine. For example, for irrigated grain-sorghum, the reductions of the average total cost per acre from previous farm sizes are $1.73 and $0.07 at farm sizes of 480 and 960 acres respectively. These reductions are much less than that of other farm sizes. Returns per acre for a farm size of 640 total acres, considering three different irrigated land limitations, increased with the expanding of the limitation from 160 acres to 320 acres and from 320 acres to 480 acres. These increases in returns per acre mean that farmers can make additional returns by expanding their irrigated farm size. Average additional returns per acre provided by federal water are $73.25 given a limitation of 160 acres of irrigated land, $68.81 for a limitation of 320 acres of irrigated land, and $66.50 for a limitation of 480 acres of irrigated land, respectively. The average total windfall benefit of $11,720 for 160 acres of irrigated land in the study area is 58.6 percent of the $20,000 in California area computed by LeVeen. The study results also show that, when those three limitations are imposed on a farm size of 640 acres, the total returns sacrificed by the various sizes of limitations decline as the irrigated land limitation increases. These declines mean that farmers will reduce their sacrifices and increase returns by expanding their irrigated farm size.

The main source of the reduction of total average cost is the decline in total capital requirement per acre as farm size increases. This declining capital requirement per acre for the various farm sizes indicates the increasing efficiency of machinery as machinery size increases with farm size. For example, in irrigated grain-sorghum, the total capital requirement per acre reduced from $206.30 to $112.80 as farm size increases from 160 to 1280 acres. Analyses of the ratio of return on capital invested and the ratio of total cost to gross receipts per acre also show clear-cut evidence of the economies of size for the various cripping systems.

The analysis of break-even prices at which the farmer's total income will exactly equal total cost shows a decline as farm size increases. The lower break-even price at a larger farm size means that a large farm can survive and operate at a lower product price level where a small farm should leave out that cropping system.

Based on the results of this study, it can be concluded that economies of farm size occur for cropping systems in the ALTUS-LUGERT Irrigation District, and farmers in that area will reduce their losses and increase their income by expanding irrigated farm sizes.

## Implications for Further Analysis

Several areas of interest were encountered during the course of this study which analyzed the economies and diseconomies of farm size in the study area. The first such area is the relaxation of some restrictive assumptions which were made due to lack of information. Some of these restrictive assumptions were constant managerial capacity per acre, constant yields and physical input requirements with farm size changes. As farm size expands managerial capacity per acre might decline, and it will result in untimeliness of operations and therefore losses in crop yields. In this study the average total cost of each cropping system does not include a land charge because land rents and rental arrangements vary depending upon the quality of land and the region of the country. Therefore, if additional information of land prices is available, then a return to land can be allocated and the resulting return figure would not need to be adjusted by the reader. The returns per acre data under two different irrigation limitations of 320 acres and 480 acres can be extended to farm sizes of 960 acres and 1280 acres. Windfall benefits from federal water for larger farm sizes of 640, 960 and 1280 acres could also be calculated. The analysis can be taken further by developing the relationship between production cost, rates of return, and the change of product price. The economic feasibility of farming 160 acres and defining an optimal farm size for given farm situations in the area will also support this study.

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# APPENDIXES

TABLE VIII

AVERAGE TOTAL COST[a] PER ACRE FOR SIX SELECTED FARM SIZES BASED ON A MINIMUM MACHINERY REQUIREMENT AND IRRIGATED CROPPING SYSTEMS

| | Farm Sizes | | | | | |
|---|---|---|---|---|---|---|
| | 160 Acres | 320 Acres | 480 Acres | 640 Acres | 960 Acres | 1280 Acres |
| Grain Sorghum | $134.14 | $124.90 | $123.17 | $115.16 | $115.09 | $112.14 |
| Cotton | 224.13 | 215.07 | 212.99 | 204.69 | 206.98 | 204.49 |
| Soybeans | 110.90 | 95.60 | 96.25 | 95.51 | 94.68 | 91.74 |
| Wheat | 91.54 | 75.11 | 74.46 | 73.21 | 72.98 | 70.17 |
| Alfalfa | 134.87 | 115.56 | 116.82 | 112.30 | 112.20 | 109.12 |
| Wheat-Grain Sorghum | 119.89 | 98.21 | 97.26 | 97.33 | 97.40 | 91.83 |
| Grain Sorghum-Soybeans | 124.80 | 117.44 | 116.91 | 107.23 | 107.05 | 103.64 |
| Wheat-Soybeans | 110.82 | 89.14 | 87.24 | 82.59 | 84.27 | 80.36 |
| Cotton-Grain Sorghum | 182.48 | 170.09 | 166.56 | 161.27 | 160.85 | 157.00 |
| Cotton-Soybeans | 176.73 | 162.01 | 161.32 | 153.14 | 151.97 | 149.95 |
| Wheat-Alfalfa | 116.46 | 102.76 | 101.45 | 95.37 | 96.70 | 87.03 |
| Cotton-Alfalfa | 195.93 | 167.27 | 163.09 | 162.57 | 154.62 | 154.13 |
| Cotton-Wheat | 169.56 | 145.86 | 149.56 | 142.34 | 142.11 | 135.42 |
| Wheat-Alfalfa-Grain Sorghum | 140.97 | 111.03 | 109.87 | 102.51 | 104.36 | 94.58 |
| Wheat-Cotton-Grain Sorghum | 170.34 | 160.16 | 148.01 | 138.37 | 138.13 | 133.32 |
| Alfalfa-Wheat-Cotton | 177.93 | 137.23 | 138.00 | 135.19 | 135.26 | 127.34 |
| Cotton-Soybeans-Alfalfa | 177.66 | 157.53 | 142.72 | 141.87 | 144.38 | 134.06 |
| Wheat-Soybeans-Grain Sorghum | 125.75 | 104.55 | 99.72 | 100.34 | 102.26 | 96.56 |
| Wheat-Cotton-Soybeans | 158.62 | 149.68 | 132.12 | 131.00 | 130.14 | 127.73 |
| Grain Sorghum-Soybeans-Cotton | 165.79 | 150.92 | 147.59 | 138.78 | 141.68 | 135.58 |

[a]Because of the wide range of rent and ownership costs of land the data in this table excludes these costs of land.

TABLE IX

AVERAGE TOTAL COST PER ACRE FOR FIVE SELECTED FARM SIZES BASED ON A MINIMUM MACHINERY REQUIREMENT AND DRYLAND CROPPING SYSTEMS

| | Farm Sizes | | | | |
|---|---|---|---|---|---|
| | 160 Acres | 320 Acres | 480 Acres | 800 Acres | 1120 Acres |
| Grain Sorghum | $ 68.32 | $ 52.49 | $ 50.67 | $ 50.65 | $ 50.36 |
| Cotton | 142.68 | 132.89 | 130.45 | 125.90 | 123.15 |
| Wheat | 73.01 | 56.89 | 56.62 | 57.27 | 52.93 |
| Alfalfa | 89.60 | 69.72 | 70.39 | 67.99 | 59.57 |
| Wheat-Grain Sorghum | 75.48 | 55.17 | 55.40 | 54.26 | 50.34 |
| Cotton-Grain Sorghum | 118.30 | 92.81 | 88.89 | 89.39 | 85.81 |
| Wheat-Alfalfa | 90.95 | 67.66 | 70.06 | 69.18 | 56.34 |
| Cotton-Alfalfa | 134.27 | 103.52 | 100.61 | 97.54 | 90.78 |
| Cotton-Wheat | 125.02 | 98.57 | 93.19 | 91.94 | 85.52 |
| Wheat-Alfalfa-Grain Sorghum | 91.34 | 69.73 | 68.46 | 67.04 | 53.79 |
| Wheat-Cotton-Grain Sorghum | 114.71 | 85.62 | 81.88 | 82.84 | 76.16 |
| Alfalfa-Wheat-Cotton | 141.62 | 111.83 | 108.00 | 108.02 | 105.20 |

TABLE X

RETURN PER ACRE TO LAND, OVERHEAD, RISK, AND MANAGEMENT FOR SIX SELECTED FARM SIZES BASED ON GIVEN IRRIGATED CROPPING SYSTEMS

| | Farm Sizes | | | | | |
|---|---|---|---|---|---|---|
| | 160 Acres | 320 Acres | 480 Acres | 640 Acres | 960 Acres | 1280 Acres |
| Grain Sorghum | $ 55.86 | $ 65.10 | $ 66.83 | $ 74.84 | $ 74.91 | $ 77.86 |
| Cotton | 97.47 | 106.53 | 108.61 | 116.91 | 114.62 | 117.11 |
| Soybeans | 64.10 | 79.40 | 78.75 | 79.49 | 80.32 | 83.26 |
| Wheat | 45.96 | 62.39 | 63.04 | 65.19 | 64.52 | 67.33 |
| Alfalfa | 195.13 | 214.44 | 213.18 | 217.70 | 217.80 | 220.88 |
| Wheat-Grain Sorghum | 43.86 | 65.54 | 66.49 | 66.42 | 66.35 | 71.92 |
| Grain Sorghum-Soybeans | 57.70 | 65.06 | 65.59 | 75.27 | 75.45 | 78.86 |
| Wheat-Soybeans | 45.43 | 67.11 | 69.01 | 73.66 | 71.98 | 75.89 |
| Cotton-Grain Sorghum | 71.32 | 85.71 | 89.24 | 94.53 | 94.95 | 98.80 |
| Cotton-Soybeans | 71.57 | 86.29 | 86.98 | 95.16 | 96.33 | 98.35 |
| Wheat-Alfalfa | 117.29 | 130.99 | 132.30 | 138.38 | 137.05 | 146.72 |
| Cotton-Alfalfa | 129.87 | 158.53 | 162.71 | 163.23 | 171.18 | 171.67 |
| Cotton-Wheat | 59.99 | 83.69 | 79.99 | 87.21 | 87.44 | 94.13 |
| Wheat-Alfalfa-Grain Sorghum | 77.86 | 107.80 | 108.96 | 116.32 | 114.47 | 124.25 |
| Wheat-Cotton-Grain Sorghum | 46.24 | 56.42 | 68.57 | 78.21 | 78.45 | 83.26 |
| Alfalfa-Wheat-Cotton | 84.64 | 125.34 | 124.57 | 127.38 | 127.31 | 135.23 |
| Cotton-Soybeans-Alfalfa | 97.49 | 117.62 | 132.43 | 133.28 | 130.77 | 141.09 |
| Wheat-Soybeans-Grain Sorghum | 42.13 | 63.33 | 68.16 | 67.54 | 65.62 | 71.32 |
| Wheat-Cotton-Soybeans | 53.00 | 61.94 | 79.50 | 80.62 | 81.48 | 84.32 |
| Grain Sorghum-Soybeans-Cotton | 63.37 | 78.24 | 81.57 | 90.38 | 87.48 | 93.58 |

TABLE XI

RETURN PER ACRE TO LAND, OVERHEAD, RISK, AND MANAGEMENT FOR FIVE SELECTED FARM SIZES BASED ON GIVEN DRYLAND CROPPING SYSTEMS

| | Farm Sizes | | | | |
|---|---|---|---|---|---|
| | 160 Acres | 320 Acres | 480 Acres | 800 Acres | 1120 Acres |
| Grain Sorghum | $ 7.68 | $23.51 | $25.35 | $25.35 | $ 25.64 |
| Cotton | 18.12 | 27.91 | 30.35 | 34.90 | 37.65 |
| Wheat | -1.51 | 14.61 | 14.88 | 14.23 | 18.57 |
| Alfalfa | 75.40 | 95.28 | 94.61 | 97.01 | 105.43 |
| Wheat-Grain Sorghum | -1.73 | 18.58 | 18.35 | 19.49 | 23.41 |
| Cotton-Grain Sorghum | 0.10 | 25.59 | 29.51 | 29.01 | 32.59 |
| Wheat-Alfalfa | 27.30 | 50.59 | 48.19 | 49.07 | 61.91 |
| Cotton-Alfalfa | 28.63 | 59.38 | 62.29 | 65.36 | 72.12 |
| Cotton-Wheat | -8.87 | 17.58 | 22.96 | 24.21 | 30.63 |
| Wheat-Alfalfa-Grain Sorghum | 12.85 | 34.46 | 35.73 | 37.15 | 50.40 |
| Wheat-Cotton-Grain Sorghum | -11.92 | 17.17 | 20.91 | 19.95 | 26.63 |
| Alfalfa-Wheat-Cotton | -9.18 | 20.61 | 24.44 | 24.44 | 27.24 |

TABLE XII

AVERAGE TOTAL PRODUCTION COSTS PER ACRE FOR SELECTED CROP COMBINATIONS AND BASED ON AN IRRIGATED LAND LIMITATION OF 160 ACRES

| Crop | Farm Sizes | | | | | |
|---|---|---|---|---|---|---|
| | 160 Acres | 320 Acres | 480 Acres | 640 Acres | 960 Acres | 1280 Acres |
| Grain Sorghum | $134.14 | $101.23 | $ 79.71 | $ 71.54 | $ 64.56 | $ 60.83 |
| Cotton | 224.13 | 183.40 | 163.30 | 153.87 | 142.27 | 135.77 |
| Wheat | 91.54 | 82.27 | 68.44 | 65.35 | 62.98 | 57.76 |
| Alfalfa | 134.87 | 112.23 | 91.44 | 86.51 | 79.14 | 68.99 |
| Wheat-Grain Sorghum | 119.89 | 97.68 | 76.75 | 71.52 | 65.20 | 59.03 |
| Cotton-Grain Sorghum | 182.48 | 150.39 | 122.70 | 112.29 | 104.91 | 97.89 |
| Wheat-Alfalfa | 116.46 | 103.71 | 83.93 | 81.66 | 77.06 | 61.23 |
| Cotton-Alfalfa | 195.93 | 165.10 | 134.32 | 124.44 | 113.94 | 103.92 |
| Cotton-Wheat | 169.56 | 147.29 | 122.23 | 112.28 | 104.88 | 96.03 |
| Wheat-Alfalfa-Grain Sorghum | 140.97 | 116.15 | 93.48 | 86.59 | 79.36 | 64.69 |
| Wheat-Cotton-Grain Sorghum | 170.34 | 142.53 | 113.86 | 104.00 | 97.42 | 87.93 |
| Alfalfa-Wheat-Cotton | 177.93 | 159.78 | 133.86 | 125.48 | 119.82 | 114.29 |

TABLE XIII

RETURN PER ACRE TO LAND, OVERHEAD, RISK AND MANAGEMENT FOR SIX SELECTED FARM SIZES BASED ON AN IRRIGATED LAND LIMITATION OF 160 ACRES

| Crop | Farm Sizes | | | | | |
|---|---|---|---|---|---|---|
| | 160 Acres | 320 Acres | 480 Acres | 640 Acres | 960 Acres | 1280 Acres |
| Grain Sorghum | $ 55.86 | $ 31.77 | $ 34.29 | $ 32.96 | $ 30.44 | $ 29.42 |
| Cotton | 97.47 | 57.80 | 51.10 | 47.13 | 45.33 | 45.13 |
| Wheat | 45.96 | 22.23 | 25.06 | 22.65 | 19.52 | 21.99 |
| Alfalfa | 195.13 | 135.27 | 128.56 | 119.74 | 113.36 | 116.64 |
| Wheat-Grain Sorghum | 43.86 | 21.07 | 27.00 | 24.73 | 23.55 | 25.97 |
| Cotton-Grain Sorghum | 71.32 | 35.61 | 40.83 | 39.96 | 36.06 | 37.43 |
| Wheat-Alfalfa | 117.29 | 72.30 | 72.82 | 65.47 | 60.44 | 68.83 |
| Cotton-Alfalfa | 129.87 | 79.25 | 82.88 | 79.19 | 76.11 | 79.34 |
| Cotton-Wheat | 59.99 | 25.56 | 31.72 | 32.22 | 30.17 | 34.30 |
| Wheat-Alfalfa-Grain Sorghum | 77.86 | 45.36 | 48.93 | 46.26 | 43.94 | 53.83 |
| Wheat-Cotton-Grain Sorghum | 46.24 | 17.16 | 26.86 | 27.24 | 24.33 | 29.08 |
| Alfalfa-Wheat-Cotton | 84.64 | 37.73 | 41.95 | 39.49 | 34.31 | 34.42 |

TABLE XIV

RETURN PER ACRE TO LAND, OVERHEAD, RISK, AND MANAGEMENT FOR SELECTED CROP COMBINATIONS AND SELECTED FARM SIZES BASED ON TWO DIFFERENT IRRIGATED LAND LIMITATIONS, 320 ACRES AND 480 ACRES

| Crop | 320 Acres Limitation | | 480 Acres Limitation |
|---|---|---|---|
| | 480 Acres | 640 Acres | 640 Acres |
| Grain Sorghum | $ 45.96 | $ 44.31 | $ 52.04 |
| Cotton | 77.06 | 67.22 | 85.99 |
| Wheat | 41.09 | 38.50 | 46.90 |
| Alfalfa | 168.09 | 154.86 | 178.74 |
| Wheat-Grain Sorghum | 43.12 | 42.06 | 49.44 |
| Cotton-Grain Sorghum | 57.17 | 55.65 | 66.96 |
| Wheat-Alfalfa | 96.43 | 90.79 | 106.05 |
| Cotton-Alfalfa | 115.23 | 109.00 | 129.19 |
| Cotton-Wheat | 52.84 | 50.64 | 57.78 |
| Wheat-Alfalfa-Grain Sorghum | 76.15 | 71.13 | 84.93 |
| Wheat-Cotton-Grain Sorghum | 33.64 | 36.80 | 48.45 |
| Alfalfa-Wheat-Cotton | 80.50 | 72.98 | 91.13 |

TABLE XV

WINDFALL BENEFIT THAT OCCURS TO A PRODUCER THROUGH THE USE OF WATER FROM FEDERAL FINANCED WATER PROJECTS FOR SELECTED FARM SIZES

| | Farm Sizes | | |
|---|---|---|---|
| Crop | 160 Acres | 320 Acres | 480 Acres |
| Grain Sorghum | $ 7,709 | $13,309 | $19,920 |
| Cotton | 12,696 | 25,159 | 36,566 |
| Wheat | 7,596 | 15,290 | 23,117 |
| Alfalfa | 19,157 | 36,851 | 55,598 |
| Wheat-Grain Sorghum | 7,295 | 15,027 | 22,651 |
| Cotton-Grain Sorghum | 11,395 | 19,238 | 26,976 |
| Wheat-Alfalfa | 12,854 | 25,600 | 39,552 |
| Cotton-Alfalfa | 16,198 | 31,728 | 46,243 |
| Cotton-Wheat | 11,017 | 21,148 | 29,150 |
| Wheat-Alfalfa-Grain Sorghum | 10,402 | 23,469 | 34,594 |
| Wheat-Cotton-Grain Sorghum | 9,305 | 12,560 | 17,045 |
| Alfalfa-Wheat-Cotton | 15,011 | 24,864 | 31,618 |
| AVERAGE | 11,720 | 22,020 | 31,919 |

TABLE XVI

TOTAL DOLLAR RETURNS GIVEN UP FOR SELECTED CROP COMBINATIONS AND SELECTED FARM SIZES, ASSUMING AN IRRIGATED LAND LIMITATION OF 160 ACRES

| | Farm Sizes | | | | | |
|---|---|---|---|---|---|---|
| Crop | 160 Acres | 320 Acres | 480 Acres | 640 Acres | 960 Acres | 1280 Acres |
| Grain Sorghum | $ 0 | $10,666 | $15,619 | $26,803 | $ 42,691 | $ 62,003 |
| Cotton | 0 | 15,594 | 27,605 | 44,659 | 66,518 | 92,134 |
| Wheat | 0 | 12,851 | 18,230 | 27,226 | 43,200 | 58,035 |
| Alfalfa | 0 | 25,334 | 40,618 | 62,694 | 100,262 | 133,427 |
| Wheat-Grain Sorghum | 0 | 14,230 | 18,995 | 26,682 | 41,088 | 58,829 |
| Cotton-Grain Sorghum | 0 | 16,032 | 23,237 | 34,925 | 56,534 | 78,554 |
| Wheat-Alfalfa | 0 | 18,781 | 28,550 | 46,662 | 73,546 | 99,699 |
| Cotton-Alfalfa | 0 | 25,370 | 38,318 | 53,786 | 91,267 | 118,182 |
| Cotton-Wheat | 0 | 18,602 | 23,170 | 35,194 | 54,979 | 76,582 |
| Wheat-Alfalfa-Grain Sorghum | 0 | 19,981 | 28,814 | 44,838 | 67,709 | 90,138 |

TABLE XVII

TOTAL DOLLAR RETURNS GIVEN UP FOR SELECTED CROP COMBINATIONS AND SELECTED FARM SIZES, ASSUMING TWO DIFFERENT IRRIGATED LAND LIMITATIONS OF 320 ACRES AND 480 ACRES

| | 320 Acres Limitation | | | | 480 Acres Limitation |
|---|---|---|---|---|---|
| Crop | 150 Acres | 320 Acres | 480 Acres | 640 Acres | 640 Acres |
| Grain Sorghum | $0.0 | $0.0 | $10,018 | $19,539 | $14,592 |
| Cotton | 0.0 | 0.0 | 15,144 | 31,802 | 19,789 |
| Wheat | 0.0 | 0.0 | 10,536 | 17,082 | 11,706 |
| Alfalfa | 0.0 | 0.0 | 21,643 | 40,218 | 24,934 |
| Wheat-Grain Sorghum | 0.0 | 0.0 | 11,218 | 15,590 | 10,867 |
| Cotton-Grain Sorghum | 0.0 | 0.0 | 15,394 | 24,883 | 17,645 |
| Wheat-Alfalfa | 0.0 | 0.0 | 17,218 | 30,458 | 20,691 |
| Cotton-Alfalfa | 0.0 | 0.0 | 22,790 | 34,707 | 21,786 |
| Cotton-Wheat | 0.0 | 0.0 | 13,032 | 23,405 | 18,835 |
| Wheat-Alfalfa-Grain Sorghum | 0.0 | 0.0 | 15,749 | 28,922 | 20,090 |
| Wheat-Cotton-Grain Sorghum | 0.0 | 0.0 | 16,766 | 26,502 | 19,046 |
| Alfalfa-Wheat-Cotton | 0.0 | 0.0 | 21,154 | 34,816 | 23,200 |

TABLE XVIII

THE RATIO OF TOTAL COST TO GROSS RECEIPTS PER ACRE FOR SELECTED FARM SIZES BASED ON A MINIMUM MACHINERY REQUIREMENT AND IRRIGATED CROPPING SYSTEMS

| | Farm Sizes | | | | | |
|---|---|---|---|---|---|---|
| | 160 Acres | 320 Acres | 480 Acres | 640 Acres | 960 Acres | 1280 Acres |
| Grain Sorghum | 0.71 | 0.66 | 0.65 | 0.61 | 0.61 | 0.51 |
| Cotton | 0.70 | 0.69 | 0.66 | 0.64 | 0.64 | 0.64 |
| Soybeans | 0.63 | 0.55 | 0.55 | 0.55 | 0.54 | 0.52 |
| Wheat | 0.67 | 0.55 | 0.54 | 0.53 | 0.53 | 0.51 |
| Alfalfa | 0.41 | 0.35 | 0.35 | 0.34 | 0.34 | 0.33 |
| Wheat-Grain Sorghum | 0.73 | 0.60 | 0.59 | 0.59 | 0.59 | 0.56 |
| Grain Sorghum-Soybeans | 0.68 | 0.64 | 0.64 | 0.59 | 0.59 | 0.57 |
| Wheat-Soybeans | 0.71 | 0.57 | 0.56 | 0.53 | 0.54 | 0.51 |
| Cotton-Grain Sorghum | 0.71 | 0.66 | 0.65 | 0.63 | 0.63 | 0.61 |
| Cotton-Soybeans | 0.71 | 0.65 | 0.65 | 0.62 | 0.61 | 0.60 |
| Wheat-Alfalfa | 0.50 | 0.44 | 0.43 | 0.41 | 0.41 | 0.37 |
| Cotton-Alfalfa | 0.60 | 0.51 | 0.50 | 0.50 | 0.47 | 0.47 |
| Cotton-Wheat | 0.74 | 0.64 | 0.65 | 0.62 | 0.62 | 0.59 |
| Wheat-Alfalfa-Grain Sorghum | 0.64 | 0.51 | 0.50 | 0.47 | 0.48 | 0.43 |
| Wheat-Cotton-Grain Sorghum | 0.79 | 0.74 | 0.68 | 0.64 | 0.64 | 0.62 |
| Alfalfa-Wheat-Cotton | 0.68 | 0.52 | 0.52 | 0.51 | 0.51 | 0.48 |
| Cotton-Soybeans-Alfalfa | 0.65 | 0.57 | 0.52 | 0.52 | 0.52 | 0.49 |
| Wheat-Soybeans-Grain Sorghum | 0.75 | 0.62 | 0.60 | 0.60 | 0.61 | 0.58 |
| Wheat-Cotton-Soybeans | 0.75 | 0.71 | 0.62 | 0.62 | 0.61 | 0.60 |
| Grain Sorghum-Soybeans-Cotton | 0.72 | 0.66 | 0.64 | 0.61 | 0.62 | 0.59 |

TABLE XIX

TOTAL CAPITAL COST PER ACRE FOR SIX SELECTED FARM SIZES BASED ON GIVEN IRRIGATED CROPPING SYSTEMS

| | Farm Sizes | | | | | |
|---|---|---|---|---|---|---|
| | 160 Acres | 320 Acres | 480 Acres | 640 Acres | 960 Acres | 1280 Acres |
| Grain Sorghum | $206.3 | $166.3 | $170.5 | $130.5 | $120.7 | $112.8 |
| Cotton | 265.3 | 208.3 | 227.4 | 187.3 | 187.3 | 184.6 |
| Soybeans | 173.6 | 96.1 | 139.4 | 114.2 | 100.9 | 93.8 |
| Wheat | 168.6 | 93.4 | 87.3 | 76.3 | 78.5 | 66.1 |
| Alfalfa | 179.9 | 94.1 | 95.2 | 74.2 | 69.3 | 60.3 |
| Wheat-Grain Sorghum | 211.0 | 111.0 | 110.3 | 116.6 | 114.0 | 87.4 |
| Grain Sorghum-Soybeans | 192.6 | 161.4 | 171.1 | 124.5 | 113.7 | 104.4 |
| Wheat-Soybeans | 205.7 | 107.0 | 102.6 | 79.2 | 83.5 | 69.9 |
| Cotton-Grain Sorghum | 253.9 | 193.4 | 190.6 | 161.3 | 158.8 | 143.0 |
| Cotton-Soybeans | 252.0 | 190.2 | 196.0 | 153.9 | 151.4 | 139.3 |
| Wheat-Alfalfa | 176.4 | 122.7 | 114.3 | 87.3 | 93.3 | 47.5 |
| Cotton-Alfalfa | 282.0 | 158.0 | 135.8 | 139.8 | 115.3 | 97.9 |
| Cotton-Wheat | 258.4 | 151.2 | 180.5 | 143.5 | 139.7 | 111.6 |
| Wheat-Alfalfa-Grain Sorghum | 262.8 | 134.9 | 133.3 | 100.8 | 106.9 | 64.0 |
| Wheat-Cotton-Grain Sorghum | 268.1 | 141.7 | 180.6 | 134.3 | 126.5 | 108.1 |
| Alfalfa-Wheat-Cotton | 307.0 | 136.8 | 151.8 | 113.0 | 123.4 | 89.0 |
| Cotton-Soybeans-Alfalfa | 287.4 | 134.2 | 134.0 | 136.9 | 138.9 | 99.7 |
| Wheat-Soybeans-Grain Sorghum | 209.5 | 110.8 | 99.2 | 105.8 | 105.1 | 87.1 |
| Wheat-Cotton-Soybeans | 254.8 | 134.2 | 125.5 | 126.0 | 129.6 | 107.4 |
| Grain Sorghum-Soybeans-Cotton | 247.2 | 177.0 | 184.6 | 141.0 | 148.1 | 121.9 |

TABLE XX

ANNUAL OPERATING CAPITAL COST PER ACRE FOR SIX SELECTED FARM SIZES BASED ON GIVEN IRRIGATED CROPPING SYSTEMS

| | Farm Sizes | | | | | |
|---|---|---|---|---|---|---|
| | 160 Acres | 320 Acres | 480 Acres | 640 Acres | 960 Acres | 1280 Acres |
| Grain Sorghum | $27.60 | $28.00 | $27.90 | $28.50 | $29.10 | $28.90 |
| Cotton | 52.50 | 52.90 | 52.60 | 52.60 | 53.60 | 53.30 |
| Soybeans | 16.50 | 17.50 | 16.40 | 16.60 | 17.20 | 16.90 |
| Wheat | 17.00 | 17.50 | 18.20 | 18.20 | 18.50 | 18.60 |
| Alfalfa | 8.30 | 8.30 | 8.30 | 8.30 | 8.30 | 8.30 |
| Wheat-Grain Sorghum | 10.70 | 10.90 | 11.10 | 11.00 | 11.10 | 11.20 |
| Grain Sorghum-Soybeans | 22.00 | 23.00 | 21.90 | 22.50 | 23.00 | 22.90 |
| Wheat-Soybeans | 7.10 | 7.30 | 7.20 | 7.30 | 7.40 | 7.40 |
| Cotton-Grain Sorghum | 34.20 | 34.60 | 34.20 | 34.80 | 34.80 | 34.90 |
| Cotton-Soybeans | 28.60 | 29.00 | 28.80 | 29.40 | 29.20 | 29.50 |
| Wheat-Alfalfa | 6.50 | 6.60 | 6.50 | 6.50 | 6.50 | 6.50 |
| Cotton-Alfalfa | 8.80 | 8.90 | 8.90 | 8.90 | 9.00 | 9.00 |
| Cotton-Wheat | 20.00 | 20.40 | 20.30 | 20.40 | 20.50 | 20.60 |
| Wheat-Alfalfa-Grain Sorghum | 6.60 | 6.70 | 6.60 | 6.70 | 6.80 | 6.80 |
| Wheat-Cotton-Grain Sorghum | 14.20 | 14.60 | 14.40 | 14.60 | 14.70 | 14.70 |
| Alfalfa-Wheat-Cotton | 8.30 | 8.40 | 8.50 | 8.50 | 8.50 | 8.70 |
| Cotton-Soybeans-Alfalfa | 6.80 | 6.60 | 7.00 | 6.90 | 7.40 | 7.00 |
| Wheat-Soybeans-Grain Sorghum | 8.00 | 8.30 | 8.30 | 8.30 | 8.40 | 8.30 |
| Wheat-Cotton-Soybeans | 12.90 | 13.30 | 13.20 | 13.50 | 13.30 | 13.60 |
| Grain Sorghum-Soybeans-Cotton | 28.20 | 28.40 | 28.20 | 28.70 | 28.90 | 29.20 |

TABLE XXI

INTERMEDIATE CAPITAL COST PER ACRE OF TRACTOR FOR SIX SELECTED FARM SIZES BASED ON GIVEN IRRIGATED CROPPING SYSTEMS

| | Farm Sizes | | | | | |
|---|---|---|---|---|---|---|
| | 160 Acres | 320 Acres | 480 Acres | 640 Acres | 960 Acres | 1280 Acres |
| Grain Sorghum | $87.60 | $87.60 | $83.60 | $62.70 | $56.60 | $47.00 |
| Cotton | 87.60 | 87.60 | 96.50 | 62.80 | 75.70 | 78.50 |
| Soybeans | 93.10 | 46.60 | 84.00 | 63.10 | 56.70 | 47.30 |
| Wheat | 86.90 | 43.50 | 41.20 | 30.90 | 35.20 | 30.90 |
| Alfalfa | 87.60 | 43.80 | 41.40 | 31.00 | 28.20 | 15.50 |
| Wheat-Grain Sorghum | 87.00 | 43.50 | 41.60 | 62.40 | 56.20 | 46.20 |
| Grain Sorghum-Soybeans | 87.70 | 87.70 | 83.80 | 62.80 | 56.50 | 47.10 |
| Wheat-Soybeans | 87.60 | 43.80 | 41.70 | 31.30 | 35.50 | 31.60 |
| Cotton-Grain Sorghum | 87.60 | 87.60 | 83.70 | 62.80 | 72.30 | 62.80 |
| Cotton-Soybeans | 88.80 | 88.80 | 86.90 | 65.20 | 71.20 | 65.20 |
| Wheat-Alfalfa | 42.00 | 46.60 | 41.20 | 30.90 | 35.10 | 15.50 |
| Cotton-Alfalfa | 88.60 | 53.90 | 41.80 | 63.30 | 39.70 | 47.00 |
| Cotton-Wheat | 88.50 | 53.20 | 83.40 | 62.30 | 67.70 | 46.90 |
| Wheat-Alfalfa-Grain Sorghum | 88.90 | 44.50 | 41.70 | 31.20 | 35.60 | 22.30 |
| Wheat-Cotton-Grain Sorghum | 87.30 | 43.60 | 83.50 | 62.60 | 52.40 | 47.00 |
| Alfalfa-Wheat-Cotton | 87.30 | 51.80 | 45.80 | 31.30 | 35.50 | 31.30 |
| Cotton-Soybeans-Alfalfa | 94.80 | 41.00 | 41.90 | 62.80 | 70.00 | 47.10 |
| Wheat-Soybeans-Grain Sorghum | 87.60 | 43.80 | 39.10 | 58.60 | 56.30 | 43.90 |
| Wheat-Cotton-Soybeans | 87.50 | 43.70 | 41.80 | 55.50 | 56.90 | 47.00 |
| Grain Sorghum-Soybeans-Cotton | 87.60 | 87.60 | 83.70 | 62.80 | 72.00 | 47.10 |

TABLE XXII

INTERMEDIATE CAPITAL COST PER ACRE OF EQUIPMENT FOR SIX SELECTED FARM SIZES BASED ON GIVEN IRRIGATED CROPPING SYSTEMS

| | Farm Sizes | | | | | |
|---|---|---|---|---|---|---|
| | 160 Acres | 320 Acres | 480 Acres | 640 Acres | 960 Acres | 1280 Acres |
| Grain Sorghum | $ 91.1 | $50.7 | $59.0 | $39.3 | $35.0 | $36.9 |
| Cotton | 125.2 | 67.8 | 78.3 | 71.9 | 58.0 | 52.8 |
| Soybeans | 64.0 | 32.0 | 39.0 | 34.5 | 27.0 | 29.6 |
| Wheat | 64.7 | 32.4 | 27.9 | 27.2 | 24.8 | 16.6 |
| Alfalfa | 84.0 | 42.0 | 45.5 | 34.9 | 32.8 | 36.5 |
| Wheat-Grain Sorghum | 113.3 | 56.6 | 57.6 | 43.2 | 46.7 | 30.0 |
| Grain Sorghum-Soybeans | 82.9 | 50.7 | 65.4 | 39.2 | 34.2 | 34.4 |
| Wheat-Soybeans | 111.0 | 55.9 | 53.7 | 40.6 | 40.6 | 30.9 |
| Cotton-Grain Sorghum | 132.1 | 71.2 | 72.7 | 63.7 | 51.7 | 45.3 |
| Cotton-Soybeans | 134.6 | 72.4 | 80.3 | 59.3 | 51.0 | 44.6 |
| Wheat-Alfalfa | 127.9 | 69.5 | 66.6 | 49.9 | 51.7 | 25.5 |
| Cotton-Alfalfa | 184.6 | 95.2 | 85.1 | 67.6 | 66.6 | 41.9 |
| Cotton-Wheat | 149.9 | 77.6 | 76.8 | 60.8 | 51.5 | 44.1 |
| Wheat-Alfalfa-Grain Sorghum | 167.3 | 83.7 | 85.0 | 62.9 | 64.5 | 34.9 |
| Wheat-Cotton-Grain Sorghum | 166.6 | 83.5 | 82.7 | 57.1 | 59.4 | 46.4 |
| Alfalfa-Wheat-Cotton | 211.4 | 76.6 | 97.5 | 73.2 | 79.4 | 49.0 |
| Cotton-Soybeans-Alfalfa | 185.8 | 86.6 | 85.1 | 67.2 | 61.5 | 45.6 |
| Wheat-Soybeans-Grain Sorghum | 113.9 | 58.7 | 51.8 | 38.9 | 40.4 | 34.9 |
| Wheat-Cotton-Soybeans | 154.4 | 77.2 | 70.5 | 57.0 | 59.4 | 46.8 |
| Grain Sorghum-Soybeans-Cotton | 131.4 | 61.0 | 72.7 | 49.5 | 47.2 | 45.6 |

TABLE XXIII

TOTAL CAPITAL COST PER ACRE FOR FIVE SELECTED FARM SIZES BASED ON GIVEN DRYLAND CROPPING SYSTEMS

| | Farm Sizes | | | | |
|---|---|---|---|---|---|
| | 160 Acres | 320 Acres | 480 Acres | 800 Acres | 1120 Acres |
| Grain Sorghum | $157.1 | $ 83.4 | $ 73.7 | $ 74.9 | $ 66.8 |
| Cotton | 237.0 | 192.7 | 170.6 | 168.3 | 152.6 |
| Wheat | 162.4 | 88.7 | 83.3 | 85.7 | 65.9 |
| Alfalfa | 178.6 | 92.8 | 93.9 | 83.5 | 44.2 |
| Wheat-Grain Sorghum | 175.1 | 83.9 | 82.4 | 77.5 | 59.1 |
| Cotton-Grain Sorghum | 248.8 | 132.3 | 117.4 | 116.0 | 107.2 |
| Wheat-Alfalfa | 208.7 | 107.1 | 112.4 | 108.4 | 51.5 |
| Cotton-Alfalfa | 271.0 | 139.1 | 128.1 | 113.3 | 85.0 |
| Cotton-Wheat | 266.2 | 147.3 | 123.7 | 118.3 | 87.7 |
| Wheat-Alfalfa-Grain Sorghum | 220.2 | 95.3 | 119.2 | 118.1 | 53.8 |
| Wheat-Cotton-Grain Sorghum | 263.1 | 134.6 | 118.6 | 121.5 | 94.4 |
| Alfalfa-Wheat-Cotton | 250.4 | 128.3 | 117.4 | 116.6 | 87.5 |

TABLE XXIV

ANNUAL OPERATING CAPITAL COST PER ACRE FOR FIVE SELECTED FARM SIZES
BASED ON GIVEN DRYLAND CROPPING SYSTEMS

| | Farm Sizes | | | | |
|---|---|---|---|---|---|
| | 160 Acres | 320 Acres | 480 Acres | 800 Acres | 1120 Acres |
| Grain Sorghum | $ 8.5 | $ 9.0 | $ 9.1 | $ 9.5 | $10.1 |
| Cotton | 24.0 | 24.6 | 24.6 | 24.3 | 24.2 |
| Wheat | 14.3 | 14.7 | 15.4 | 15.4 | 15.6 |
| Alfalfa | 7.0 | 7.0 | 7.0 | 7.0 | 7.0 |
| Wheat-Grain Sorghum | 3.9 | 4.0 | 4.1 | 4.2 | 4.2 |
| Cotton-Grain Sorghum | 13.9 | 14.8 | 14.8 | 15.4 | 14.8 |
| Wheat-Alfalfa | 5.5 | 5.5 | 5.6 | 5.6 | 5.6 |
| Cotton-Alfalfa | 6.8 | 7.0 | 6.8 | 6.9 | 6.9 |
| Cotton-Wheat | 8.5 | 8.9 | 8.9 | 8.7 | 9.0 |
| Wheat-Alfalfa-Grain Sorghum | 4.1 | 4.2 | 4.3 | 4.3 | 4.3 |
| Wheat-Cotton-Grain Sorghum | 5.6 | 5.8 | 5.9 | 6.1 | 6.0 |
| Alfalfa-Wheat-Cotton | 6.2 | 6.2 | 6.2 | 6.2 | 6.3 |

TABLE XXV

INTERMEDIATE CAPITAL COST PER ACRE OF TRACTOR FOR FIVE SELECTED FARM SIZES BASED ON GIVEN DRYLAND CROPPING SYSTEMS

| | Farm Sizes | | | | |
|---|---|---|---|---|---|
| | 160 Acres | 320 Acres | 480 Acres | 800 Acres | 1120 Acres |
| Grain Sorghum | $87.1 | $43.6 | $37.5 | $42.4 | $35.6 |
| Cotton | 87.7 | 87.7 | 86.0 | 85.1 | 71.7 |
| Wheat | 86.4 | 43.2 | 41.4 | 42.0 | 35.5 |
| Alfalfa | 87.6 | 43.8 | 41.4 | 34.4 | 17.7 |
| Wheat-Grain Sorghum | 86.8 | 43.4 | 41.2 | 41.2 | 35.6 |
| Cotton-Grain Sorghum | 87.4 | 43.7 | 41.8 | 44.3 | 53.7 |
| Wheat-Alfalfa | 96.2 | 48.1 | 41.4 | 42.2 | 17.7 |
| Cotton-Alfalfa | 87.6 | 43.8 | 42.1 | 35.6 | 36.0 |
| Cotton-Wheat | 87.3 | 43.7 | 41.7 | 42.5 | 35.8 |
| Wheat-Alfalfa-Grain Sorghum | 85.8 | 42.9 | 41.2 | 42.3 | 17.7 |
| Wheat-Cotton-Grain Sorghum | 87.2 | 43.6 | 41.7 | 47.0 | 45.6 |
| Alfalfa-Wheat-Cotton | 85.8 | 42.9 | 40.7 | 40.1 | 39.7 |

TABLE XXVI

INTERMEDIATE CAPITAL COST PER ACRE OF EQUIPMENT FOR FIVE SELECTED FARM SIZES BASED ON GIVEN DRYLAND CROPPING SYSTEMS

| | Farm Sizes | | | | |
|---|---|---|---|---|---|
| | 160 Acres | 320 Acres | 480 Acres | 800 Acres | 1120 Acres |
| Grain Sorghum | $ 61.5 | $30.8 | $27.1 | $23.0 | $21.1 |
| Cotton | 125.3 | 80.4 | 60.0 | 58.9 | 56.7 |
| Wheat | 61.7 | 30.8 | 26.5 | 28.3 | 14.8 |
| Alfalfa | 84.0 | 42.0 | 45.5 | 42.1 | 19.5 |
| Wheat-Grain Sorghum | 84.4 | 36.5 | 37.1 | 32.1 | 19.3 |
| Cotton-Grain Sorghum | 147.5 | 73.8 | 60.8 | 56.3 | 38.7 |
| Wheat-Alfalfa | 107.0 | 53.5 | 65.4 | 60.6 | 28.2 |
| Cotton-Alfalfa | 176.6 | 88.3 | 79.2 | 70.8 | 42.1 |
| Cotton-Wheat | 170.4 | 94.7 | 73.1 | 67.1 | 42.9 |
| Wheat-Alfalfa-Grain Sorghum | 130.3 | 48.2 | 73.7 | 71.5 | 31.8 |
| Wheat-Cotton-Grain Sorghum | 170.3 | 85.2 | 71.0 | 68.4 | 42.8 |
| Alfalfa-Wheat-Cotton | 158.4 | 79.2 | 70.5 | 70.3 | 47.8 |

TABLE XXVII

THE RATIO OF RETURN[a] ON CAPITAL INVESTED PER ACRE FOR SIX SELECTED FARM SIZES BASED ON A MINIMUM MACHINERY REQUIREMENT AND IRRIGATED CROPPING SYSTEMS

| | Farm Sizes | | | | | |
|---|---|---|---|---|---|---|
| | 160 Acres | 320 Acres | 480 Acres | 640 Acres | 960 Acres | 1280 Acres |
| Grain Sorghum | 29.1% | 39.1% | 39.2% | 57.3% | 62.1% | 69.0% |
| Cotton | 36.7 | 51.1 | 47.8 | 62.4 | 61.2 | 63.4 |
| Soybeans | 36.9 | 82.6 | 53.3 | 69.6 | 79.6 | 88.8 |
| Wheat | 27.3 | 66.8 | 72.2 | 85.4 | 82.2 | 101.9 |
| Alfalfa | 108.5 | 227.9 | 223.9 | 293.4 | 298.1 | 366.3 |
| Wheat-Grain Sorghum | 20.8 | 59.0 | 60.3 | 56.5 | 57.5 | 82.3 |
| Grain Sorghum-Soybeans | 30.0 | 40.3 | 38.3 | 60.5 | 66.4 | 75.5 |
| Wheat-Soybeans | 22.1 | 62.7 | 67.3 | 93.0 | 86.2 | 108.6 |
| Cotton-Grain Sorghum | 28.1 | 44.3 | 46.8 | 58.6 | 59.8 | 69.1 |
| Cotton-Soybeans | 28.4 | 45.4 | 44.4 | 61.8 | 63.6 | 70.6 |
| Wheat-Alfalfa | 66.5 | 106.8 | 115.7 | 158.5 | 146.9 | 308.9 |
| Cotton-Alfalfa | 46.1 | 100.3 | 119.8 | 116.8 | 148.5 | 175.4 |
| Cotton-Wheat | 23.2 | 55.4 | 44.3 | 60.8 | 62.6 | 84.3 |
| Wheat-Alfalfa-Grain Sorghum | 29.6 | 79.9 | 81.7 | 115.4 | 107.1 | 194.1 |
| Wheat-Cotton-Grain Sorghum | 17.2 | 39.8 | 38.0 | 58.2 | 62.0 | 77.0 |
| Alfalfa-Wheat-Cotton | 27.6 | 91.6 | 79.8 | 112.7 | 103.2 | 151.9 |
| Cotton-Soybeans-Alfalfa | 33.9 | 87.6 | 98.8 | 97.4 | 91.3 | 141.5 |
| Wheat-Soybeans-Grain Sorghum | 20.1 | 57.2 | 68.7 | 63.8 | 62.4 | 81.9 |
| Wheat-Cotton-Soybeans | 20.8 | 46.2 | 63.3 | 64.0 | 62.9 | 78.5 |
| Grain Sorghum-Soybeans-Cotton | 25.6 | 41.8 | 44.2 | 64.1 | 59.1 | 76.8 |

[a] This is "Return to Land, Overhead, Risk, and Management".

TABLE XXVIII

THE RATIO OF RETURN[a] ON CAPITAL INVESTED PER ACRE FOR SEX SELECTED FARM SIZES BASED ON A MINIMUM MACHINERY REQUIREMENT AND DRYLAND CROPPING SYSTEMS

| | Farm Sizes | | | | |
|---|---|---|---|---|---|
| | 160 Acres | 320 Acres | 480 Acres | 800 Acres | 1120 Acres |
| Grain Sorghum | 4.9% | 27.9% | 34.4% | 33.8% | 38.4% |
| Cotton | 7.6 | 14.5 | 17.8 | 20.7 | 24.7 |
| Wheat | -0.9 | 16.5 | 17.9 | 16.6 | 28.2 |
| Alfalfa | 42.2 | 102.7 | 100.8 | 116.2 | 238.5 |
| Wheat-Grain Sorghum | -0.1 | 22.1 | 22.3 | 25.1 | 39.6 |
| Cotton-Grain Sorghum | 0.04 | 19.3 | 25.1 | 25.0 | 30.4 |
| Wheat-Alfalfa | 13.1 | 47.2 | 42.9 | 45.3 | 120.2 |
| Cotton-Alfalfa | 10.6 | 42.7 | 48.6 | 57.7 | 84.8 |
| Cotton-Wheat | -3.3 | 11.9 | 18.6 | 20.5 | 34.9 |
| Wheat-Alfalfa-Grain Sorghum | 5.8 | 46.7 | 30.0 | 31.5 | 93.7 |
| Wheat-Cotton-Grain Sorghum | -4.5 | 12.8 | 17.6 | 16.4 | 28.2 |
| Alfalfa-Wheat-Cotton | -3.7 | 16.1 | 27.6 | 37.1 | 44.7 |

[a]This is "Return to Land, Overhead, Risk, and Management".

TABLE XXIX

MONTHLY LABOR HOUR REQUIREMENTS OF SELECTED FARM SIZE FOR THE OPERATION OF MACHINERY AND IRRIGATION EQUIPMENT

| Acres | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Hours | | | | | | | |
| **Irrigated Grain Sorghum** | | | | | | | | | | | | | |
| 160 | 80 | 44.8 | 128 | 84.8 | 41.6 | 57.6 | 89.6 | 32 | | | | | 558.4 |
| 320 | 160 | 89.6 | 256 | 169.6 | 83.2 | 115.2 | 179.2 | 64 | | | | | 1116.8 |
| 480 | 91.2 | 96 | 355.2 | 158.4 | 81.6 | 129.6 | 225.6 | 96 | | | | | 1238.4 |
| 640 | 121.6 | 128 | 473.6 | 211.2 | 108.8 | 172.8 | 300.8 | 128 | | | | | 1651.2 |
| 960 | 307.2 | 220.8 | 729.6 | 393.6 | 201.6 | 297.6 | 489.6 | 192 | | | | | 2822.4 |
| 1280 | 243.2 | 256 | 947.2 | 422.4 | 217.6 | 345.6 | 601.6 | 256 | | | | | 3302.4 |
| **Irrigated Cotton** | | | | | | | | | | | | | |
| 160 | 80 | 44.8 | 105.6 | 67.2 | 41.6 | 41.6 | 115.2 | 73.6 | | | 139.2 | | 710.4 |
| 320 | 160 | 89.6 | 211.2 | 134.4 | 83.2 | 83.2 | 230.4 | 147.2 | | | 278.4 | | 1420.8 |
| 480 | 91.2 | 96 | 292.8 | 134.4 | 81.6 | 81.6 | 264 | 177.6 | | | 417.6 | | 1636.8 |
| 640 | 121.6 | 128 | 390.4 | 179.2 | 108.8 | 108.8 | 352 | 236.8 | | | 556.8 | | 2182.4 |
| 960 | 307.2 | 220.8 | 604.8 | 326.4 | 201.6 | 201.6 | 595.2 | 393.6 | | | 835.2 | | 3667.2 |
| 1280 | 243.2 | 256 | 780.8 | 358.4 | 217.6 | 217.6 | 704 | 473.6 | | | 1113.2 | | 4364.8 |
| **Irrigated Soybeans** | | | | | | | | | | | | | |
| 160 | | 91.2 | | 105.6 | 35.2 | 17.6 | 132.8 | 73.6 | | | | | 459.2 |
| 320 | | 182.4 | | 211.2 | 70.4 | 35.2 | 265.6 | 147.2 | | | | | 918.4 |
| 480 | | 168 | | 292.8 | 72 | 24 | 288 | 177.6 | | | | | 1008 |
| 640 | | 224 | | 390.4 | 96 | 32 | 384 | 236.8 | | | | | 1344 |
| 960 | | 412.8 | | 604.8 | 172.8 | 67.2 | 662.4 | 393.6 | | | | | 2313.6 |
| 1280 | | 448 | | 780.8 | 192 | 64 | 768 | 473.6 | | | | | 2688 |

TABLE XXIX (Continued)

| Acres | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Hours | | | | | | | |
| Irrigated Wheat | | | | | | | | | | | | | |
| 160 | | 16 | | 16 | | 48 | 20.8 | 41.6 | 32 | 20.8 | | | 196.8 |
| 320 | | 32 | | 32 | | 96 | 41.6 | 83.2 | 64 | 41.6 | | | 393.6 |
| 480 | | 48 | | 48 | | 129.6 | 62.4 | 124.8 | 62.4 | 43.2 | | | 518.4 |
| 640 | | 64 | | 64 | | 172.8 | 83.2 | 166.4 | 83.2 | 57.6 | | | 691.2 |
| 960 | | 96 | | 96 | | 268.8 | 124.8 | 249.6 | 153.6 | 96 | | | 1094.4 |
| 1280 | | 128 | | 128 | | 345.6 | 166.4 | 332.8 | 166.4 | 115.2 | | | 1382.4 |
| Irrigated Alfalfa | | | | | | | | | | | | | |
| 160 | | | | | 43.2 | 60.8 | 64 | 59.2 | 28.8 | 27.2 | | | 284.8 |
| 320 | | | | | 86.4 | 121.6 | 128 | 118.4 | 57.6 | 54.4 | | | 569.6 |
| 480 | | | | | 120 | 148.8 | 182.4 | 168 | 72 | 72 | | | 763.2 |
| 640 | | | | | 160 | 198.4 | 243.2 | 224 | 96 | 96 | | | 1017.6 |
| 960 | | | | | 249.6 | 336 | 374.4 | 345.6 | 153.6 | 153.6 | | | 1612.8 |
| 1280 | | | | | 320 | 396.8 | 486.4 | 448 | 192 | 192 | | | 2035.2 |
| Irrigated Wheat-Grain Sorghum | | | | | | | | | | | | | |
| 160 | 40 | 30.4 | 64 | 51.2 | 20.8 | 52.8 | 56 | 36.8 | 16 | 11.2 | | | 377.6 |
| 320 | 80 | 60.8 | 128 | 102.4 | 41.6 | 105.6 | 112 | 73.6 | 32 | 22.4 | | | 755.2 |
| 480 | 48 | 72 | 177.6 | 100.8 | 43.2 | 129.6 | 144 | 110.4 | 28.8 | 19.2 | | | 878.4 |
| 640 | 64 | 96 | 236.8 | 134.4 | 57.6 | 172.8 | 192 | 147.2 | 38.4 | 25.6 | | | 1171.2 |
| 960 | 153.6 | 163.2 | 364.8 | 240 | 96 | 288 | 307.2 | 220.8 | 76.8 | 48 | | | 1953.4 |
| 1280 | 128 | 192 | 473.6 | 268.8 | 115.2 | 345.6 | 384 | 294.4 | 76.8 | 51.2 | | | 2342.4 |

TABLE XXIX (Continued)

| Acres | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Hours | | | | | | | |
| Irrigated Grain Sorghum-Soybeans | | | | | | | | | | | | | |
| 160 | 40 | 68.8 | 64 | 96 | 38.4 | 110.4 | 112 | 52.8 | | | | | 580.8 |
| 320 | 80 | 137.6 | 128 | 192 | 76.8 | 220.8 | 224 | 105.6 | | | | | 1161.6 |
| 480 | 48 | 124.8 | 177.6 | 225.6 | 76.8 | 292.8 | 254.4 | 139.2 | | | | | 1339.2 |
| 640 | 64 | 116.4 | 236.8 | 300.8 | 102.4 | 390.4 | 339.2 | 185.6 | | | | | 1785.6 |
| 960 | 153.6 | 316.8 | 364.8 | 460.8 | 220.8 | 576 | 576 | 326.4 | | | | | 3004.8 |
| 1280 | 128 | 332.8 | 473.6 | 601.6 | 204.8 | 780.8 | 678.4 | 371.2 | | | | | 3571.2 |
| Irrigated Wheat-Soybeans | | | | | | | | | | | | | |
| 160 | | 54.4 | | 60.8 | 17.6 | 33.6 | 76.8 | 57.6 | 16 | 11.2 | | | 328 |
| 320 | | 108.8 | | 121.6 | 35.2 | 67.2 | 153.6 | 115.2 | 32 | 22.4 | | | 656 |
| 480 | | 100.8 | | 168 | 33.6 | 76.8 | 172.8 | 153.6 | 28.8 | 19.2 | | | 763.2 |
| 640 | | 134.4 | | 224 | 44.8 | 102.4 | 230.4 | 204.8 | 38.4 | 38.4 | | | 1017.6 |
| 960 | | 249.6 | | 345.6 | 86.4 | 172.8 | 393.6 | 326.4 | 76.8 | 48 | | | 1699.2 |
| 1280 | | 268.8 | | 448 | 89.6 | 204.8 | 460.8 | 409.6 | 76.8 | 76.8 | | | 2035.2 |
| Irrigated Cotton-Grain Sorghum | | | | | | | | | | | | | |
| 160 | 80 | 44.8 | 116.8 | 76.8 | 41.6 | 49.6 | 102.4 | 52.8 | | | 68.8 | | 633.6 |
| 320 | 160 | 89.6 | 233.6 | 153.6 | 83.2 | 99.2 | 131.2 | 105.6 | | | 137.6 | | 1267.2 |
| 480 | 91.2 | 96 | 292.8 | 144 | 81.6 | 105.6 | 244.8 | 139.2 | | | 206.4 | | 1406.4 |
| 640 | 121.6 | 128 | 390.4 | 192 | 108.8 | 140.8 | 326.4 | 185.6 | | | 275.2 | | 1875.2 |
| 960 | 307.2 | 220.8 | 604.8 | 355.2 | 201.6 | 249.6 | 537.6 | 288 | | | 412.8 | | 3177.6 |
| 1280 | 243.2 | 256 | 780.8 | 384 | 217.6 | 281.6 | 652.8 | 371.2 | | | 550.4 | | 3750.4 |

TABLE XXIX (Continued)

| Acres | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Hours | | | | | | | |
| **Irrigated Cotton-Soybeans** | | | | | | | | | | | | | |
| 160 | 40 | 68.8 | 56 | 89.6 | 38.4 | 30.4 | 124.8 | 73.6 | | | 68.8 | | 590.4 |
| 320 | 80 | 137.6 | 112 | 179.2 | 76.8 | 60.8 | 249.6 | 147.2 | | | 137.6 | | 115.2 |
| 480 | 48 | 105.6 | 206.4 | 211.2 | 76.8 | 52.8 | 273.6 | 177.6 | | | 206.4 | | 1363.2 |
| 640 | 64 | 140.8 | 275.2 | 281.6 | 102.4 | 70.4 | 364.8 | 236.8 | | | 275.2 | | 1817.6 |
| 960 | 153.6 | 278.4 | 345.6 | 460.8 | 182.4 | 134.4 | 624 | 393.6 | | | 412.8 | | 2995.2 |
| 1280 | 128 | 281.6 | 550.4 | 563.2 | 204.8 | 140.8 | 729.6 | 473.6 | | | 550.4 | | 3635.2 |
| **Irrigated Wheat-Alfalfa** | | | | | | | | | | | | | |
| 160 | | 8 | | 8 | 14.4 | 56 | 43.2 | 51.2 | 22.4 | 24 | | | 227.2 |
| 320 | | 16 | | 16 | 28.8 | 112 | 86.4 | 102.4 | 44.8 | 48 | | | 454.4 |
| 480 | | 24 | | 24 | 33.6 | 139.2 | 120 | 148.8 | 43.2 | 57.6 | | | 590.4 |
| 640 | | 32 | | 32 | 44.8 | 185.6 | 160 | 198.4 | 57.6 | 76.8 | | | 787.2 |
| 960 | | 48 | | 48 | 76.8 | 297.6 | 249.6 | 297.6 | 105.6 | 124.8 | | | 1248 |
| 1280 | | 64 | | 64 | 89.6 | 371.2 | 320 | 396.8 | 115.2 | 153.6 | | | 1574.4 |
| **Irrigated Cotton-Alfalfa** | | | | | | | | | | | | | |
| 160 | 40 | 22.4 | 56 | 33.6 | 41.6 | 51.2 | 60.8 | 36.8 | 14.4 | 14.4 | 68.8 | | 443.2 |
| 320 | 80 | 44.8 | 112 | 67.2 | 83.2 | 102.4 | 121.6 | 73.6 | 28.8 | 28.8 | 137.5 | | 886.4 |
| 480 | 48 | 48 | 144 | 67.2 | 57.6 | 115.2 | 177.6 | 216 | 76.8 | 33.6 | 206.4 | | 1200 |
| 640 | 64 | 64 | 192 | 89.6 | 76.8 | 153.6 | 236.8 | 288 | 102.4 | 44.8 | 275.2 | | 1600 |
| 960 | 153.6 | 115.2 | 297.6 | 163.2 | 124.8 | 268.8 | 384 | 470.4 | 172.8 | 76.8 | 384 | | 2601.6 |
| 1280 | 128 | 128 | 384 | 179.2 | 153.6 | 307.2 | 473.6 | 550.4 | 204.8 | 89.6 | 550.4 | | 3200 |

TABLE XXIX (Continued)

| Acres | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Hours | | | | | | | |
| Irrigated Cotton-Wheat | | | | | | | | | | | | | |
| 160 | 40 | 30.4 | 56 | 41.6 | 20.8 | 46.4 | 68.8 | 57.6 | 16 | 11.2 | 68.8 | | 457.6 |
| 320 | 80 | 60.8 | 112 | 83.2 | 41.6 | 92.8 | 137.6 | 115.2 | 32 | 22.4 | 137.6 | | 915.2 |
| 480 | 48 | 48 | 144 | 67.2 | 43.2 | 105.6 | 115.2 | 105.6 | 28.8 | 19.2 | 206.4 | | 936 |
| 640 | 64 | 64 | 192 | 89.6 | 57.6 | 140.8 | 153.6 | 140.8 | 38.4 | 25.6 | 275.2 | | 1248 |
| 960 | 153.6 | 163.2 | 297.6 | 211.2 | 96 | 240 | 355.2 | 326.4 | 76.8 | 48 | 412.8 | | 2380.8 |
| 1280 | 128 | 128 | 384 | 179.2 | 115.2 | 281.6 | 307.2 | 281.6 | 76.8 | 51.2 | 550.4 | | 2496 |
| Irrigated Wheat-Soybeans-Grain Sorghum | | | | | | | | | | | | | |
| 160 | 27.2 | 97.6 | 41.6 | 116.8 | 25.6 | 88 | 321.6 | 48 | 11.2 | 6.4 | | | 784 |
| 320 | 54.4 | 195.2 | 83.2 | 233.6 | 51.2 | 176 | 643.2 | 96 | 22.4 | 12.8 | | | 1568 |
| 480 | 28.8 | 240 | 120 | 283.2 | 28.8 | 235.2 | 912 | 134.4 | 19.2 | 14.4 | | | 2016 |
| 640 | 38.4 | 320 | 160 | 377.6 | 38.4 | 313.6 | 1216 | 179.2 | 25.6 | 19.2 | | | 2688 |
| 960 | 96 | 528 | 240 | 624 | 124.8 | 470.4 | 1843.2 | 278.4 | 48 | 57.6 | | | 4310.4 |
| 1280 | 76.8 | 640 | 320 | 755.2 | 76.8 | 627.4 | 2432 | 358.4 | 51.2 | 38.4 | | | 5376 |
| Irrigated Wheat-Cotton-Soybeans | | | | | | | | | | | | | |
| 160 | 27.2 | 97.6 | 35.2 | 110.4 | 25.6 | 35.2 | 89.6 | 62.4 | 11.2 | 6.4 | 46.4 | | 545.6 |
| 320 | 54.4 | 195.2 | 70.4 | 220.8 | 51.2 | 70.4 | 179.2 | 124.8 | 22.4 | 12.8 | 92.8 | | 1091.2 |
| 480 | 28.8 | 240 | 96 | 297.6 | 52.8 | 76.8 | 201.6 | 158.4 | 19.2 | 14.4 | 139.2 | | 1329.6 |
| 640 | 38.4 | 320 | 128 | 396.8 | 70.4 | 102.4 | 268.8 | 211.2 | 25.6 | 19.2 | 185.6 | | 1772.8 |
| 960 | 96 | 528 | 201.6 | 643.2 | 124.8 | 182.4 | 451.2 | 345.6 | 48 | 28.8 | 278.4 | | 2928 |
| 1280 | 76.8 | 640 | 256 | 793.6 | 140.8 | 204.8 | 537.6 | 422.4 | 51.2 | 38.4 | 371.2 | | 3545.6 |

TABLE XXIX (Continued)

| Acres | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Hours | | | | | | | |
| Irrigated Grain Sorghum-Soybeans-Cotton | | | | | | | | | | | | | |
| 160 | 54.4 | 60.8 | 78.4 | 86.4 | 40 | 86.4 | 112 | 59.2 | | | 46.4 | | 622.4 |
| 320 | 108.8 | 121.6 | 156.8 | 172.8 | 80 | 172.8 | 224 | 118.4 | | | 92.8 | | 1244.8 |
| 480 | 62.4 | 115.2 | 216 | 192 | 76.8 | 220.8 | 259.2 | 124.8 | | | 139.2 | | 1406.4 |
| 640 | 83.2 | 153.6 | 288 | 256 | 102.4 | 294.4 | 345.6 | 166.4 | | | 185.6 | | 1875.2 |
| 960 | 201.6 | 278.4 | 441.6 | 412.8 | 192 | 470.4 | 576 | 259.2 | | | 278.4 | | 3120 |
| 1280 | 166.4 | 307.2 | 576 | 512 | 204.8 | 588.8 | 691.2 | 332.8 | | | 371.2 | | 3750.4 |
| Irrigated Wheat-Alfalfa-Grain Sorghum | | | | | | | | | | | | | |
| 160 | 27.2 | 19.2 | 44.8 | 27.2 | 57.6 | 59.2 | 43.2 | 14.4 | 16 | | | | 336 |
| 320 | 54.4 | 38.4 | 89.6 | 54.4 | 115.2 | 118.4 | 86.4 | 28.8 | 32 | | | | 672 |
| 480 | 28.8 | 48 | 96 | 67.2 | 139.2 | 158.4 | 129.6 | 28.8 | 38.4 | | | | 787.2 |
| 640 | 38.4 | 64 | 128 | 89.6 | 185.6 | 211.2 | 172.8 | 38.4 | 51.2 | | | | 1049.6 |
| 960 | 96 | 105.6 | 201.6 | 144 | 297.6 | 326.4 | 259.2 | 67.2 | 86.4 | | | | 1728 |
| 1280 | 76.8 | 128 | 256 | 179.2 | 371.2 | 422.4 | 345.6 | 76.8 | 102.4 | | | | 2099.2 |
| Irrigated Wheat-Cotton-Grain Sorghum | | | | | | | | | | | | | |
| 160 | 54.4 | 35.2 | 78.4 | 56 | 27.2 | 48 | 315.2 | 48 | 11.2 | 6.4 | 46.4 | | 726.4 |
| 320 | 108.8 | 70.4 | 156.8 | 112 | 54.4 | 96 | 630.4 | 96 | 22.4 | 12.8 | 92.8 | | 1452.8 |
| 480 | 62.4 | 76.8 | 216 | 110.4 | 57.6 | 115.2 | 907.2 | 134.4 | 19.2 | 14.4 | 139.2 | | 1843.2 |
| 640 | 83.2 | 102.4 | 288 | 147.2 | 76.8 | 153.6 | 1209.6 | 179.2 | 25.6 | 19.2 | 185.6 | | 2457.6 |
| 960 | 201.6 | 172.8 | 441.6 | 268.8 | 134.4 | 249.6 | 1843.2 | 278.4 | 48 | 28.8 | 278.4 | | 3955.2 |
| 1280 | 166.4 | 204.8 | 576 | 94.4 | 153.6 | 307.2 | 2419.2 | 358.4 | 51.2 | 38.4 | 371.2 | | 4915.2 |

TABLE XXIX (Continued)

| Acres | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Hours | | | | | | | |
| Irrigated Alfalfa-Wheat-Cotton | | | | | | | | | | | | | |
| 160 | 27.2 | 19.2 | 35.2 | 27.2 | 27.2 | 49.6 | 67.2 | 57.6 | 14.4 | 16 | 46.4 | | 385.6 |
| 320 | 54.4 | 38.4 | 70.4 | 54.4 | 54.4 | 99.2 | 134.4 | 115.2 | 28.8 | 32 | 92.8 | | 771.2 |
| 480 | 28.8 | 48 | 96 | 57.6 | 67.2 | 120 | 168 | 153.6 | 28.8 | 38.4 | 139.2 | | 940.8 |
| 640 | 38.4 | 64 | 128 | 76.8 | 89.6 | 160 | 224 | 204.8 | 38.4 | 51.2 | 185.6 | | 1254.4 |
| 960 | 96 | 105.6 | 201.6 | 134.4 | 144 | 259.2 | 364.8 | 326.4 | 67.2 | 86.4 | 278.4 | | 2064 |
| 1280 | 76.8 | 128 | 256 | 153.6 | 179.2 | 320 | 448 | 409.6 | 76.8 | 102.4 | 371.2 | | 2508.8 |
| Irrigated Cotton-Soybeans-Alfalfa | | | | | | | | | | | | | |
| 160 | 27.2 | 44.8 | 35.2 | 57.6 | 40 | 33.6 | 68.8 | 40 | 4.8 | 9.6 | 46.4 | | 406.4 |
| 320 | 54.4 | 89.6 | 70.4 | 115.2 | 80 | 67.2 | 137.6 | 80 | 9.6 | 19.2 | 92.8 | | 812.8 |
| 480 | 28.8 | 81.6 | 96 | 139.2 | 91.2 | 76.8 | 235.2 | 172.8 | 9.6 | 24 | 139.2 | | 1094.4 |
| 640 | 38.4 | 108.8 | 128 | 185.6 | 121.6 | 102.4 | 313.6 | 230.4 | 12.8 | 32 | 185.6 | | 1459.2 |
| 960 | 96 | 211.2 | 201.6 | 307.2 | 201.6 | 432 | 604.8 | 374.4 | 19.2 | 48 | 278.4 | | 2784 |
| 1280 | 76.8 | 217.6 | 256 | 371.2 | 243.2 | 204.8 | 627.2 | 460.8 | 25.6 | 64 | 371.2 | | 2918.4 |

TABLE XXX

MONTHLY LABOR HOUR REQUIREMENTS OF SELECTED FARM SIZES FOR THE OPERATION OF MACHINERY

| Acres | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Hours | | | | | | | |
| **Dryland Grain Sorghum** | | | | | | | | | | | | | |
| 160 | 27.2 | 20.8 | | 20.8 | 62.4 | 41.6 | 41.6 | | | | | | 214.4 |
| 320 | 54.4 | 41.6 | | 41.6 | 124.8 | 83.2 | 83.2 | | | | | | 428.3 |
| 480 | 67.2 | 62.4 | | 62.4 | 139.2 | 148.8 | 81.6 | | | | | | 566.4 |
| 800 | 120 | 104 | | 104 | 264 | 168 | 168 | | | | | | 928 |
| 1120 | 156.8 | 145.6 | | 145.6 | 324.8 | 347.2 | 190.4 | | | | | | 1321.6 |
| **Dryland Cotton** | | | | | | | | | | | | | |
| 160 | 27.2 | | | | 166.4 | 41.6 | 83.2 | | | | 216 | 91.2 | 625.6 |
| 320 | 54.4 | | | | 332.8 | 83.2 | 166.4 | | | | 432 | 182.4 | 1251.2 |
| 480 | 67.2 | | | | 403.2 | 81.6 | 168 | | | | 648 | 177.6 | 1521.6 |
| 800 | 120 | | | | 736 | 168 | 336 | | | | 1080 | 344 | 2776 |
| 1120 | 156.8 | | | | 940.8 | 190.4 | 392 | | | | 1512 | 414.4 | 3550.4 |
| **Dryland Wheat** | | | | | | | | | | | | | |
| 160 | | | | | | 48 | 20.8 | 20.8 | | 41.6 | | | 132.8 |
| 320 | | | | | | 96 | 41.6 | 41.6 | | 83.2 | | | 265.6 |
| 480 | | | | | | 129.6 | 62.4 | 62.4 | | 105.6 | | | 364.8 |
| 800 | | | | | | 224 | 104 | 104 | | 192 | | | 624 |
| 1120 | | | | | | 302.4 | 145.6 | 145.6 | | 246.4 | | | 851.2 |

TABLE XXX (Continued)

| Acres | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Hours | | | | | | | |
| Dryland Alfalfa | | | | | | | | | | | | | |
| 160 | | | | | 43.2 | 44.8 | 4.8 | | 28.8 | 43.2 | | | 166.4 |
| 320 | | | | | 86.4 | 89.6 | 9.6 | | 57.6 | 86.4 | | | 332.8 |
| 480 | | | | | 120 | 100.8 | 14.4 | | 72 | 120 | | | 427.2 |
| 800 | | | | | 208 | 192 | 24 | | 128 | 208 | | | 760 |
| 1120 | | | | | 280 | 235.2 | 33.6 | | 168 | 280 | | | 996.8 |
| Dryland Wheat-Grain Sorghum | | | | | | | | | | | | | |
| 160 | 12.8 | 11.2 | | 11.2 | 32 | 44.8 | 32 | 11.2 | | 20.8 | | | 172.8 |
| 320 | 25.6 | 22.4 | | 22.4 | 64 | 89.6 | 64 | 22.4 | | 41.6 | | | 345.6 |
| 480 | 33.6 | 33.6 | | 33.6 | 67.2 | 105.6 | 72 | 33.6 | | 52.8 | | | 432 |
| 800 | 64 | 56 | | 56 | 96 | 200 | 136 | 56 | | 96 | | | 744 |
| 1120 | 78.4 | 78.4 | | 78.4 | 156.8 | 246.4 | 168 | 78.4 | | 123.2 | | | 1008 |
| Dryland Cotton-Grain Sorghum | | | | | | | | | | | | | |
| 160 | 27.2 | 11.2 | | 11.2 | 115.2 | 41.6 | 62.4 | | | | 107.2 | 46.4 | 420.8 |
| 320 | 54.4 | 22.4 | | 22.4 | 230.4 | 83.2 | 124.8 | | | | 214.4 | 92.8 | 841.6 |
| 480 | 67.2 | 33.6 | | 33.6 | 268.8 | 81.6 | 124.8 | | | | 321.6 | 76.8 | 1008 |
| 800 | 120 | 56 | | 56 | 528 | 168 | 248 | | | | 536 | 224 | 1936 |
| 1120 | 156.8 | 78.4 | | 78.4 | 627.2 | 190.4 | 291.2 | | | | 750.4 | 179.2 | 2352 |
| Dryland Wheat-Alfalfa | | | | | | | | | | | | | |
| 160 | | | | | 22.4 | 46.4 | 12.8 | 11.2 | 14.4 | 43.2 | | | 148.8 |
| 320 | | | | | 44.8 | 92.8 | 25.6 | 22.4 | 28.8 | 86.4 | | | 297.6 |

TABLE XXX (Continued)

| Acres | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Hours | | | | | | | |
| 480 | | | | | 57.6 | 115.2 | 38.4 | 33.6 | 33.6 | 110.4 | | | 393.6 |
| 800 | | | | | 104 | 208 | 64 | 56 | 64 | 200 | | | 696 |
| 1120 | | | | | 134.4 | 268.8 | 89.6 | 78.4 | 78.4 | 257.6 | | | 918.4 |
| Dryland Cotton-Alfalfa | | | | | | | | | | | | | |
| 160 | 12.8 | | | | 105.6 | 43.2 | 44.8 | | 14.4 | 22.4 | 107.2 | 46.4 | 396.8 |
| 320 | 25.6 | | | | 211.2 | 86.4 | 89.6 | | 28.8 | 44.8 | 214.4 | 92.8 | 793.6 |
| 480 | 33.6 | | | | 259.2 | 91.2 | 91.2 | | 33.6 | 57.6 | 321.6 | 76.8 | 974.4 |
| 800 | 64 | | | | 472 | 184 | 176 | | 64 | 104 | 536 | 168 | 1768 |
| 1120 | 78.4 | | | | 604.8 | 212.8 | 212.8 | | 78.4 | 134.4 | 750.4 | 179.2 | 2273.6 |
| Dryland Cotton-Wheat | | | | | | | | | | | | | |
| 160 | 12.8 | | | | 83.2 | 44.8 | 52.8 | 11.2 | | 91.2 | 38.4 | 46.4 | 379.2 |
| 320 | 25.6 | | | | 166.4 | 89.6 | 105.6 | 22.4 | | 182.4 | 76.8 | 92.8 | 758.4 |
| 480 | 33.6 | | | | 201.6 | 105.6 | 115.2 | 33.6 | | 259.2 | 115.2 | 76.8 | 940.8 |
| 800 | 64 | | | | 368 | 200 | 216 | 56 | | 96 | 536 | 168 | 1704 |
| 1120 | 78.4 | | | | 470.4 | 246.4 | 268.8 | 78.4 | | 604.8 | 268.8 | 179.2 | 2195.2 |
| Dryland Wheat-Alfalfa-Grain Sorghum | | | | | | | | | | | | | |
| 160 | 9.6 | 6.4 | | 6.4 | 25.6 | 35.2 | 22.4 | 6.4 | 9.6 | 19.2 | | | 142.4 |
| 320 | 19.2 | 12.8 | | 12.8 | 51.2 | 70.4 | 44.8 | 12.8 | 19.2 | 38.4 | | | 284.8 |
| 480 | 24 | 19.2 | | 19.2 | 86.4 | 105.6 | 52.8 | 19.2 | 24 | 72 | | | 427.2 |
| 800 | 40 | 32 | | 32 | 152 | 192 | 96 | 32 | 40 | 128 | | | 768 |
| 1120 | 56 | 44.8 | | 44.8 | 201.6 | 246.4 | 123.2 | 44.8 | 56 | 168 | | | 996.8 |

TABLE XXX (Continued)

| Acres | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Hours | | | | | | | |
| Dryland Wheat-Cotton-Grain Sorghum | | | | | | | | | | | | | |
| 160 | 17.6 | 6.4 | | 6.4 | 76.8 | 43.2 | 48 | 6.4 | | 14.4 | 70.4 | 30.4 | 321.6 |
| 320 | 35.2 | 12.8 | | 12.8 | 153.6 | 86.4 | 96 | 12.8 | | 28.8 | 140.8 | 60.8 | 643.2 |
| 480 | 43.2 | 19.2 | | 19.2 | 177.6 | 100.8 | 105.6 | 19.2 | | 33.6 | 211.2 | 52.8 | 787.2 |
| 800 | 88 | 32 | | 32 | 328 | 88 | 320 | 32 | | 64 | 352 | 112 | 1456 |
| 1120 | 100.8 | 44.8 | | 44.8 | 414.4 | 235.2 | 246.4 | 44.8 | | 78.4 | 492.8 | 123.2 | 1836.8 |
| Dryland Alfalfa-Wheat-Cotton | | | | | | | | | | | | | |
| 160 | 8 | | | | 51.2 | 48 | 33.6 | 19.2 | 8 | 32 | 70.4 | 16 | 270.4 |
| 320 | 16 | | | | 102.4 | 96 | 67.2 | 38.4 | 16 | 64 | 148 | 32 | 540.8 |
| 480 | 24 | | | | 148.8 | 134.3 | 110.4 | 52.8 | 24 | 105.6 | 211.2 | 52.8 | 864 |
| 800 | 40 | | | | 272 | 192 | 160 | 32 | 112 | 128 | 352 | 112 | 1408 |
| 1120 | 56 | | | | 347.2 | 313.6 | 257.6 | 123.2 | 156 | 246.4 | 492.8 | 123.2 | 2116 |

TABLE XXXI

BREAK-EVEN PRICE FOR EACH PRODUCT PRODUCED ON SELECTED FARM SIZES BASED ON A MINIMUM MACHINERY REQUIREMENT AND IRRIGATED CROPPING SYSTEMS

| Cropping Systems | Name of Product | Unit | Farm Sizes 160 Acres | 320 Acres | 480 Acres | 640 Acres | 960 Acres | 1280 Acres |
|---|---|---|---|---|---|---|---|---|
| Grain Sorghum | Milo | CWT | $ 2.68 | $ 2.50 | $ 2.46 | $ 2.30 | $ 2.30 | $ 2.24 |
| Cotton | Cotton Lint | CWT | 33.45 | 32.10 | 31.78 | 30.55 | 30.89 | 30.52 |
| | Cotton Seed | CWT | 2.44 | 2.34 | 2.32 | 2.23 | 2.25 | 2.23 |
| Soybeans | Soybeans | BU | 3.17 | 2.73 | 2.75 | 2.73 | 2.71 | 2.62 |
| Wheat | Wheat | BU | 1.83 | 1.50 | 1.49 | 1.46 | 1.46 | 1.40 |
| Alfalfa | Hay | TONS | 22.48 | 19.26 | 19.47 | 18.72 | 18.70 | 18.19 |
| Wheat-Grain Sorghum | Wheat | BU | 2.01 | 1.65 | 1.63 | 1.64 | 1.71 | 1.54 |
| | Milo | CWT | 2.78 | 2.28 | 2.26 | 2.27 | 2.36 | 2.13 |
| Grain Sorghum-Soybeans | Milo | CWT | 2.60 | 2.45 | 2.43 | 2.23 | 2.23 | 2.16 |
| | Soybeans | BU | 3.42 | 3.22 | 3.20 | 2.94 | 2.93 | 2.84 |
| Wheat-Soybeans | Wheat | BU | 1.95 | 1.57 | 1.54 | 1.45 | 1.48 | 1.41 |
| | Soybeans | BU | 3.55 | 2.85 | 2.79 | 2.64 | 2.70 | 2.57 |
| Cotton-Grain Sorghum | Cotton Lint | CWT | 34.24 | 31.92 | 31.25 | 30.26 | 30.18 | 29.46 |
| | Cotton Seed | CWT | 2.50 | 2.33 | 2.28 | 2.21 | 2.20 | 2.15 |
| | Milo | CWT | 2.71 | 2.53 | 2.47 | 2.40 | 2.40 | 2.33 |
| Cotton-Soybeans | Cotton Lint | CWT | 34.16 | 31.32 | 31.19 | 29.60 | 29.38 | 28.99 |
| | Cotton Seed | CWT | 2.49 | 2.28 | 2.27 | 2.16 | 2.14 | 2.11 |
| | Soybeans | BU | 3.56 | 3.26 | 3.25 | 3.08 | 3.06 | 3.02 |
| Wheat-Alfalfa | Wheat | BU | 1.37 | 1.21 | 1.19 | 1.12 | 1.14 | 1.02 |
| | Hay | TONS | 27.40 | 24.18 | 23.87 | 22.44 | 22.75 | 20.48 |

TABLE XXXI (Continued)

| Cropping Systems | Name of Product | Unit | Farm Sizes 160 Acres | 320 Acres | 480 Acres | 640 Acres | 960 Acres | 1280 Acres |
|---|---|---|---|---|---|---|---|---|
| Cotton-Alfalfa | Cotton Lint | CWT | $28.87 | $24.64 | $24.03 | $23.95 | $22.78 | $22.71 |
| | Cotton Seed | CWT | 2.10 | 1.80 | 1.75 | 1.75 | 1.66 | 1.66 |
| | Hay | TONS | 33.08 | 28.24 | 27.53 | 27.44 | 26.10 | 26.02 |
| Cotton-Wheat | Cotton Lint | CWT | 35.46 | 30.50 | 31.27 | 29.76 | 29.72 | 28.32 |
| | Cotton Seed | CWT | 2.59 | 2.22 | 2.28 | 2.17 | 2.17 | 2.06 |
| | Wheat | BU | 2.03 | 1.74 | 1.79 | 1.71 | 1.70 | 1.62 |
| Wheat-Alfalfa-Grain Sorghum | Wheat | BU | 1.77 | 1.40 | 1.38 | 1.29 | 1.31 | 1.19 |
| | Milo | CWT | 2.45 | 1.93 | 1.91 | 1.78 | 1.81 | 1.64 |
| | Hay | TONS | 35.43 | 27.91 | 27.61 | 25.76 | 26.23 | 23.77 |
| Wheat-Cotton-Grain Sorghum | Wheat | BU | 2.16 | 2.03 | 1.88 | 1.76 | 1.73 | 1.69 |
| | Cotton Lint | CWT | 37.75 | 35.50 | 32.80 | 30.67 | 30.61 | 29.55 |
| | Cotton Seed | CWT | 2.75 | 2.59 | 2.39 | 2.24 | 2.23 | 2.15 |
| | Milo | CWT | 2.99 | 2.81 | 2.60 | 2.43 | 2.42 | 2.34 |
| Alfalfa-Wheat-Cotton | Hay | TONS | 37.27 | 28.75 | 28.90 | 28.32 | 28.33 | 26.67 |
| | Wheat | BU | 1.86 | 1.43 | 1.44 | 1.42 | 1.42 | 1.33 |
| | Cotton Lint | CWT | 32.53 | 25.09 | 25.20 | 24.71 | 24.73 | 23.28 |
| | Cotton Seed | CWT | 2.37 | 1.83 | 1.83 | 1.80 | 1.80 | 1.70 |
| Cotton-Soybeans-Alfalfa | Cotton Lint | CWT | 30.99 | 27.48 | 24.90 | 24.75 | 25.18 | 23.39 |
| | Cotton Seed | CWT | 2.26 | 2.00 | 1.82 | 1.80 | 1.84 | 1.71 |
| | Soybeans | BU | 3.23 | 2.86 | 2.59 | 2.58 | 2.62 | 2.44 |
| | Hay | TONS | 35.51 | 31.49 | 28.53 | 28.36 | 28.86 | 26.80 |
| Wheat-Soybeans-Grain Sorghum | Wheat | BU | 2.06 | 1.71 | 1.63 | 1.64 | 1.67 | 1.58 |
| | Soybeans | BU | 3.75 | 3.11 | 2.97 | 2.99 | 3.05 | 2.88 |
| | Milo | CWT | 2.83 | 2.37 | 2.26 | 2.27 | 2.31 | 2.19 |

TABLE XXXI (Continued)

| Cropping Systems | Name of Product | Unit | Farm Sizes 160 Acres | 320 Acres | 480 Acres | 640 Acres | 960 Acres | 1280 Acres |
|---|---|---|---|---|---|---|---|---|
| Wheat-Cotton-Soybeans | Wheat | BU | $ 2.06 | $ 1.94 | $ 1.72 | $ 1.70 | $ 1.69 | $ 1.66 |
| | Cotton Lint | CWT | 35.98 | 33.95 | 29.97 | 29.71 | 29.52 | 28.97 |
| | Cotton Seed | CWT | 2.62 | 2.48 | 2.19 | 2.17 | 2.15 | 2.11 |
| | Soybeans | BU | 3.75 | 3.54 | 3.12 | 3.10 | 3.07 | 3.02 |
| Grain Sorghum-Soybeans-Cobton | Soybeans | BU | 3.62 | 3.29 | 3.22 | 3.03 | 3.09 | 2.96 |
| | Cotton Lint | CWT | 34.73 | 31.61 | 30.91 | 29.07 | 29.68 | 28.40 |
| | Cotton Seed | CWT | 2.53 | 2.31 | 2.25 | 2.12 | 2.16 | 2.07 |
| | Milo | CWT | 2.75 | 2.50 | 2.45 | 2.30 | 2.35 | 2.25 |

TABLE XXXII

BREAK-EVEN PRICE FOR EACH PRODUCT PRODUCED ON SELECTED FARM SIZES BASED ON A MINIMUM MACHINERY REQUIREMENT AND DRYLAND CROPPING SYSTEMS

| | | | Farm Sizes | | | | |
|---|---|---|---|---|---|---|---|
| Cropping Systems | Name of Product | Unit | 160 Acres | 320 Acres | 480 Acres | 800 Acres | 1120 Acres |
| Grain Sorghum | Milo | CWT | $ 3.42 | $ 2.62 | $ 2.53 | $ 2.53 | $ 2.52 |
| Alfalfa | Hay | TONS | 29.87 | 23.24 | 23.46 | 22.66 | 19.86 |
| Wheat | Wheat | BU | 2.81 | 2.19 | 2.18 | 2.20 | 2.04 |
| Cotton | Cotton Lint | CWT | 42.59 | 39.67 | 38.94 | 37.58 | 36.76 |
| | Cotton Seed | CWT | 3.10 | 2.90 | 2.80 | 2.70 | 2.70 |
| Wheat-Grain Sorghum | Wheat | BU | 2.81 | 2.06 | 2.06 | 2.02 | 1.88 |
| | Milo | CWT | 3.89 | 2.84 | 2.85 | 2.80 | 2.59 |
| Cotton-Grain Sorghum | Cotton Lint | CWT | 47.96 | 37.63 | 36.04 | 36.24 | 34.79 |
| | Cotton Seed | CWT | 3.50 | 2.70 | 2.60 | 2.60 | 2.50 |
| | Milo | CWT | 3.80 | 2.98 | 2.85 | 2.87 | 2.75 |
| Wheat-Alfalfa | Hay | TONS | 42.30 | 31.47 | 32.59 | 31.18 | 26.20 |
| | Wheat | BU | 2.12 | 1.57 | 1.63 | 1.61 | 1.31 |
| Cotton-Alfalfa | Cotton Lint | CWT | 39.56 | 30.60 | 29.65 | 28.74 | 26.75 |
| | Cotton Seed | CWT | 2.90 | 2.20 | 2.20 | 2.10 | 2.00 |
| | Hay | TONS | 45.33 | 34.95 | 33.97 | 32.93 | 30.65 |
| Cotton-Wheat | Cotton Lint | CWT | 51.67 | 40.73 | 38.51 | 38.00 | 35.47 |
| | Cotton Seed | CWT | 3.80 | 3.00 | 2.80 | 2.80 | 2.60 |
| | Wheat | BU | 3.50 | 2.75 | 2.61 | 2.57 | 2.39 |
| Wheat-Alfalfa-Grain Sorghum | Milo | CWT | 3.33 | 2.54 | 2.50 | 2.45 | 1.96 |
| | Wheat | BU | 2.41 | 1.84 | 1.81 | 1.77 | 1.42 |
| | Hay | TONS | 48.20 | 36.81 | 36.14 | 35.39 | 28.39 |

TABLE XXXII (Continued)

| Cropping Systems | Name of Product | Unit | Farm Sizes 160 Acres | 320 Acres | 480 Acres | 800 Acres | 1120 Acres |
|---|---|---|---|---|---|---|---|
| Wheat-Cotton-Grain Sorghum | Cotton Lint | CWT | $53.57 | $39.98 | $38.24 | $38.68 | $35.56 |
| | Cotton Seed | CWT | 3.90 | 2.90 | 2.80 | 2.80 | 2.60 |
| | Milo | CWT | 4.24 | 3.17 | 3.03 | 3.06 | 2.82 |
| | Wheat | BU | 3.07 | 2.29 | 2.19 | 2.22 | 2.04 |
| Alfalfa-Wheat-Cotton | Cotton Lint | CWT | 51.33 | 40.53 | 36.24 | 32.32 | 30.88 |
| | Cotton Seed | CWT | 3.70 | 3.00 | 2.60 | 2.40 | 2.30 |
| | Hay | TONS | 58.81 | 46.44 | 41.53 | 37.04 | 35.38 |
| | Wheat | BU | 2.94 | 2.32 | 2.07 | 1.85 | 1.77 |

VITA

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