AGRICULTURAL ADJUSTMENT PROBLEMS IN THE WELLTON-MOHAWK IRRIGATION AND DRAINAGE DISTRICT

by

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STATEMENT BY AUTHOR

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Preface

Farmers and agencies interested in farming in the Wellton-Mohawk Irrigation and Drainage District have indicated that some of the smaller farms (below 320 acres) in the District are in financial difficulty. The combination of reduced commodity prices and stable or increasing costs has reduced income on many of these smaller farms to the point where it is inadequate to meet family living expenses. Moreover, with small acreages of crops, government farm programs have been relatively ineffective in increasing farm incomes.

In the face of this situation, a possibility exists that a study of farms in the District might indicate adjustments which could be made to increase farm income to some extent. This study sets out to consider just such possible adjustments by analyzing the income potential of alternative cropping patterns for several farm sizes. A comparison of alternative cropping patterns, with their relevant financial data, should indicate the most profitable cropping patterns for the area. With such information farmers may be able to adjust their farming operations in the area to alleviate, to some extent, their financial problems.

CHAPTER I

INTRODUCTION

Description of the Wellton-Mohawk Project

Location

This study is based on the Wellton-Mohawk Irrigation and Drainage District, located 35 miles east of Yuma along a 40-mile length of the Gila River (Figure 1). To the south the area is bounded by the mesa contour and to the north by the edge of the valley lands. The Gila River bed runs through the area which varies in width from two to six miles. South of the river is an escarpment which clearly defines the limits of the valley and the mesa.

Welton-Mohawk Irrigation and Drainage District

The Wellton-Mohawk Irrigation and Drainage District (hereafter referred to as the District) was established in 1947 under U. S. Public Law 272 by Congress operating through the Bureau of Reclamation. It is a Division of the Gila Project built under authority of the Newlands Reclamation Act of 1902 which provides interest-free federal loans for the construction of irrigation and drainage projects by mutual irrigation

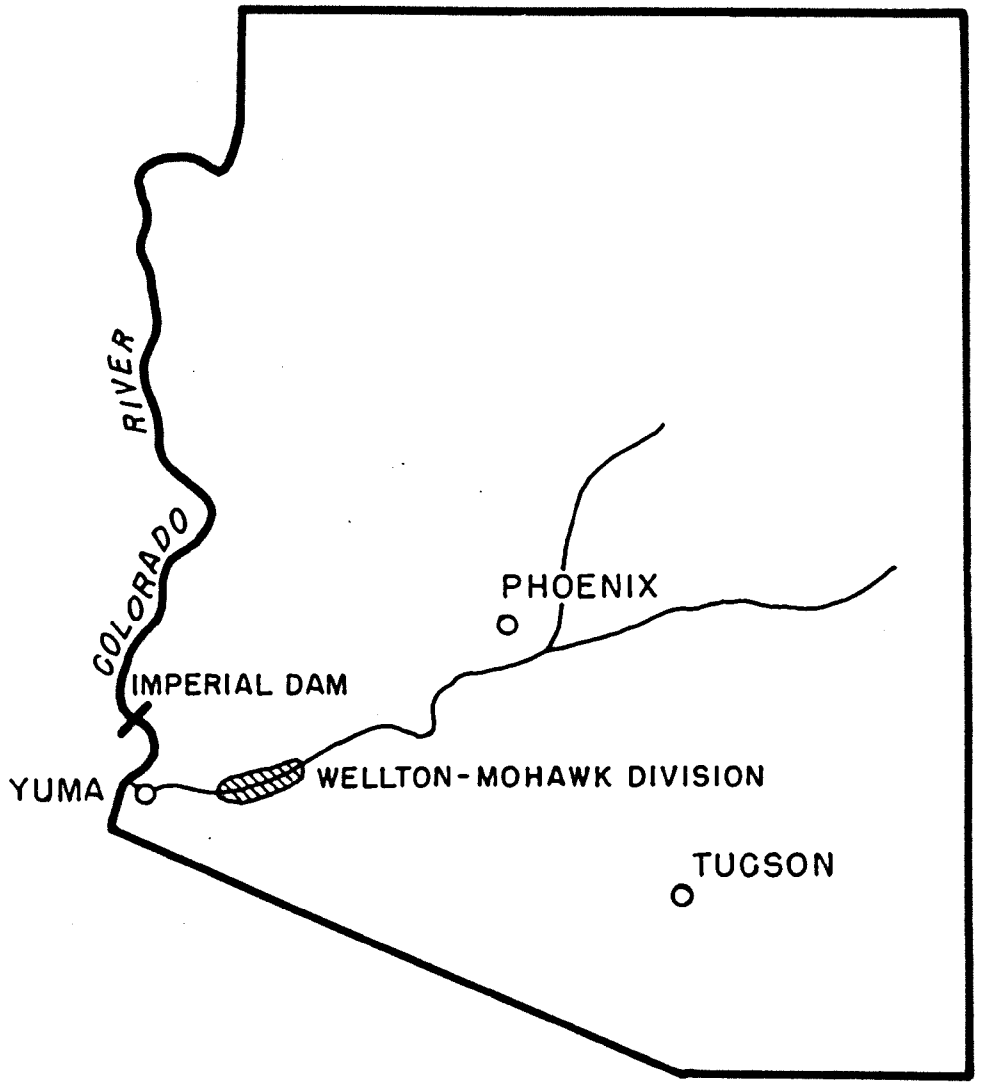

Figure 1. State of Arizona indicating the location of the Wellton-Mohawk Division.

Water for Irrigation

Water for the irrigation service is provided by a 22-mile canal which carries water from the Imperial Dam on the Colorado River. Pumping is provided at three main stations for the higher land. The principal water delivery system runs in concrete-lined ditches throughout the project. The District is responsible for the control, distribution, and handling of the water in the project. In 1959, 331,686 acre-feet were delivered to the farms in the project for an average of six acre-feet per acre farmed.

Drainage

Over-all conditions for drainage are good in both the valley and mesa soils; however, with introduction of irrigation in 1951 the groundwater table rose and the need for a drainage canal became evident. This canal is under construction at the present time, and plans were to have it in operation in March, 1961. The building and planning of the canal, like the irrigation system, was supervised by the Bureau of Reclamation.

Soils

The soils in the area are conveniently divided into the valley soils and the mesa soils. The valley soils have been formed from alluvial deposits of sands, silts, and clays and contain noticeable amounts of organic matter. These soils have a good water-holding

capacity. The mesa soils have a similar origin to the valley soils, but the mesa soils are lighter in texture and have a low water-holding capacity. Organic material is also not so evident in these mesa soils.

In general, the valley soils are superior to those on the mesa in fertility. The mesa soils will also require heavier treatments of water for crop production as they drain more rapidly.

Description of Farming in the Wellton-Mohawk Project

Historical Background

Farming in the area now included in the District dates back well into history. Homestead claims were being made in 1875, and by 1930 11,000 acres were irrigated from wells. However, by 1934 excessive salt appeared as a result of falling groundwater tables in the area, resulting in the abandonment of many farms and the concentration on salt-resistant crops. The 1940 United States Census of Agriculture shows that alfalfa and bermudagrass seed, crops relatively salt resistant, accounted for 70 per cent of farm income. During this difficult period interest was developing in an irrigation district to obtain water from the Colorado River for irrigation. By 1940, 68 farm operators had organized the Mohawk Municipal Water Conservation District. In 1951 this District was dissolved and its functions were taken over by the Wellton-Mohawk Irrigation and Drainage District.

Description of Farms

In 1959 there were 168 full-time farms in the District, ranging from 60 to 6,000 acres. There were also 18 part-time farmers in the project. Between both the full-time and the part-time farms, there were 51,835 acres of harvested cropland or pasture. The average farm size was 278.6 acres of harvested cropland or pasture. The Bureau of Reclamation has estimated the gross crop value for the District was $9,112,397 in 1959, which amounted to an average of $172 per acre.

Based on water contracts information provided by the District, the size distribution of the farms in the area is shown in Table 1.

Table 1. Farm Size Distribution Based on Irrigable Acres per Water Contract.

Acres	No. of Contracts	Per Cent of Total Farms
0- 79	53	23
80-159	87	39
160-239	29	13
240-319	20	9
320-639	22	10
Over 640	13	6

Source: Wellton-Mohawk Irrigation and Drainage District water contracts.

Crops

A wide variety of crops can be grown in the area due to the climatic environment. However, many of these crops are specialty crops.

In general, throughout the District there is a core of crops which are typical of all sizes of farms. These crops are alfalfa, cotton, barley, wheat, sorghums, and bermudagrass seed. These six crops take up the majority of the acreage with the specialty crops being of secondary importance (Table 2).

External Factors Influencing Farmers Plans

In addition to the climatic and physical factors affecting the combinations of crops and livestock which may be produced in the Wellton-Mohawk area, there are other external factors which bear on the enterprise combinations selected. Such items as capital and credit available, markets, marketing systems, transportation, irrigation district assessments, and governmental programs all are important factors to be considered in planning farming operations.

Capital and Credit

In any new farming area, capital usually is one of the major restrictions on farmers plans. If land is bought and developed (leveled, etc.) and the necessary machinery for efficient operation purchased,

Table 2. Acreage, Yield, and Number of Producers of Major and Other Crops in the Wellton-Mohawk Irrigation and Drainage District, 1959.

Crop	Acreage	Yield per Acre	Number of Producers
Major			
Alfalfa hay	18,136	5.5 tons	126
Alfalfa seed	1,613	200 lbs.	
Cotton	8,156	1.7 bales	129
Barley grain	3,906	1.0 tons)	
Wheat grain	7,089	1.4 tons)	98[1]
Sorghum grain	6,975	2.4 tons)	
Bermudagrass seed	3,744	740 lbs.	36
	83% total acreage		
Other			
Oats	13	1.1 tons	1
Hay (other than alfalfa)	1,259	3.2 tons	N.A.[2]
Irrigated pasture	6,980	5.6 tons	26
Corn fodder	126	11.6 tons	N.A.[2]
Corn silage	295	26.0 tons	N.A.[2]
Soya beans	55	1.3 tons	2
Vegetables	1,522	--	9
Vegetable seed	432	--	5
Safflower	286	1.4 tons	6
	17% total acreage		

Source: Bureau of Reclamation Report, 1959.

[1] Not available individually.

[2] Not available.

large outlays of capital are required prior to any returns. Few farmers have sufficient equity capital to meet these demands in their entirety. Thus, in the majority of cases, farmers wishing to begin operation must apply for loans for real estate purchase and in some cases production credit also. For this reason, much depends upon the lending agencies. However, from their point of view, a new area is suspect from the risk angle and, consequently, they proceed with great caution. Herein lies a problem, as the farmer needs funds to establish his reputation for loans.

This is true particularly of commercial lenders, since they must carry all the risk involved in loans they make. Few commercial lenders extend credit to the smaller farmers in the area, which leaves these operators largely dependent upon the Farmers Home Administration for credit. When the District was organized, the Federal Land Bank made real estate loans in the district, but it has largely withdrawn due to the high water table in the valley. Completion of the drainage canal should help this situation and improve the chances of farmers obtaining real estate financing. Meanwhile, there apparently has been a retarding factor in the availability of loans for real estate. In general, there has been no credit problem in the availability of crop production and installment purchase contracts for farm equipment, etc. There is some evidence that cotton acreage provides a useful base for obtaining production credit, and where this crop is not grown, production credit may be

restricted. These specific problems will be brought into the analytical discussion in a later chapter.

Marketing and Transportation

Marketing and transportation are not problems for the area in the sense of being a limiting factor, but makes its effects felt through transport costs. In this respect, however, the area is similar to other agricultural areas in Arizona. Markets for the agricultural products grown in the District extend over the whole county, although Central Arizona and Southern California receive the bulk of the produce. There are commercial railroad sidings at Roll and Tacna, both within the District. Freight and produce hauling services by truck are also available from local and urban areas.

Bureau Repayments

Under U. S. Public Law 272 of July 1947, the District was authorized by Congress, and a repayment contract with the United States, covering cost of construction of the irrigation works, was made in 1952. Repayment is due to commence in 1962, which will have a marked effect upon net revenues of farms in the area. At the present time the system of establishing yearly payments, under the contract, has not been determined. However, if carried out as originally planned, it will amount to, in effect, an approximate doubling of the water cost. In the present lack

of accurate information, nothing further can be said. It is obvious, however, that an annual levy in the region of $10 per acre on all irrigated land will have a substantial effect on revenues, especially on small farms with encumbered ownership.

No Historical Acreage Allotment Base

In a new area such as the District the acreage allotment plan for production control founded on an historical base is a strong disadvantage. With environmental conditions apparently suited to cotton, the absence of an historical cotton base has been a real economic handicap. In some cases where a small base had been established, allotments have been provided which are too small for efficient machinery use. This has led in the District to cases where cotton is grown at high cost once every three years to maintain an allotment. If allotments were transferable, this situation would be alleviated to some degree. At the present time this restriction, which also applies to wheat and now to grain sorghum as well, puts a premium upon an allotment as a means of maintaining revenue on a small farm where output of less intensive crops is not economic.

Problem

In the light of the above situations, farmers are faced with the problem of how to combine the available resources into the most

profitable cropping and livestock patterns. The problem is acute in a new area where established patterns generally are not available as guides. The cost-price squeeze in agriculture puts emphasis upon efficient resource use to maintain or increase farm revenues. Repayment contract conditions will force a move to more efficient farming methods.

The problem of determining profitable enterprise combinations is complicated by physical restrictions and by institutional restraints imposed by private agencies and governmental programs with which the producer must deal. The lack of adequate and reliable empirical data raises the problem of providing such data for use in enterprise analysis.

The problem is not one requiring one optimum plan, static in conception, but is one requiring constant reorganization and planning. However, guide lines for resource combinations are needed not only for farmers faced with the problem, but also for other agencies interested in agriculture. Optimum patterns will vary with farm size and the specific restrictions in the District. Each farm will have its own optimum solution to the problem, and the major problem will be the providing of guides to farmers for individual use in arriving at optimum enterprise combinations.

The problem of combining resources into various enterprises to maximize profits revolves around the three main relationships in production economics. These are the factor-product, factor-factor, and

product-product relationships. These relationships provide analytical tools with which the problem can be approached in an attempt to find solutions. The problem, then, is one which needs empirical data as a basis for guide lines to indicate profitable cropping and livestock patterns.

Objectives

The main objective of this study is to indicate how various cropping patterns affect income for the area of the Wellton-Mohawk Irrigation and Drainage District. No attempt will be made to analyze or budget the possibilities of livestock enterprises for the area. It is realized that these may provide alternative possibilities, but the collection and analysis of basic data would be beyond the resources and time limits of this study.

Since optimum combinations vary with size of farm and levels of inputs, the objectives will be sought for various sizes of farms which are characteristic of the area.

Specifically, the objectives will be:

1. To develop a theoretical framework or model within which the problem can be studied.
2. To present alternative farm budgets for typical farms in the area and show the associated income produced.
3. To produce empirical data for the area.

Procedure

As a background for this study, a number of similar studies were reviewed and pertinent economic theory was examined. A summary of this review of studies is given here to indicate the procedures customarily followed. An economic model and the procedures followed in the analysis are then outlined, together with the limitations which should be kept in mind.

Similar Studies

Many studies with objectives similar to this one have been made. Such studies are made with the intention of providing a basis for judgment by management in planning for maximum income. Techniques vary between studies but, basically, budgeting is the fundamental tool. More recently, linear programming, which is a refined budgetary technique, has been used extensively. This procedure allows simultaneous consideration of a large number of crops, with the result that the optimum situation within the framework of the study is more nearly approached.

In general, the procedures followed in similar studies have been to set up "typical" farms. These farms are representative of the area and use the costs and revenues normally associated with the area under study. Planning restraints are often included in organizing the "typical" farms. Usually such restraints include labor at peak periods, a

capital limitation, and rotational restrictions needed to maintain productive efficiency. These restraints will, both individually and in combination, effect the choice of optimum plans. Within the "typical" farms, various cropping alternatives have been planned, and the one with the greatest returns to labor and management is chosen as the optimum for the typical farm. Uncertainty is not usually discussed as a special topic but probably is considered in the determination of both input-output prices and yield relationships used for the budgetary process.

Since a large number of similar studies have been made for different areas in the United States, no mention will be made of individual studies, but examples have been cited in the bibliography.

Economic Model

The theoretical framework for analysis of optimum use of resources lies in the three fundamental relationships of agricultural production economics: (1) factor-product relationships, (2) factor-factor relationships, and (3) product-product relationships. Factor-product relationships involve the relationships between resources used and the product which is produced. Factor-factor relationships are concerned with the relative amounts of two or more factors used to produce a product. Product-product relationships are involved in determining the relative amounts of various products to produce. Since the major objective of this study is to analyze enterprise combinations and

the resultant effect on income, the model developed will be limited to that needed to analyze product-product relationships.

Product-product relationships involve allocating a given amount of resources among two or more enterprises. The amount of resources is held constant and the product combinations change. For maximum income, resources are allocated to the enterprise where their marginal product is greatest in terms of net revenue, until all are equal.

For example, with a given amount of resources to produce alfalfa and cotton, various combinations of these crops can be produced by transfering these given inputs between the crops. If neither crop is being produced in the irrational area (in this case the area of negative marginal returns) the crops are competitive. Output of one can be increased only by sacrificing output of the other. Assuming that both crops are being produced in the rational area, they will substitute, or replace, each other at increasing rates. As production combinations approach all alfalfa and no cotton, more and more cotton must be sacrificed to increase alfalfa output. This situation is illustrated in Figure 2. Alfalfa production is shown on the vertical axis and cotton production on the horizontal axis with the input level held constant at $1,200.

Iso-outlay curves, or production possibility curves, can be drawn for all levels of inputs. When this is done, a two-product cost surface results. The surface is made up of infinite numbers of iso-outlay curves and infinite numbers of combinations of alfalfa and cotton

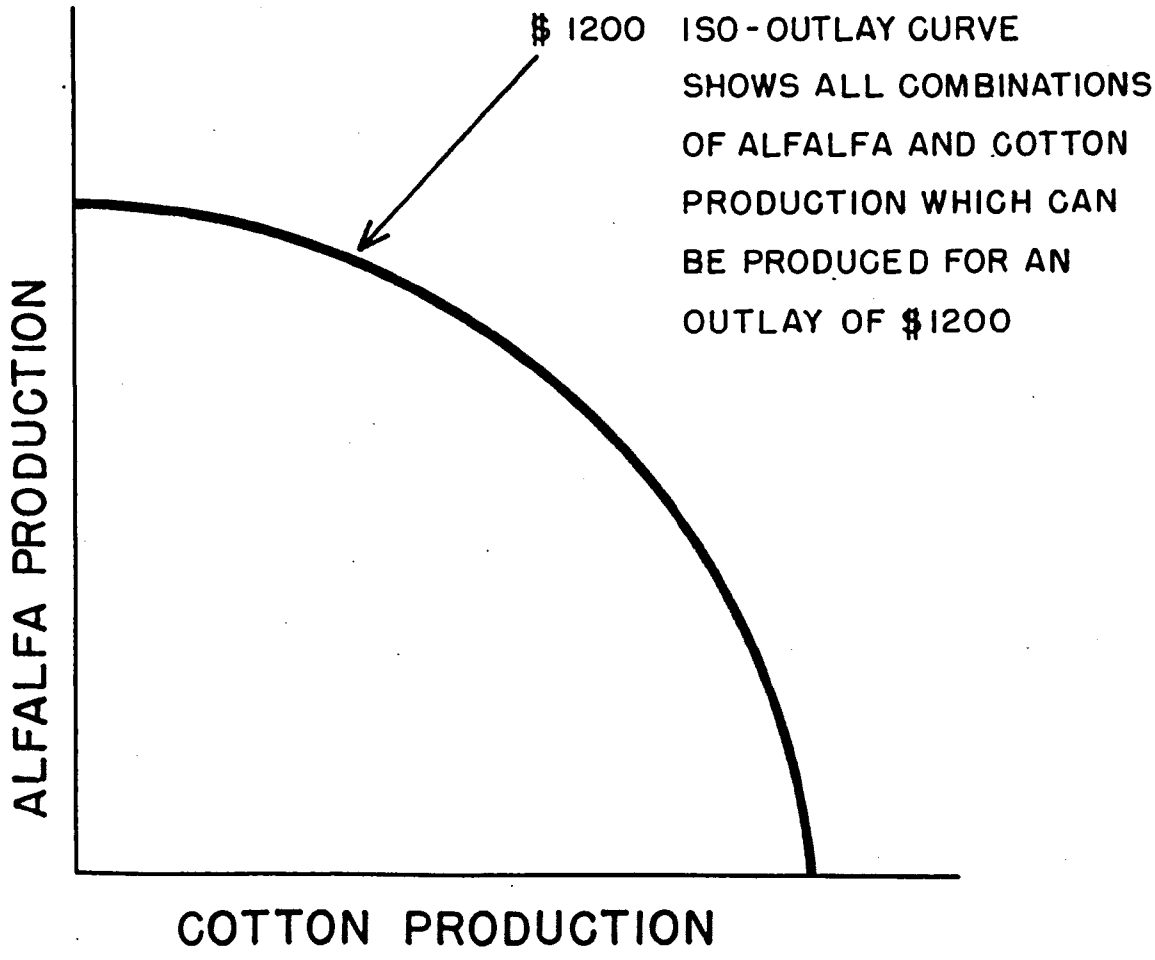

Figure 2. Production possibilities for alfalfa and cotton with a given amount of resources. (Hypothetical)

which can be produced at any level of input use. The iso-outlay curves then become contours around the face of the cost surface joining points of equal cost. The shape of the iso-outlay curves varies with the levels of outlay. As outlay is increased, the relative importance of different crops may change, due to such restrictions as capital limitations and risk avoidance. As size of farm increases, there will often be a move towards highly mechanized crops. For such reasons the optimum combination of crops may not remain the same as input level increases.

To illustrate possible changes in proportions of products as the level of inputs increases, four levels of inputs (iso-outlay curves) have been used. These correspond to four sizes of farms. A geometric diagram of a two-product cost surface is fhown in Figure 3. Since costs are increasing in the rational area, the surface is also curved, both as output of cotton and alfalfa are increased individually or in combination.

On the cost surface, four hypothetical iso-outlay curves have been drawn to represent four levels of resource inputs. At each level of outlay--$900, $1,000, $1,100, and $1,200--maximum revenue is only produced at one combination of alfalfa and cotton. These combinations are indicated by points of tangency of lines of equal revenue, iso revenue lines, with the iso-outlay curves for each of the four outlay levels. At these points revenue is maximized for that level of outlay. The slope of the iso-revenue lines depends upon the relative prices of the products.

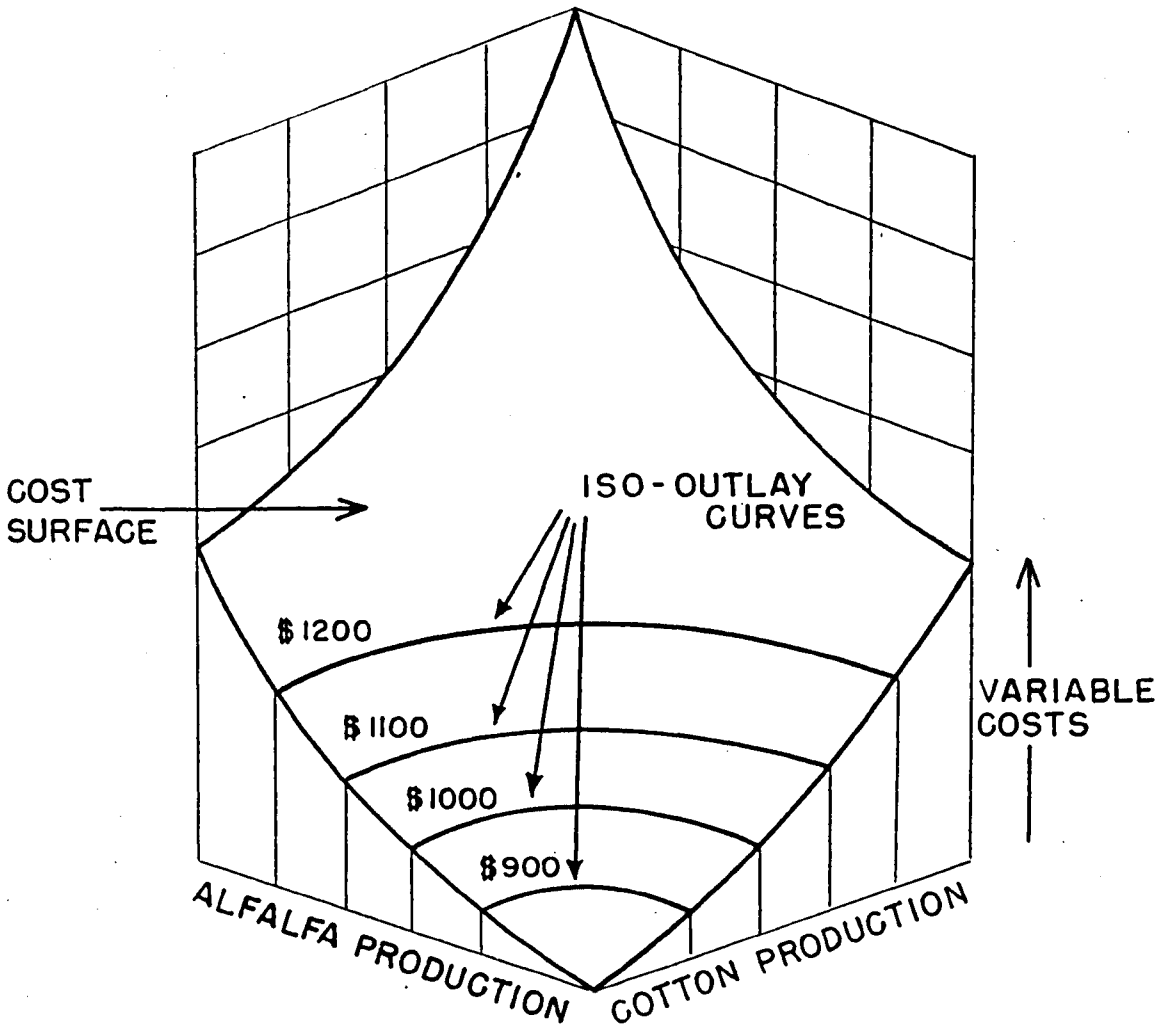

Figure 3. Production possibility cost surface with four levels of resource outlay specified. (Hypothetical)

Figure 4 portrays the optimum production combination of cotton and alfalfa as indicated by tangency of the iso-revenue and iso-outlay curves. A two-dimensional diagram is employed to simplify the presentation.

The tangency points in Figure 4 indicate the optimum combinations of alfalfa and cotton, but not the amount it will be profitable to produce. The limit of profitable production is determined by increasing production, i.e., climbing up the cost surface along the expansion path A-B in Figure 4, until additional resource outlays no longer produce an equivalent addition to revenue. When marginal costs equal marginal revenues, the optimum levels of production of alfalfa and cotton have been reached. At this point both combinations of alfalfa and cotton and output have been indicated at the optimum level.

In Figure 5 the concepts portrayed in the two preceding diagrams have been combined to illustrate the relationships involved. To review, the production opportunity curves (iso-cost curves) indicate the various combinations of cotton and alfalfa which could be produced with the specified amounts of resources. The iso-revenue lines indicate the combinations of the two crops which would produce a constant revenue with the specified resource inputs. Points of tangency of these two curves (the production possibility curve and iso-revenue line) indicate optimum resource allocation in production of the two crops, and the expansion path connects these points for the four given levels of inputs.

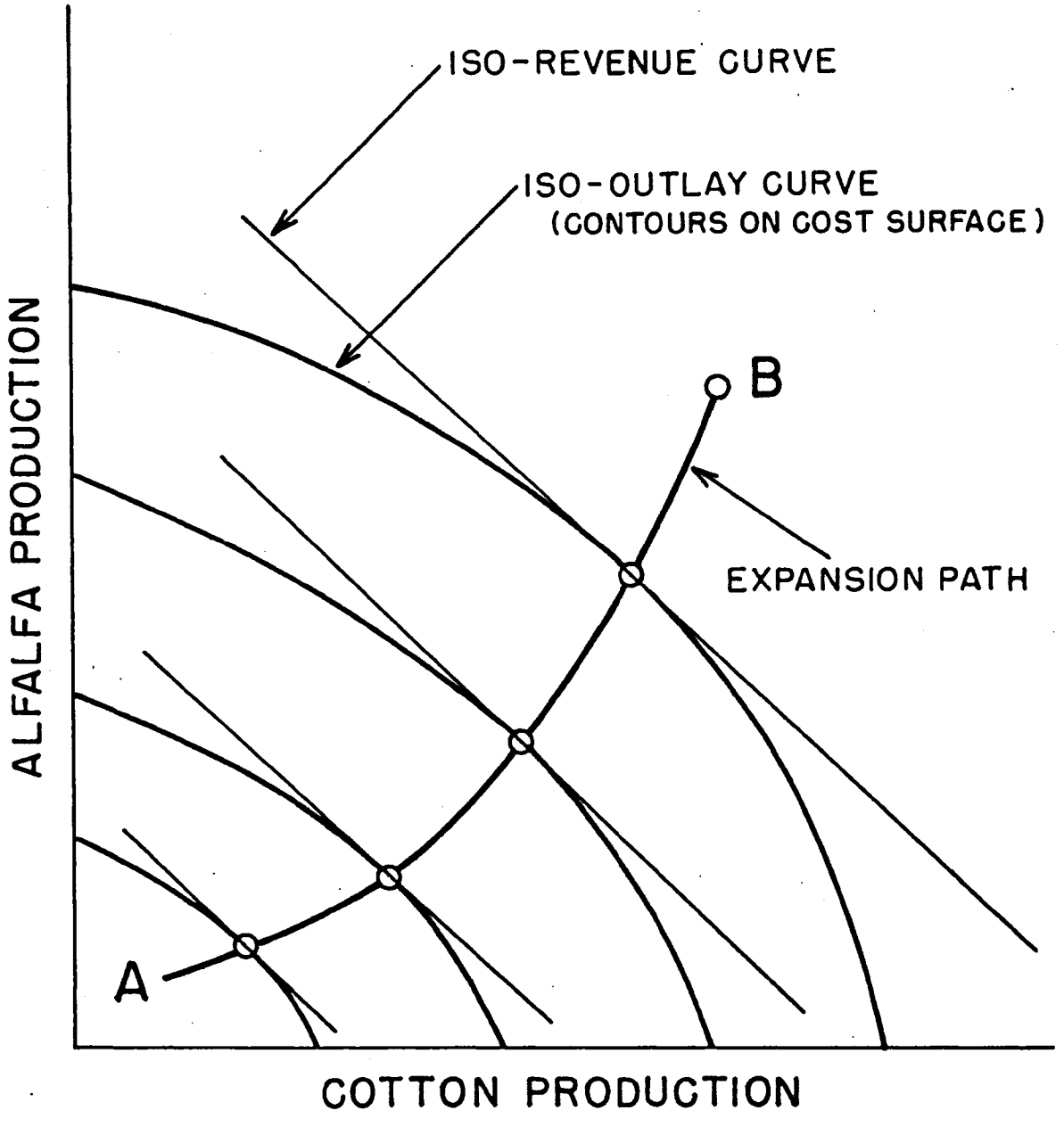

Figure 4. Optimum production combinations of alfalfa and cotton at four levels of resource outlay. (Hypothetical)

CURVE A-B = EXPANSION PATH MOVING UP COST SURFACE AS RESOURCE OUTLAY AND PRODUCTION INCREASE.

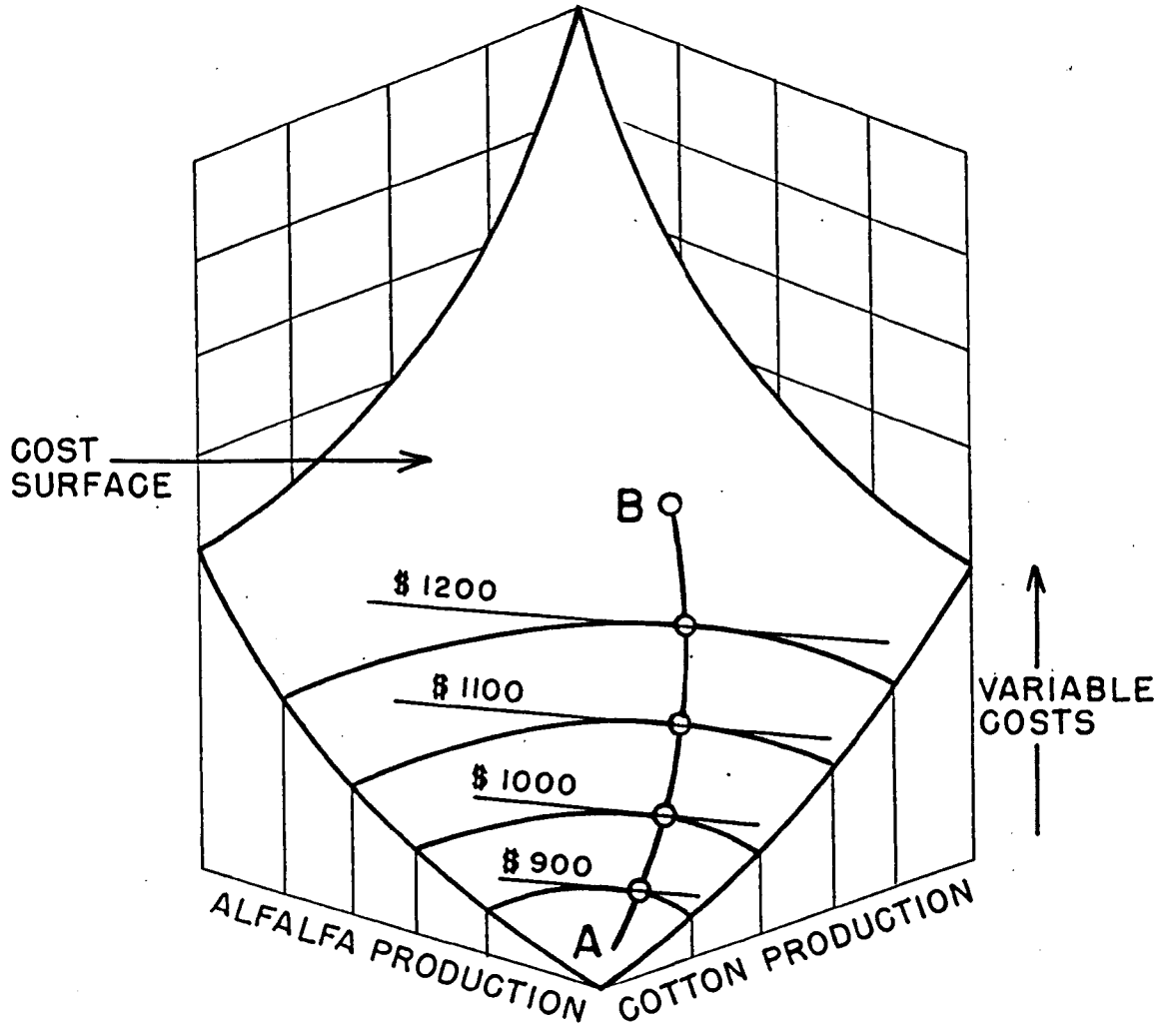

Figure 5. Production possibility cost surface with expansion path A-B joining optimum production combinations of alfalfa and cotton at four levels of resource outlay. (Hypothetical)

Production of the two crops can be expanded, in the proportions indicated by path of the line, until marginal costs and marginal revenue are equal. In other words, it would pay to expand production (increase resources used) by moving up the cost surface along the expansion path until the additional cost is just covered by the added revenue.

Although the analytical framework above has been built around only two products, this framework provides the conceptual basis for dealing with any number of products. When large numbers of products are involved, mathematical procedures must be used in place of geometric models. Moreover, restrictions, both economic and institutional, can be included within this framework, merely becoming refinements to the concepts involved.

Budgetary Analysis Used in This Study

Budgets were used as a tool in the analysis of enterprise combinations in this study. Customary budgetary procedures were employed. Typical farm situations in terms of acreage and resources employed were developed to facilitate studying alternative enterprise combinations with resource inputs held relatively constant. Four different sizes of farms, in terms of acreage, were studied both to provide information on enterprise combinations at various levels of resource utilization, and to give some indication of the effect of moving up the expansion path on farm income from crops.

In the above discussion of the model, reference was made to the three fundamental relationships in resource utilization: factor-product relationships, factor-factor relationships, and product-product relationships. Obviously, a budgetary analysis of product-product relationships is based upon the other two basic relationships. In developing the factor-product (input-output) data used in the budgets, a level of management comparable with the better farmers in the area was assumed. This management level was chosen on the basis of yield performance. A yield distribution was arranged from field data and a management level chosen which approximates that within the top third of the sample farms. An equivalent level of management was assumed in the combinations of factors employed in the enterprises considered in the budgets.

Limitations of This Study

While the budget type of procedure has been widely used and is a valuable method for studying the effect of alternative enterprise combinations on returns to given resources, certain limitations or weaknesses of the procedure should be recognized. Because the "typical" farm does not exist in actuality, plans for showing the optimum returns cannot be applied rigidly to existing farm situations. Input-output relationships will vary between farmers as will the exact combination of resources available.

Uncertainty

One of the major limitations of this study is that prices and yields used in the farm budgets are subject to uncertainty. Uncertainty arises due to a less than perfect knowledge of future events, whose occurrence cannot be predicted statistically. Uncertainty is an important consideration in farm planning, and this is especially true of bermudagrass seed and other specialty crops where price and yield variability are high. Since crop failures, price fluctuations, or other uncertainties could seriously decrease farm profits, some farmers may prefer a relatively stable income stream, rather than face the uncertainty of bermudagrass seed production. In general, alfalfa and cotton rotations appear to be associated with a lesser degree of uncertainty from price and yield standpoints. Nevertheless, the uncertainty remains although to a lesser degree. Because price variation is very great with bermudagrass seed, an attempt has been made to indicate the uncertainty associated with this crop by including three levels of price for the seed. Financial comparisons for the three price levels give some measure of the price uncertainty of this enterprise because the range of prices assumed has occurred within the last few years. Ideally, this method could be used for all enterprises in consideration of price uncertainty, but this would be beyond the resources of this study.

For such reasons the farm organizations presented are intended only as guides to the types of farming which are most profitable in the

Wellton-Mohawk Irrigation and Drainage District. Each individual farmer's specific capabilities and resources will determine his best organization. However, it is believed that the pattern of analysis may well be employed by individual farmers, especially if the farmer is concerned with maximizing the returns he obtains for the resources he has at his command.

CHAPTER II

SOURCES OF DATA

This chapter presents and explains the source of data which was used in developing the budgets presented in the following chapter.

Survey of Farms

Data for this study came primarily from personal interviews, with a sample of farmers during the summer of 1960 in the Wellton-Mohawk Irrigation and Drainage District, during which a questionnaire was completed. A copy of the questionnaire used in the survey is enclosed in an envelope at the back of this thesis. This material was collected during the summer of 1960. Supplementary data have been obtained from other sources, both within the Agricultural Economics Department and elsewhere.

The sample of farmers for the survey was selected at random from a list of all water users registered with the District. The list included all water contracts, and some farmers (may have) held a number of contracts. For this reason stratified sampling was impossible. However, since a better list was not available, the sample was taken

randomly and later classified into size groups which are believed to be representative of the farms in the area.

In making the survey, information was obtained on the current year as far as possible. Data were collected on all phases of the farming business including crops, acreages, yields, equipment inventory, expenses, revenues, labor, and a section on the use of capital. The figures came from a mixture of memory and records. Where harvest of the current crop was not completed, estimated yields based upon previous performance were obtained. It is recognized some memory bias may have been involved in the estimates, but the bias was minimized as far as possible by obtaining actual data wherever it was available.

In all, questionnaires were obtained from 58 farmers. Some of these were only partially complete, however, so the bulk of the data came from 45 questionnaires. The remaining schedules furnished partial information, and usually referred to some specialized enterprise.

Characteristics of the Sample Farms

Table 3 summarizes the main characteristics of the 58 sample farms included in the survey. Data in the table are for the 1960 calendar year. Except in the cases of the large farms, over 800 acres,

Table 3. Characteristics of 58 Sample Farms in the Wellton-Mohawk Irrigation and Drainage District, 1960.

Item	Average Yield	Mean	Low	High
		(acres)	(acres)	(acres)
Land				
In farm		340	71	1,500
Owned		249	71	1,500
Rented		91	40	500
Cropped		306	64	1,340
Crops[1]				
Alfalfa hay	6.7 tons	125	23	838
Cotton (short)	1.95 bales	59	9	271
Barley	1.42 tons	27	10	328
Wheat	1.43 tons	21	13	140
Bermudagrass seed	730 lbs.	64	10	750
Other	--	20	15	250
		(dols.)	(dols.)	(dols.)
Labor				
Hired		7,464	206	40,475
Operator[2]		3,484	1,300	3,640
Total		10,948	1,506	45,115
Machinery Investment				
(Market value)		9,092	4,071	16,448
Gross Income				
(1960 yields and prices)		46,375	8,683	161,200

[1] Acreages of crops will not coincide with acres cropped due to the double cropped acres.

[2] Operator labor charged at $1.00 per hour throughout.

ownership of land by actual operators is typical, but in the large farms acreages of leased property increase rapidly.

The crop production acreages provide a useful guide to the relative importance of each of the crops. The acreages thus provided were considered in setting up farm rotations for the farm budgets. High and low acreages for each crop in Table 3 show the greatest and smallest acreages of each crop grown, but do not show that in some cases none of the crop was grown.

Yields associated with each crop are given as a mean, but remembering that some of these were based on previous performance, some memory bias may be involved. This may account for the high mean yield of alfalfa hay which is almost 1.4 tons per acre greater than that reported by the Bureau of Reclamation Annual Report for the same year.

Average labor input per farm was $10,948. Operator labor was charged at a constant rate of $1.00 per hour. Operator labor charged at this rate for all farm sizes takes up about 35 per cent of the total labor cost. The reason for using the $1.00 figure for operator labor was that no field data were available upon which to base a figure.

Machinery investment figures were provided from machinery inventories taken for each farm in the survey. Since market value figures were not available from each farm, this information was provided

by machinery firms and applied to the inventories to arrive at the investment figure.

Gross income shown in the table was calculated on the basis of prices and yields obtained in 1960. The 1960 prices and yields were similar to those estimated for the immediate future which permitted using gross income realized by farmers in the area as a check on the budgetary analysis.

Cropping Patterns

Some indication of cropping patterns on the farms in the District are given in Table 3, summarizing the characteristics of survey farms. The crops used in setting up farm budgets were alfalfa hay, cotton, barley, wheat, safflower, and bermudagrass seed. Safflower was included since it provides an alternative to barley and at prevailing yields and prices was worth including in the farm budgets. Other crops were considered such as grain sorghums and various seed crops. Grain sorghums, however, failed to show sufficiently high returns at the prevailing yields to be included. Seed crops required more specialized knowledge than was generally available among farm operators.

Other crops, although not mentioned, are available as alternatives, but insufficient data were available upon them from the District to warrant their inclusion in the budgets.

In setting up cropping patterns in the budgets, consideration was given to the proportions of each crop in the rotation of the survey farms. Thus, the survey farms provided a guide to restrictions on acreages of various crops which must be considered to maintain productive efficiency by following sound rotational practices.

Yields

Yields used in this study, shown in Appendix Table 1, are those associated with the better farmers in the District because above average management is assumed in this study. The average yields obtained from the survey are reported for one year, while those used in the budgets are expected to prevail with above-average management. Over a period of years, however, the yields used in the budgets are suitable aiming points for farm operators obtaining lower yields.

Commodity Prices

Prices used in this study, shown in Appendix Table 1, were estimated at the level expected to prevail in the next one to three years, the period for which the budgets were developed. They are based upon prices received by the survey farms in 1960 adjusted by the five-year trend, 1955-1960.

It should be recognized that prices used in the budgets will vary from those which actually prevail during the next one to three years.

However, in making plans for the future, average figures from the past, adjusted for trends and other forseeable developments, provide the best estimates available. Such price figures are representative of price relationships expected to prevail which is more important than the general level of prices in analyzing enterprise combinations.

Optimum farm plans will not change if all prices move up or down together, because the same relationship exists. Optimum plans will vary if product prices move independently, because the relative profitability of different enterprises may change.

Expenses

Variable Expenses

Variable expenses associated with production of the crops used in the budgets were provided from several sources. A summary of these costs on a per-acre basis is given in Appendix Tables 2, 3, and 4. These expenses were provided, as far as possible, from the survey data and detailed records kept by some farmers in the District. Other sources were also used from the Department of Agricultural Economics, including Arizona Agriculture, 1959 and 1960, and from unpublished material along with published data from California. Owner rates were used throughout except where it is typical to make use of custom operations.

A general expense item has been built up for each farm size from survey data. A summary of these costs is included in Appendix

Table 7. This general expense item includes electricity, vehicle licenses, telephone, bookkeeping, and supplies. The totals of these expenses are combined and included in the budgets under the "Variable Cash Expense" heading.

Fixed Costs

Estimated fixed costs have been built up from survey data for each of the four typical farms 80, 160, 320, and 600 acres. These costs include insurance on buildings and equipment, real estate tax, return on investment, and depreciation on buildings and equipment. A summary of these fixed costs is included in Appendix Table 6.

Depreciation has been calculated for both buildings and machinery on a straight-line basis. For all buildings a 40-year life was assumed, while for machinery a 10-year life was assumed. Buildings were taken to be an average of five years old and machinery six years old.

A charge of 5 per cent has been made on investment in land, buildings, and machinery. This is charged to the business as an opportunity charge using the 5 per cent level as an available market rate.

An extimate of fixed costs per acre is also shown in Appendix Table 6 by dividing the total fixed costs by the acreage on each farm.

CHAPTER III

ANALYSIS

Bases Used for Establishing Farm Budgets

This chapter presents and explains the farm budgets which portray the acreage of various crops and associated summary financial data. Before presenting the farm budgets, however, the assumptions used in setting up the budgets are given and explained. These assumptions are of great importance in the correct interpretation of the farm budgets, since they directly affect land use and income produced.

Farm Size

The four sizes of farms used for budgetary analysis in this study--80, 160, 320, and 600--are believed to be representative of farms in the Wellton-Mohawk Irrigation and Drainage District. Land used for farmsteads, roads, ditches, and the like would be in addition to these acreages. Each farm budget assumes that the total farm acreage is cropped each year so that no idle land exists.

Tenure and Capital

It is assumed that each farm is owner-operated and that sufficient capital is available to facilitate operations which will maximize farm income. Not all the capital need be owned by the operator. In the budgets a charge of 5 per cent was made for fixed capital (land, buildings, and machinery)and 7 per cent for operating capital to cover interest payments on borrowed funds and an opportunity return for equity capital. The 7 per cent charge on operating capital was included with variable expenses and the 5 per cent charge on fixed assets with fixed expenses.

Fixed Costs

Fixed costs have been established for each farm size group. Fixed costs include insurance, real estate tax, annual machinery depreciation, and a 5 per cent charge on buildings for annual depreciation and repairs. The same depreciation rates were used on all farm sizes. This assumes that all machinery and buildings have an equal life for the different farm sizes. Other studies have shown that this is not entirely realistic, although survey evidence in this study showed that machinery age was approximately equal in all four sizes of farms.

No attempt has been made to allocate fixed costs to each enterprise because fixed costs are incurred regardless of what enterprises are included in the farm and, therefore, do not affect the relative profitability of each enterprise. Fixed costs have been subtracted in each budget in arriving at management returns.

Variable Costs

The variable costs per acre were considered to be the same on all sizes of farm. These variable costs were derived from data obtained from the District and were primarily planned to apply to the two middle sizes of farms for which most data were available; namely, 160-acre and 320-acre farms. Thus, these costs per acre may not be entirely accurate when applied to the extremes in size. It is recognized that theoretical considerations indicate a reduction in variable costs due to a decreasing average cost curve, but data available were insufficient to differentiate in variable costs among the four farm sizes.

Allotments

Lacking better information, it was assumed the maximum acreage of cotton which could be grown under the allotment program would be 25 per cent of available cropland for each size farm. This is believed to be a reasonably good assumption, judging from empirical data obtained for the area. However, where an effort has been made to indicate the financial effects of growing small grains, rotational restrictions have reduced the proportion of cropland in cotton to some extent.

Labor

Since data on seasonal labor requirements were not available on an enterprise basis, no analysis of aggregate labor requirements as

such has been made for the various enterprise combinations. However, each budget presented in each size group has been carefully chosen as being similar to,or the same as, existing cropping patterns in the area. Thus, the enterprise combinations shown in the budgets are believed to be feasible from the viewpoint of labor requirements and supply. However, it should be recognized that the budgets do not necessarily represent optimum labor utilization.

Bermudagrass Seed

This crop has been considered individually because it has unusual characteristics, and for this reason needs special analysis as an enterprise possibility in the farm budgets.

Bermudagrass seed is well adapted to the area and will provide yields of up to 1,300 pounds of clean seed if grown under specialized conditions. The more typical yield is 700 pounds of clean seed with two crops per year.

Price variation from year to year is very wide, and may vary as much as 100 per cent from one year to the next. There appears to be little connection between price and acreage grown. Since 1955, the price has varied between 15 to 36 cents per pound as shown in Table 4.

Because of the wide variation in price, budgets are presented under each farm size for three price levels of bermudagrass seed: 30 cents, 25 cents, and 20 cents per pound. By doing this, and showing

the associated revenue information, some indication has been given as to the profit and loss possibilities associated with this crop. Since the 20-cent price shows a loss in all sizes, no lower price has been budgeted.

Table 4. Bermudagrass Seed Prices in Yuma County, Arizona, 1955-1960.

Year	Price per Pound in Cents (rounded)
1955	16
1956	18
1957	15
1958	15
1959	29
1960	36

Source: Prices for 1955-57 are from the Yuma County Agricultural Extension Service; those for 1958-60 are from the Federal Crop and Livestock Reporting Service, Phoenix.

Bermudagrass seed is not a crop with which it is advisable to go in and out of as a production possibility. Specialized knowledge is necessary to obtain the higher levels of yield. It is also an expensive crop to eradicate. This means in effect that it should only be grown as a long-term enterprise.

At the present time it appears that the acreage of bermudagrass seed is increasing under the stimulus of high prices and high returns. Unless demand continues to increase for this seed, the price can be expected to drop. Reliable information is not available upon which a trend in demand can be projected.

Farm Budgets

This section presents budgets for each farm size showing summary revenues, expenses, and management returns for selected cropping patterns. These budgets indicate, within the framework of assumptions discussed above, the estimated effect of various cropping systems upon income, expense, and management returns. Comparison of the budgets involving bermudagrass seed production show the effect of seed prices upon management returns. It is unlikely that any of the budgets presented will precisely fit any specific farm in the district. However, they may provide a basis for judgment for individual farm operators, and a pattern of analysis which farmers may follow in analyzing their individual farming operations.

Budgets for an 80-Acre Crop Farm

Budgets for three alternative cropping systems and for three different prices of bermudagrass seed for the 80-acre farm are summarized in Table 5. Budget No. I includes 20 acres of cotton and 60

Table 5. Income, Expense, and Management Returns for an 80-Acre Farm Under Various Cropping Systems in the Wellton-Mohawk Irrigation and Drainage District.[1]

Item	Budget Number				
	I	II	III	III(a)	III(b)
Crops					
Alfalfa (acres)	60	40			
Upland cotton (acres	20				
Bermudagrass seed (acres)		40	80	80	80
Bermudagrass seed (¢/lb.)		30	30	25	20
Total cash income ($)	16,060	15,200	18,400	15,600	12,800
Variable cash expense ($)	11,966	10,341	11,411	11,411	11,411
Net cash income ($)	4,094	4,859	6,989	4,189	1,389
Fixed costs ($)	4,900	4,900	4,900	4,900	4,900
Management returns ($)	- 806	- 41	2,089	- 711	-3,511

[1] Estimated on the basis of material in text.

acres of alfalfa. In Budget No. II no cotton is included, alfalfa is reduced to 40 acres, and 40 acres are devoted to bermudagrass seed production.

Other figures used in developing these summary budgets are given in the Appendix Tables. Total cash income was calculated by computing total production, using estimated yields and prices given in Appendix Table 1. Variable cash expenses for each of the budgets include cash expenses for the specified crops including a charge for all labor (Appendix Tables 2, 3, and 4), general cash expenses of the farm business (Appendix Table 7), and interest at the rate of 7 per cent on the operating capital employed. Net cash income was obtained by deducting variable expenses from total cash income, and management returns was obtained by deducting fixed expenses (based on Appendix Table 6) from net cash income. Since some of the management return figures are negative, care should be taken in reading them.

Budget I with cotton and alfalfa shows a large negative return to management. Because prices of alfalfa and cotton have shown less variation than that of bermudagrass seed in the last five years, there will probably be less fluctuation of net cash income in Budget I than in those containing bermudagrass seed.

Budget II with bermudagrass seed and alfalfa shows a small negative return to management at the high price of bermudagrass seed.

Other than the all bermudagrass seed Budget No. III at the high price level, Budget II shows the lowest negative return to management.

Budget III indicates the highest return to management associated with the high price of bermudagrass seed. Budgets III(a) and III(b) show the increasingly negative returns which result as the price of bermudagrass seed is decreased from 25 cents to 20 cents per pound.

In general, this size group shows a positive return to management only at the high level (30¢) of bermudagrass seed. The reason for this is probably the high fixed costs per acre associated with this size, which amounts to $61.25. More will be said of this when the farm sizes are compared.

Budgets for a 160-Acre Crop Farm

The farm budgets for this farm appear in Table 6 and are set up in a similar way to those for the 80-acre farm.

Budget I with alfalfa and cotton at the allotted acreage shows the best return to management with the exception of Budgets V, VI, VI(a), and VI(b) which include bermudagrass seed. In Budgets II, III, and IV the effects can be seen of reducing alfalfa acreage to allow grains to be introduced. This has the double effect of cutting back cotton production due to rotational restrictions. Of these three budgets, No. IV with safflower offers the highest returns, but even this is a negative return greater than growing alfalfa and cotton with no small grains. In Budget No. III it can be seen that barley has a low return.

Table 6. Income, Expense, and Management Returns for a 160-Acre Farm Under Various Cropping Systems in the Wellton-Mohawk Irrigation and Drainage District.[1]

Item	Budget Number							
	I	II	III	IV	V	VI	VI(a)	VI(b)
Crops								
Alfalfa (acres)	120	100	90	100	90			
Upland cotton (acres)	40	30	30	30	30			
Barley (acres)			40					
Wheat (acres)		30						
Bermudagrass seed (acres)					40	160	160	160
Safflower (acres)				30				
Bermudagrass seed (¢/lb.)					30	30	25	20
Total cash income ($)	32,120	28,260	26,810	28,920	33,290	36,800	31,200	25,600
Variable cash expense ($)	23,972	20,792	20,013	21,374	23,691	22,862	22,862	22,862
Net cash income ($)	8,148	7,468	6,797	7,546	9,599	13,938	8,338	2,738
Fixed costs ($)	8,497	8,497	8,497	8,497	8,497	8,497	8,497	8,497
Management returns ($)	- 349	-1,029	-1,700	- 951	1,102	5,441	- 159	-5,759

[1] Estimated on the basis of material in text.

Budget V includes bermudagrass seed at the high price (30¢) and shows a positive return to management. This budget has the advantage that the presence of alfalfa and cotton act as a financial buffer to some extent in periods when the price of bermudagrass seed falls. Thus, the net cash income will not vary in this budget so greatly as bermudagrass seed price varies.

Budgets VI, VI(a), and VI(b) show an all bermudagrass seed cropping plan with bermudagrass seed price at 30, 25, and 20 cents, respectively. In this size group due to a lower fixed cost per acre than in the 80-acre farm, bermudagrass seed shows a better return to management at a price of 25 cents per pound than bermudagrass seed does at the same price on 80 acres, although still negative.

Budgets for a 320-Acre Crop Farm

The budgets for this farm are summarized in Table 7. Budgets I, II, and III all allow the full cotton allotment and vary only in the grains produced. Budgets II and III with wheat and safflower show an almost equivalent return to management.

Budgets IV, IV(a), and IV(b) are all with bermudagrass seed occupying the whole farm. At this size of 320 acres, bermudagrass seed shows a positive return to management below the 25-cent per pound price.

Table 7. Income, Expense, and Management Returns for a 320-Acre Farm Under Various Cropping Systems in the Wellton-Mohawk Irrigation and Drainage District.[1]

Item	Budget Number					
	I	II	III	IV	IV(a)	IV(b)
Crops						
Alfalfa (acres)	160	160	160			
Upland cotton (acres)	80	80	80			
Wheat (acres)	40	40	80			
Barley (acres)	40					
Safflower (acres)		40				
Bermudagrass seed (acres)				160	160	160
Bermudagrass seed (¢/lb.)				30	25	20
Total cash income ($)	58,420	60,240	59,360	73,600	62,400	51,200
Variable cash expense ($)	41,216	42,266	41,390	45,757	45,757	45,757
Net cash income ($)	17,204	17,974	17,970	27,843	16,643	5,443
Fixed costs ($)	15,515	15,515	15,515	15,515	15,515	15,515
Management returns ($)	1,689	2,459	2,455	12,328	1,128	-10,072

[1] Estimated on the basis of material in text.

Generally, there appears to be no financial difficulty at this size of farm. Indeed, real estate loan payments could be made from management returns for all budgets in this size group, except for the one with bermudagrass seed figured at 20 cents per pound.

Budgets for a 600-Acre Crop Farm

The budgets for this farm are summarized in Table 8. Budget I shows the greatest management return. Cotton is grown at the assumed allotment level and alfalfa occupies the rest of the acreage. Budgets II, III, and IV show decreasing returns to management as the acreages of grains are increased at the expense of alfalfa and cotton.

Budget V shows very high returns to management. Acreages of bermudagrass seed of this size demand superior management if the crops are to be taken before the seed begins to shed. Moreover, it would be unwise for farms of this size to move to an all bermudagrass seed budget, because demand does not appear to be adequate to accept this extra production. Note that, even at this size, the price of 20 cents per pound for bermudagrass seed gives a large negative management return.

Comparison of Farm Sizes

In comparing the four sizes of farms for management returns, it becomes apparent that similarities exist between 80- and 160-acre

Table 8. Income, Expense, and Management Returns for a 600-Acre Farm Under Various Cropping Systems in the Wellton-Mohawk Irrigation and Drainage District. [1]

Item	Budget Number						
	I	II	III	IV	V	V(a)	V(b)
Crops							
Alfalfa (acres)	450	400	350	400			
Upland cotton (acres)	150	150	150	100			
Wheat (acres)		50	50	50			
Barley (acres)			50				
Safflower (acres)				50			
Bermudagrass seed (acres)					600	600	600
Bermudagrass seed (¢/lb.)					30	25	20
Total cash income ($)	120,450	117,400	113,300	105,300	138,000	117,000	96,000
Variable cash expense ($)	85,912	83,394	80,669	74,550	86,554	86,554	86,554
Net cash income ($)	34,538	34,006	32,631	30,750	51,446	30,446	10,446
Fixed costs ($)	27,167	27,167	27,167	27,167	27,167	27,167	27,167
Management returns ($)	7,371	6,839	5,464	3,583	24,279	3,279	-16,721

[1] Estimated on the basis of material in text.

farms and the 320- and 600-acre farms. The smaller farms both show negative returns to management under all cropping patterns except bermudagrass seed at the high price level. A cause for this is the high fixed costs per acre of crops associated with these farms, which amount to $61.25 per acre for the 80-acre farm and $53.12 per acre for the 160-acre farm. The machinery inventory on these farms is probably necessary in view of the problem of timely operations associated with custom operations. At these small acreages, 80 and 160, specialized machinery for an assumed cotton allotment of 20 and 40 acres, respectively, adds to the cost burden. Farmers in the 160-acre group complain of the high cost per acre of maintaining an inventory of cotton equipment, for the small cotton allotment. In both the 80- and 160-acre farms, custom operations were typical for the baling of alfalfa. In these circumstances the revenue over variable costs of alfalfa are insufficient to cover the fixed costs. However, the complementary relationship between alfalfa and cotton make alfalfa a desirable crops for its effect on cotton production. The need for this custom operation adds to the expense for these sizes of farms.

Moving to the 320- and 600-acre farms, both these sizes show positive returns for all cropping budgets, except where the all bermudagrass seed budget is associated with the low level bermudagrass seed price. In the latter case only both sizes show large negative manage-

ment returns. Fixed costs for these groups are $48.48 per acre for the 320-acre farm and $45.28 per acre for the 600-acre farm.

Since the 320- and 600-acre farms customarily have a baler in their machinery inventory, owner rates for alfalfa baling have been used in these sizes. The lowered variable costs associated with this ownership means that alfalfa will cover both variable and fixed costs and the complementary relationship between alfalfa and cotton accrues to the advantage of management returns.

From this comparison of the sizes of farms it appears that both the 80- and 160-acre farms will not cover their fixed costs in the long run.

Possibly the introduction of a livestock enterprise in the budgets for the smaller farms would improve their financial status. The survey data assembled for this study indicate some farmers are raising dairy replacements as a supplementary enterprise. Raising feeder cattle was also mentioned. However, since analysis of these enterprises was beyond the scope of this study, only general observations can be made here. In considering livestock enterprises, attention would have to be given to labor requirements. The amount of labor available may be inadequate in peak periods, particularly where most of the work is done by the operator and family. Moreover, it should be recognized that adding livestock enterprises will not contribute much by way of spreading fixed costs. Some complementary and supplementary benefits may

be realized by adding livestock enterprises, and over-all income may be increased, but the smaller farms need to reduce fixed costs per unit of production in one way or another. The budgetary analysis of this study indicates one way is to increase the size of farm.

The budgetary analysis indicates that the 320- and 600-acre farms are in no immediate financial difficulty. Looking back at the historical data for the area, a trend toward these larger sizes is indicated. The financial stimulus for such a trend is apparent in the financial results demonstrated in this study.

Repayment Contracts

Mention should again be made of the problem of the repayment contract for the Irrigation and Drainage system due to begin in 1962. Any repayment plan based on an acreage levy will add a financial burden to farms in the District. Indeed, the budgetary analysis of this study indicates that it will be difficult for the 80- and 160-acre farms to make any payments, and even the larger farms could pay only a small levy under most cropping patterns. Assuming average prices and yields, a levy on these farms will force these farmers to depend further upon their investment in the farm as a means of livelihood. Since repayment contract conditions have not been published, further analysis is not feasible. However, the implications which may arise have been indicated.

CHAPTER IV

SUMMARY AND CONCLUSIONS

The purpose of this study has been to analyze alternative cropping systems and income opportunities for farms in the Wellton-Mohawk Irrigation and Drainage District. Four farm resource situations representative of four farm sizes have been analyzed. It is intended that the budgetary analysis of these farms will provide management guides for a variety of farm situations in the area.

The four farm situations used for this analysis are judged to be typical in size, type, buildings, and machinery facilities of those found in the District. Farm sizes of 80, 160, 320, and 600 acres have been used. Alternative budgets have been presented for each of these farm sizes--each one budgeted to show the relevant financial data associated with given cropping systems. No attempt was made to analyze livestock enterprises, although these probably offer good alternatives. The various farm budgets were compared both within size groups and among size groups on a basis of the returns to management which would be produced.

The budgets were based upon estimated yields, prices, and costs expected to be realized during the next one to three years by farmers with above average managerial ability as assumed in the study. The yields and prices were based upon those in the area adjusted for trends and conditions involved. Since only limited current or historical data were available for bermudagrass seed, three price levels--30, 25, and 20 cents per pound--were used in the budgets. The costs used in the budgets were estimated at approximately the level prevailing in the area, since such costs are not expected to change materially in the immediate future.

Six crops were considered in various combinations in the farm budgets: cotton, alfalfa hay, safflower, wheat, barley, and bermudagrass seed. The relative profitability of producing bermudagrass seed depended upon the price assumed. With a price of 30 cents per pound, bermudagrass seed would be the most profitable crop, whereas at 20 cents per pound it would be the least profitable. Except for bermudagrass seed at the high price level, cotton produced the highest return per acre with the estimated yields, prices, and costs employed in this study. Estimated returns for cotton above variable costs were $125 per acre. Alfalfa hay ranked next with estimated per-acre returns of $48.00 above variable costs. Safflower, wheat, and barley production followed with estimated returns above variable costs of $48.00, $45.00, and $27.00, respectively, per acre.

The estimated income obtained in the various budgets is directly related to the crop enterprises included. Thus, budgets which include substantial acreages of cotton, alfalfa, safflower (assuming a contract for sale of the safflower can be obtained), and bermudagrass seed figured at the higher prices, produce the highest management returns. Using part of the acreage to produce wheat and barley, and bermudagrass seed at the lower price, reduced management returns. In setting up the acreages of various crops included in the budgets, consideration was given to acreage allotments and to rotations essential to maintain production.

Considering the four sizes of farms, management returns increased as acreage in the farm increased, assuming comparable cropping systems. With per-acre variable costs being figured at the same level on the large as on the small farms, the higher management returns on the larger farms resulted from the larger acreage and fixed costs being spread over a larger acreage. For the 80- and 160-acre farms all budgets show a negative management return, except for the ones including bermudagrass seed and with seed figured at 30 cents per pound. Many families on farms of this size in the area are experiencing financial difficulty, which is understandable since the budgetary analysis indicates income ordinarily is inadequate to cover all costs, including depreciation on working and fixed assets, a return on capital employed, and a wage for operator and family labor. In such cases,

funds for living expenses must come from these two latter sources and/or from equity capital. On the other hand, the budgetary analysis indicates the 320- and 600-acre farms are in a stronger income position, with management returns being positive for all cropping systems except the one with bermudagrass seed figured at the lowest price of 20 cents per pound. Indications are that these farms generally have sufficient income to make some saving in the form of debt repayment or otherwise.

In interpreting the budgetary analysis of this study, the estimates of production, prices and costs, and the related assumptions used in deriving management returns should be recognized and kept in mind. These conditions vary from farm to farm in the District and an interpretation of the budgets in terms of any specific farm should recognize the differences which probably prevail between the farm conditions and those used in the budgets. Moreover, it should be kept in mind that input-output data used in this study have been held constant for all farm sizes, and are based on average conditions. Individual input-output data may vary among actual farms to such an extent that the most profitable cropping budget may change among farms of the same size.

These cautions have been mentioned to help the individual farmer to appraise the farm budgets for his own situation. This study is not intended to show that all farmers will maximize returns to

management by adopting a specific budget shown. But an understanding of the principles and procedures involved will provide a frame work within which each farmer can analyze his own operation to provide the highest returns to management.

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APPENDIX

Appendix Table 1. Average Commodity Prices and Average Yields Assumed for this Study.

Item	Unit	Price	Yield Per Acre
Alfalfa hay (baled)	ton	25.00	6.0
Cotton (Upland)	bale	176.50	2.0
Barley	ton	45.00	1.5
Wheat	ton	59.00	1.5
Safflower	ton	74.00	1.5
Bermudagrass seed	lbs. (clean)	.30, .25, & .20[1]	700
Bermudagrass straw (baled)	ton	10.00	1.0

[1] Three separate levels of bermudagrass seed prices have been used in the budgets.

Appendix Table 2. Estimated Variable Expenses per Acre for Alfalfa Hay and Bermudagrass Seed.

Item	Annual Costs per Acre		
	Alfalfa Hay		Bermuda-grass seed (2 crops)
	80 & 160 acres	320 & 600 acres	
	(dols.)	(dols.)	(dols.)
Establish stand[1]	36.00	36.00	30.00
Annual charge	12.00	12.00	2.00
Fertilizers & application	12.00	12.00	22.00
Insecticide & application			20.00
Herbicide & application			1.00
Water (6 A. ft.)	14.50	14.50	11.50 (5 A. ft.)
Irrigation labor	10.00	10.00	10.00
Mow and rake	15.00	15.00	6.00
Combine			16.00
Bale	26.00[2]	28.00[3]	20.00
Roadside	12.00		6.00
Clean seed			12.25
Total	101.50	91.50	126.75

[1] Not included in totals.

[2] Custom rate.

[3] Using owned machine.

Appendix Table 3. Estimated Variable Expenses of Producing Upland Cotton per Acre.

Item	Costs per Acre
	(dols.)
Land preparation	13.00
Seed and planting	4.00
Cultivation	5.50
Hoe and thin	7.00
Irrigation and ditch labor	8.00
Fertilizers and application	18.00
Insecticide and application	20.00
Water (5 A. ft.)	11.50
Picking by hand (2 bales)	112.00
Hauling	2.00
Ginning	29.00
Total	230.00

Appendix Table 4. Estimated Variable Expenses, per Acre, for Producing Barley, Wheat, and Safflower.

Item	Costs per Acre		
	Barley	Wheat	Safflower
	(dols.)	(dols.)	(dols.)
Land preparation	5.00	7.00	10.00
Seed	3.50	5.50	2.25
Planting	1.50	1.75	1.75
Cultivation			3.00
Fertilizers & application	12.50	13.00	12.00
Insecticide & application			9.00
Water	5.75 [1]	5.75 [1]	9.20 [1]
Irrigation labor	3.50	3.50	5.00
Combine	5.00	6.00	7.50
Hauling grain	4.00	2.50	3.00
Total	41.75	45.00	62.70

[1] 2 1/2 A. ft. --barley; 2 1/2 A. ft. --wheat; 4 A. ft. --safflower.

Appendix Table 5. Estimated Capital Investments on Typical 80-, 160-, 320-, and 600-Acre Farms in the Wellton-Mohawk Irrigation and Drainage District.

Item	Farm Size (Acres)			
	80	160	320	600
	(dols.)	(dols.)	(dols.)	(dols.)
Land at $600/acre	48,000	96,000	192,000	360,000
Buildings[1]	8,948	9,248	11,248	13,548
Machinery[2]	4,071	5,491	10,911	16,448
Total	61,019	110,739	214,159	389,996

[1] Assumes 40-year average life and that the buildings are one eighth worn out.

[2] Based on typical machinery inventories for the four farm sizes.

Appendix Table 6. Estimated Fixed Costs on Typical 80-, 160-, 320-, and 600-Acre Farms in the Wellton-Mohawk Irrigation and Drainage District.

Item	Farm Size (Acres)			
	80	160	320	600
	(dols.)	(dols.)	(dols.)	(dols.)
Insurance $2/acre	160	320	640	1,200
Real estate tax $2.80/acre	224	448	896	1,680
Depreciation				
Buildings [1]	447	460	560	675
Machinery [2]	1,019	1,734	2,629	4,112
Interest on invest. 5%	3,050	5,535	10,710	19,500
Total	4,900	8,497	15,515	27,167
Fixed cost per acre	61.25	53.12	48.48	45.28

[1] Depreciation on buildings assumed at 5% made up of 2 1/2% repairs and 2 1/2% depreciation as a 40-year life is allowed.

[2] Assumes an average life of 10 years and that the machinery is six tenths worn out. Straight line depreciation used.

Appendix Table 7. Estimated General Expenses for Typical 80-, 160-, 320-, and 600-Acre Farms in the Wellton-Mohawk Irrigation and Drainage District.

Item	Farm Size (Acres)			
	80	160	320	600
	(dols.)	(dols.)	(dols.)	(dols.)
Electricity	125	211	363	666
Vehicle licenses	50	64	92	280
Telephones	90	126	257	990
Bookkeeping	50	70	100	200
Supplies and misc.	187	573	1,309	2,555
Total	502	1,044	2,121	4,691
Dols. per acre	6.28	6.52	6.63	7.82

University of Arizona
Department of Agricultural Economics

Wilbert Pollard

WELLTON-MOHAWK FARM ADJUSTMENT STUDY

Interviewer _____ Date _____

Person Interviewed _____ Phone _____

Name of Farm or Ranch _____

Address _____

I. FARM CHARACTERISTICS

A. Land Use and Crop Production 1959-60 Crop.

CROP	ACREAGE	YIELD
Alfalfa for hay		
Alfalfa for seed		
Cotton, upland		
Cotton, American-Egyptian		
Barley--for grain		
Barley--for green chop		
Barley--hay or pasture		
Grain sorghum--for grain		
Grain sorghum--for silage		
Wheat--for grain		
Wheat--pastured		
Oranges--bearing		
nonbearing		
Grapefruit--bearing		
nonbearing		
Lemons--bearing		
nonbearing		

CROP	ACREAGE	YIELD
Bermuda--for seed N. K. 37		
common		
for pasture N. K. 37		
common		
Lettuce--for crop		
Lettuce--for seed		
Millett--crop		
seed		
Other seeds		
Vegetables and melons		
Safflower--for seed		
for oil		

CROP	ACREAGE	YIELD
Irrigated pasture--type or forage crops green chopped		
Other crops		

B. Acreages

Acreage in farm not cropped	
" idle cropland	
" farmsteads, roads, ditches, etc.	
" undeveloped irrigable land	
" waste land	
Total acreage in farm	

C. Farming Experience

Length of time operating in:

1. Wellton-Mohawk District _____
2. Unit now held _____
3. Previous experience _____

Length of time operating in: (cont'd)

D. Livestock -- During 1959-60

	No. of animals	Production per animal	Total Production
1. Dairy Herds			
Milking cows			
Dry cows			
Heifers			
Calves			
Bulls			
2. Beef Breeding Herds (registered & nonreg.)			
Cows			
Breeding heifers			
Yearling steers & heifers			
" calves			
" bulls			
3. Sheep and lambs			
Ewes			
Lambs			
Wethers			
Wool sheared			
Ewes (pounds)			
Lambs "			

Livestock (cont'd)

	No. of Animals	Production per animal	Total Production
4. Poultry			
Laying hens			
Broilers			
5. Cattle on Feed			
Steers			
Heifers			
Cows			

Feeding Period

E. Buildings

Type of Building	Size or Capacity	Replacement Cost
Shop and equipment		
Grain storage		
Office		
Labor housing		
Bunkhouse -- single		
family		
Bracero's		
Other labor housing		
_____		
Gasoline, oil, grease, storage		
Scales (capacity)		
General storage buildings		
Dairy Buildings		
Milking parlor		
Dairy barns with stanchions		

Buildings (cont's)

Type of Building	Size or Capacity	Replacement Cost
Dairy buildings (cont'd)		
Loafing sheds		
Milk lhouse		
Calf pens and sheds		
Shades		
Beef cattle		
Barns and sheds		
Feedlot capacity		
Pit silos		
Seeds and Vegs.		
Seed mills		
Other buildings		

F. Equipment

Item	Type	Year	Make	Capa-city	No	Replacement Cost
1. Field Crop Equipment						
Tractor						

Equipment (cont'd)

Item	Type	Year	Make	Capacity	No.	Replacement Cost
Field crop equip. (cont'd)						
Plows						
Discs						
Harrows						
Planters and drills						
Cultivators						
Rollers						
Floats and scrapes (for tillage						
Hay equipment						
Mowers						
Rakes						
Self propelled windrower						

Equipment (cont'd)

Item	Type	Year	Make	Capa - city	No.	Replacement Cost
Field crop equip. (cont'd) Crushers & crimpers						
Balers						
Wagons						
regular						
automatic						
other roadsiding						
Forage or silage harvesters						
Forage or silage green chop wagons						
regular						
self unloading						
Cotton harvesting mechanical pickers						
Wagons and trailers						
Strippers						
Grain combines						

Equipment (cont'd)

Item	Type	Year	Make	Capa-city		Replacement Cost
Field crop equip. (cont'd) Threshing machines						
Land levelling						
land planes						
bulldozers						
scrapers						
carry-alls						
Trucks, autos (all farm)						
Specialized seed & veg. equip.						

Equipment (cont'd)

Item	Type	Year	Make	Capacity	No.	Replacement Cost
Spraying & dusting						
Fertilizer application						
2. Livestock Equipment						
Dairy Milking machines						
Bulk tanks & refrig coolers						
Cleaning equip.						
Water heaters						
Miscellaneous						

Beef Cattle

Mill Capacity _____ Type _____

_____ _____

Replacement cost $ _____

Truck loading hopper Type _____

Cost $ _____

Beef Cattle Equip. (cont'd)

Feed wagons Type _____ Cost $_____

Squeezes _____

Loading chutes _____

Sprays _____

II. EXPENSES

A. General

Farm Supplies	Expense
Gasoline	
Tractor fuel	
Oil and grease	
Fencing	
Ditch repairs and maintenance	
Ditch lining	
Land levelling and clearing	
Electricity and gas	
Repairs	
Farm supplies	

Insurance	
Fire and extended coverage	
Farm liability	
Auto	
Truck	

Insurance (cont'd)	Expense
Industrial insurance (3 or more men)	
Social Security	
Operator's life insurance	
Other	

Taxes

Real estate	
Personal property	
Water assessment	
Auto and truck licenses	

Rent

Acres rented $ -per Acre

If not cash, crop share	
Share of expenses	
Tenant	
Landlord	

Other General Expenses

Bookkeeping and office	
Legal fees (business only)	
Dues, memberships, magazines	
Telephone	
Proportion of auto expense to farm	

B. Crop Expense

Expense Item	CROPS					
	Cotton	Cost	Alfalfa	Cost	G. sorghum	Cost
Fertilizers Type						
Amount						
Type						
Amount						
Type						
Amount						
Type						
Amount						
Insect & disease Type						
Amount						
Type						
Amount						
Type						
Amount						
Herbicide Type						
Amount						
Type						
Amount						
Type						
Amount						
Defoliant Type						
Amount						

Crop Expense (cont'd)

Expense Item	CROPS					
	Cotton	Cost	Alfalfa	Cost	G. sorghum	Cost
Seed						
Type						
Amount						
Type						
Amount						
Type						
Amount						
Water						
A. ft.						
Custom work						
Tillage						
Harvesting						

Crop Expense (cont'd)

Expense Item	CROPS					

Crop Expense (cont'd)

Expense Item	CROPS					

Crop Expense (cont'd)

Expense Item	CROPS					

Crop Expense (cont'd)

Expense Item	CROPS					

Crop Expense (cont'd)

Expense Item	CROPS					

C. Labor (1959-60 crop year)

Laborer	No.	Time worked per person		Wage		Value of Perquisites
		hrs. /week	no. of weeks	Unit	$	
Operators						
Managers labor						
Foreman						
Other full time						
Braceros						
Domestic						
Seasonal						

Is labor available for hire when needed? _____

If not, what type of worker is in short supply? _____

_____

In which months are they short? _____

_____

D. Allocation of labor to crops, livestock, other use

Worker	Proportion Chargeable to:		
	Crops	Livestock	Other
Operator			
Manager			
Foreman			
Other labor			

E. Livestock Expense

Dairy Herds (use schedule for units over 50 cows)

Typical ration fed to milking cows _____

_____

_____

(composition and rate of feed) _____

Ration fed to replacement heifers _____

_____

_____

_____

Other expenses

Veterinary costs _____

Breeding fees _____

DHIA fees _____

Other expenses (cont'd)

Dairy supplies _____

Death loss Number _____ _____

_____ _____

_____ _____

_____ _____

Beef Cattle Herds

Feed

Supplemental feed _____

Pasture _____

Hay _____

_____ _____

Veterinary fees _____

Breeding fees _____

Death loss Number _____ _____

Purchased roughage Amount _____ _____

Purchased feed " _____ _____

_____ " _____ _____

Other expenses _____

_____ _____

_____ _____

III. RECEIPTS

Item	Units sold	Price per unit	Total	Used on farm	Value on farm	
Crops						
alfalfa hay						
alfalfa seed						
cotton, upland						
cotton, AE						
grain sorg, grain						
" silage						
barley						
wheat						
Bermuda, seed						
" straw						
vegetables						
citrus						

Receipts (cont'd)

Item	Units sold	Price per unit	Total	Used on farm	Value on farm	
Other seeds						
Other crops						
Livestock						
Milk						
Dairy culls						
Beef calves						
Yearling feeders						
Beef culls						
Finished cattle						
Feedlot steers						
" heifers						
" others						
Sheep						
Lambs						
Wool						

Receipts (cont'd)

Item	Units sold	Price per unit	Total	Used on farm	Value on farm	
Chickens						
Eggs						
Other						
Custom work done off farm						

IV. AVAILABILITY AND USE OF CAPITAL

A. If money were available to you would you be interested in borrowing to expand your farming operations?

Yes /___/ No /___/

If yes, for what purposes would you use additional capital? _____

_____

_____

_____

_____

B. Use of Credit

1. Amount borrowed or outstanding (1959-60):

For real estate loans $_____

Source _____

Interest rate _____ Length of loan _____

Production credit $_____

Source _____

Interest rate _____ Length of loan _____

Installment payment contracts

Items purchased _____ $_____

_____ _____

_____ _____

_____ _____

_____ _____

_____ _____

_____ _____

Source _____

Interest rate _____ Length of loan _____

Service charge, if any $_____

Do you feel that credit is adequate for:

Real estate loans Yes /___/ No /___/

Comments _____

_____

_____

Production loans Yes /___/ No /___/

Comments _____

_____

_____

Installment loans Yes /___/ No /___/

Comments _____

_____

_____

V. What farm enterprises do you think offer the best opportunities here in the Wellton-Mohawk Valley?