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## **An analysis of general farms in Tennessee with special reference to family farm income**

Bhoopalam N. Sampath Kumar

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To the Graduate Council:

I am submitting herewith a thesis written by Bhoopalam N. Sampath Kumar entitled "An analysis of general farms in Tennessee with special reference to family farm income." I have examined the final electronic copy of this thesis for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Master of Science, with a major in Agricultural Economics.

Larry L. Bauer, Major Professor

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Carolyn R. Hodges

Vice Provost and Dean of the Graduate School

(Original signatures are on file with official student records.)

May 22, 1969

To the Graduate Council:

I am submitting herewith a thesis written by Bhoopalam N. Sampath Kumar entitled "An Analysis of General Farms in Tennessee with Special Reference to Family Farm Income." I recommend that it be accepted for nine quarter hours of credit in partial fulfillment of the requirements for the degree of Master of Science, with a major in Agricultural Economics.

Larry L Bauer  
Major Professor

We have read this thesis and  
recommend its acceptance:

Troy W Hunter  
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Accepted for the Council:

Hutton A. Smith  
Vice Chancellor for  
Graduate Studies and Research

AN ANALYSIS OF GENERAL FARMS IN TENNESSEE WITH SPECIAL  
REFERENCE TO FAMILY FARM INCOME

---

A Thesis  
Presented to  
the Graduate Council of  
The University of Tennessee

---

In Partial Fulfillment  
of the Requirements for the Degree  
Master of Science

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by  
Bhoopalam N. Sampath Kumar

June 1969

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## ABSTRACT

Agriculture in Tennessee is lagging behind the other southeastern states. In 1954 the net income per farm in Tennessee was \$1452, fifth among the southeastern states. In 1964, net income per farm had increased to \$1801, but this was the lowest in the southeast. From 1954 to 1969, the percent increase in net income per farm in Tennessee was 24 percent, lowest in southeast. Four other states had increased income by more than 100 percent; so there is a great need to improve the agriculture in Tennessee.

The basic data for the present study was selected from the records of the Tennessee Farms in Unit Test Demonstration program. Forty-two general farms were selected for the four year period from 1964 to 1967, as far as possible using as a criteria that these are classified as general farms for at least three out of the four years.

The selected 42 farms were divided into three groups for each year based on the family farm income. The high, middle and low income groups are the three divisions which have the averages for 11,20 and 11 farms respectively.

It was found that the reason for the higher income of the middle and high income groups is the favorable relationship between the major factors that affects the family farm income and the family farm income. The reason for the low income of the low income group is the preponderance of unfavorable relationship between major factors and family farm income.

In conclusion, measures for improving the family farm income for all income groups of farms were suggested. The practical aspects involved in these improvements were briefly mentioned.

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## CHAPTER I

### INTRODUCTION

Modern farming is becoming increasingly commercial. Efficient farmers are giving way to those who are more efficient. Unless the farm is managed efficiently, it is not possible to thrive as a successful farmer. "Efficiency factors"<sup>1</sup> are generally considered as the management factors that are used as a basis for measuring financial success in farming. Efficiency factors which may be considered include production per unit, capital turnover, income, and labor output per worker.<sup>2</sup>

The farm manager of exceptional ability with intuition can decide the best ways of doing without undergoing the long process of analysis. But, generally farm managers do not have these abilities and need to analyze farm records to know where they stand and what they should do in the future to increase their efficiency.

The concept of farm management is stated by Bradford and Johnson in the following words:

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<sup>1</sup>John A. Hopkins, <sup>and</sup> Earl O. Heady, Farm Records and Accounting (Ames, Iowa: Iowa State University Press, 1962), p. 181.

<sup>2</sup>Andrew Boss and George A. Pond, Modern Farm Management, Principles and Practice (St. Paul: The Webb Publishing Company, 1947), p. 243.

Management is an intangible part of production which develops within the lives of men. It is first a mental process, a concentration of desires, a will power. Management functions when a farmer is: (1) observing and conceiving ideas, (2) analyzing with further observations, (3) making decisions on the basis of analysis, (4) taking action, and (5) accepting responsibilities. Management can be seen only through observing the decision-making process and its results.<sup>3</sup>

Variations in farm income of a group of farmers from year to year may be caused by differences in prices, weather and other factors outside their control, but the variation among groups of farmers within a given year is due mainly to differences in the "organization and methods of production."<sup>4</sup> These factors affecting farm income may be grouped into four classes: (1) size of business, (2) organization of business, (3) rate of production or yield, and (4) efficiency in production.

The general objectives of farm management research may be stated as follows in the words of Headley:

Farm Management research has two general objectives. First, to evaluate the performance of farmers as managers and second, to provide information that can be used to teach farmers and prospective farmers how to achieve a high degree of performance.<sup>5</sup>

Performance may be defined for our purpose, "as the degree to which goals are attained."<sup>6</sup>

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<sup>3</sup>Lawrence A. Bradford and Glenn L. Johnson, Farm Management Analysis (New York: John Wiley and Sons, 1953), p. 1

<sup>4</sup>Boss and Pond, op. cit., p. 243.

<sup>5</sup>J. C. Headley, "Evaluating Farm Management Performance and the Challenge to Farm Management Research," Illinois Agricultural Economics (Urbana: University of Illinois Agricultural Experiment Station, January 1967), p. 11.



## I. THE PROBLEM

The prosperity of Tennessee depends to a large extent on the prosperity of agriculture. To improve agriculture, farm management research has to be conducted to know where and how to improve.

Table 1 shows the changes in median family income in the United States and Tennessee, for 1950 and 1960. Though the median family income has risen for both, the absolute difference between them has increased from \$1,090 in 1950 to \$1,711 in 1960.

### Changes in the State's Income Position

In terms of productivity and profitability, the relative position of Tennessee's farmers when compared to other southeastern states, has diminished in recent years. Table 2 and Figure 1 show the changes that have taken place in the net income per farm of the southeastern states. In 1954 Tennessee ranked fifth in net income per farm among the eight states and in 1964 it stood lowest with only \$1,801. This low income problem in Tennessee can be corrected by scientific approach to the problem.

### The Objectives

The specific objectives of the study are the following:

1. To find the main causes for the difference in family farm income among the groups of farms,
2. To find out the relationship between family farm income and the main factors affecting it, and
3. To recommend the measures to increase the family farm income.

TABLE 1  
 MEDIAN FAMILY INCOME IN UNITED STATES AND TENNESSEE  
 FOR 1950<sup>a</sup> AND 1960<sup>b</sup>

	1950		1960	
	Median	% of U.S. Median	Median	% of U.S. Median
United States	3,073	100.0	5,660	100.0
Tennessee	1,983	64.5	3,949	69.7

<sup>a</sup>United States Bureau of the Census, United States Census of Population: 1950, Vol. 11, Characteristics of the Population, Part 1, United States Summary and Part 42, Tennessee (Washington, D.C.: U. S. Government Printing Office, 1953).

<sup>b</sup>United States Bureau of the Census, United States Census of Population: 1960, Vol. 1, Characteristics of the Population, Part 1, United States Summary and Part 44, Tennessee (Washington, D.C.: U. S. Government Printing Office, 1963).

TABLE 2  
 RELATIVE NET INCOME PER FARM POSITION OF STATES IN 1954  
 AND 1964 AND THE RANKED PERCENTAGE INCREASE IN NET  
 INCOME PER FARM<sup>a</sup>

	Per Farm Income 1954	Rank	Per Farm Income 1964	Rank	Income Change 54-65	Percent Change	Rank
Alabama	\$1,332	6	\$2,692	6	\$1,360	102	4
Georgia	1,475	4	3,685	1	2,210	149	2
Kentucky	1,820	2	2,910	4	1,090	60	5
Mississippi	1,307	7	3,279	3	1,972	150	1
North Carolina	2,225	1	3,293	2	1,086	48	6
South Carolina	1,211	8	2,820	5	1,609	132	3
Tennessee	1,452	5	1,801	8	349	24	8
Virginia	1,707	3	2,293	7	586	34	7

<sup>a</sup>Economic Research Service, Farm Income State Estimates, 1949-1965, United States Department of Agriculture, FIS 203 Supplement (Washington, D.C.: Government Printing Office, August 1966), pp. 10-11.

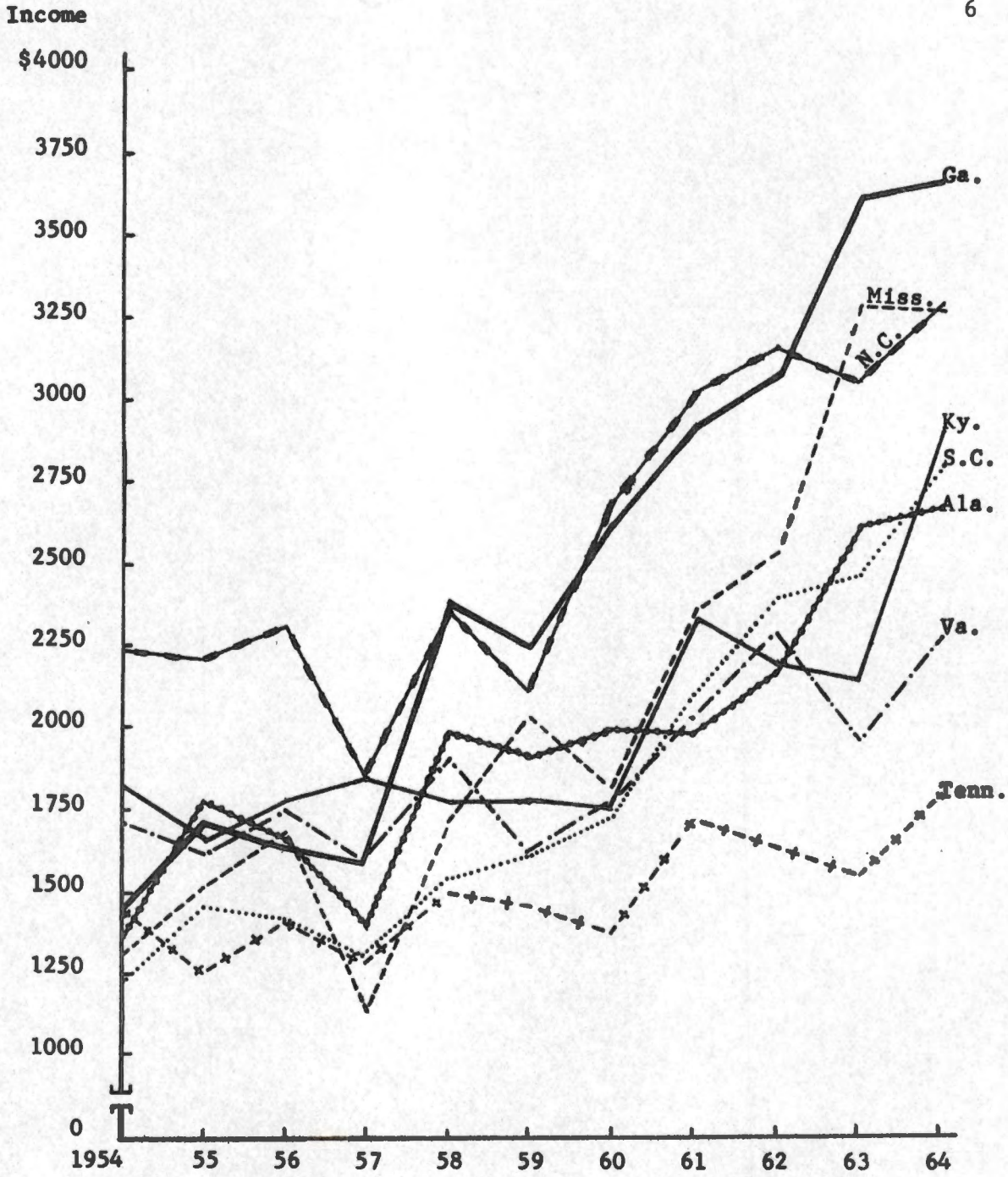


Figure 1. Realized net income per farm from 1954 to 1964 for the southeastern states. (From Economic Research Service, Farm Income State Estimates 1949-1965, United States Department of Agriculture, FIS 203 Supplement, Washington, D.C.: Government Printing Office, August, 1966, pp. 10-11).

### The Nature of the Study

The analysis of the farming enterprise is a complex one, as in decision making, many factors are involved which either cannot be measured or are not easily measured in physical terms. The concept of the function of management in the words of Woodworth and Saunders is as follows:

The task of evaluation and choice among alternatives is a function of management. It cannot effectively be delegated to others since intricate systems of conflicting and changing goals and objectives are involved. A high income may be an immediate objective, but the sacrifice which a family is willing to undergo to obtain this income depends on many complex, intangible, yet more fundamental goals.<sup>7</sup>

A way to increase efficiency in agriculture is expressed by Strand and Heady as follows:

Efficiency of agriculture in our country varies in different areas and with different segments of the agricultural economy. In some areas and with some farming systems, efficiency is high; in others, it is low. How can we increase the efficiency of our agriculture? One way is to emphasize, more than has been done in the past, opportunities for production and to encourage shifts in resources in areas where efficiency of production is currently low. The consequent improvement of incomes of people in these areas will make for a healthier economy.<sup>8</sup>

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<sup>7</sup>Roger C. Woodworth and Fred B. Saunders, Evaluating Income Opportunities on North Georgia Farms, Bulletin N.S. 34 (Athens: Georgia Experiment Station, October 1956), p. 8.

<sup>8</sup>Edwin O. Strand and Earl O. Heady, Productivity of Resources Used on Commercial Farms, Technical Bulletin No. 1128 (Ames: Iowa Agricultural Experiment Station, November 1955), pp. 2-3.

Threefold benefits that might be derived from the analysis of the groups of records are as follows in the expression of Case and Johnston:

(1) The organization of the individual farm may be compared with the organization of other farms in the area or community, (2) the efficiency of each productive enterprise and each major item of input may be compared with returns and inputs on similar farms, (3) the earnings of the farm as a unit may be compared with the earnings of farms similar in size and systems of farming. The earnings from the various systems of farming may also be compared.<sup>9</sup>

When the number of farms under study is too large to make individual comparisons, groups may be formed on the basis of income and comparisons can be made conveniently.

Much use of the analysis of the farm records is made. "Complete analysis should point out 'strong' and 'weak' points in the organization and operation of the business."<sup>10</sup> By increasing the "strong" points and by eliminating or decreasing the "weak" points, the farm income may be increased. "Farm accounts serve a very useful purpose as a farm-management tool, which the individual producer can use as a basis for adequately finding out what he is doing and why and for providing ideas as to future improvements."<sup>11</sup>

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<sup>9</sup> H. C. M. Case and Paul E. Johnston, Principles of Farm Management (Chicago: J. B. Lippincott Company, 1953), p. 298.

<sup>10</sup> Emery N. Castle and Manning H. Becker, Farm Business Management (New York: The Macmillan Company, 1962), p. 99.

<sup>11</sup> J. Norman Efferson, Principles of Farm Management (New York: McGraw-Hill Book Company, Inc., 1953), p. 48.

Farmers generally have fewer years of formal education than their counterparts in the industrial sector of the economy. Often because of their lack of education, they will not be aware that some of the best methods of production are applicable to their particular situations. In a changing world, the ways of doing things must be constantly adjusted if one is to survive and the agricultural sector is no exception to this. The need for adjustment in a changing world may be put in the words of Castle and Becker as follows:

The function of management is to anticipate future conditions and to use available resources in light of these anticipations to achieve certain objectives. The greater the deviation of anticipated future conditions from those existing at present, the more important becomes the adjustment problem of the manager. That rapid change has characterized American agriculture in recent years is a matter of historical record. As far as the future is concerned, it appears that the only condition that can be taken as certain is that even more change is likely to occur. The magnitude of the underlying forces that affect both supply and demand conditions for agricultural commodities has not remained and will not remain constant. Examples of such forces that are constantly changing are the technology of production, and the size, income, and tastes of the consuming public.<sup>12</sup>

Because this country is surplus in food production, it does not necessarily follow that no more research is necessary to improve farming methods. To maintain the superior position in agriculture, it is necessary to continue research. Without research, this country may not be able to continue to compete in the world market. Modern farming is not only affected by the supply and demand conditions of the country in question, but also by the supply and demand conditions of the foreign

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<sup>12</sup>Castle and Becker, op. cit., p. 379.

countries. The world is becoming smaller and the impact of agriculture in one country on the other is increasing. According to Black, Clawson, Sayre and Wilcox, this concept is stated as follows:

The overwhelming facts of the situation are that modern agriculture cannot operate in isolation, but is closely tied in with the rest of the national economy; that it is also tied in inescapably, practically speaking, with the agriculture of the rest of the world, and the economies of other countries; and that the agriculture and the economies of other countries as well as our own, are in constant flux in large measure in unison with ours because of mutual interdependence and subjection to powerful common influences.<sup>13</sup>

#### Importance of the Study

Tennessee has shown a pronounced lag in its rate of increase in net farm income over the past number of years when compared to other southeastern states. Low farm income not only affects farmers, but also the other business sectors. Higher income to farmers means increased inputs. Increased inputs means increased demand in the business sector. With the higher income to farmers the whole agricultural community becomes more prosperous. So, to turn the low income farms into high income farms, it is necessary to know its organization and operation.

Identification of problems is the first and most difficult part of farm management research. A preponderance of low income farms is the major problem of farming in Tennessee. The reasons for this problem

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<sup>13</sup> John D. Black, Marion Clawson, Charles R. Sayre, and Walter W. Wilcox, Farm Management (New York: The Macmillan Company, 1947), p. 107.



have to be found to arrive at a workable solution. To find these reasons, the analysis of the farm business is a must.

In the present study an attempt has been made to analyze forty-two general farms in Tennessee for a period of four years from 1964 to 1967. It is hoped this analysis will permit the understanding of the problem and act as a means to bring forth a workable solution for the purpose of increasing farm incomes,

#### Selection of Data

The basic data was obtained from the records of Tennessee farms which fall under Unit-Test Demonstration Program. "The Unit-Test Demonstration Program is a three way partnership involving selected farm families, The University of Tennessee Agricultural Extension Service and the Tennessee Valley Authority."<sup>14</sup>

The basic data for forty-two general farms was selected for a four year period from 1964 to 1967, as far as possible using as a criteria that these are classified as general farms for at least three out of four years. These forty-two general farms are located in twenty-five counties of the state of Tennessee (Figure 2). These general farms cover all the six Crop Reporting Districts of Tennessee.

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<sup>14</sup> Agricultural Extension Service, Tennessee's Unit-Test Demonstration Program, SP 159 (Knoxville: The University of Tennessee, June 1966), p. 1.



### The Procedure

The forty-two selected general farms were divided into three groups for each year based on the family farm income. The highest income group had eleven farms and is referred to as the high income group in the analysis. The middle income group had twenty farms and the low income group had eleven farms.

The percentage change in family farm income and all the main factors affecting it was determined. All the values have been deflated to the 1964 price level using price indexes for the United States.

The correlation coefficient between family farm income and all other main factors affecting it was also calculated. The higher the coefficient the greater the relationship between the income and the factor.

## II. THE SCOPE AND LIMITATIONS OF THE STUDY

While measuring the success of a farm, there are social, aesthetic and other factors apart from the economic factors that have to be taken into account. This idea is described in the following manner:

A successful farm must provide a profitable farm business, a cheerful place in which to live, and a wholesome environment for children. It must allow the family a share in the better things of present-day civilization. This is the final measure of a successful farm.<sup>15</sup>

The goals of all the farmers may not be the same. One of the problems in analyzing the farm enterprise is to know the extent to which

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<sup>15</sup> Frank App and Allen G. Waller, Farm Economics, Management, and Distribution (Chicago: J. B. Lippincott Company, 1938), p. 1

increased maximum income is the goal of the farmer. So, while comparing the farm records of different farms, to have uniformity for the convenience of analysis, it is necessary to assume that income is the goal.

"Goal definition means that farmers must determine what provides satisfaction for them and their families,"<sup>16</sup>

Another assumption made was about the consistency of groupings. As the low, middle and high income groups are the statistical groupings for each year, all the farms that are in each group for each year are not the same. Some farms have maintained their grouping positions for all the four years. The remaining farms have either declined on the ladder or climbed up on the ladder of grouping during the course of the given four years. In spite of the change in grouping positions of some farms, it is assumed for the purpose of analysis that the net result is not inconsistent, though it may not be true always.

It may be argued that the present study is more concerned with what is rather than what ought to be, and so it may not be of much use to the farmers who want to adjust their farm operation and organization to improve their incomes. The study does not propose to give exact answers to all the existing problems of the individual farmers. It is an attempt to have the general understanding of the farm business, which would give some ideas to the farmers about the relationship between the different aspects of farm business, which would enable them to make adjustments for increased income.

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<sup>16</sup>Headley, op. cit., p. 11.

It may be argued that what is good for a group of farmers may not be the best alternative for the individual farmer. The farms selected for the Unit-Test Demonstration Program were "representative of the type of agriculture in the county."<sup>17</sup> And so the problems encountered in the study are the typical problems of the area and not the exceptional ones. Therefore, the individual farmers can be benefited by the study. The concept of adjustment on the individual farms in relation to the farming of the region is made clear by the statement of Bradford and Johnson:

They have thus usually adopted the system of farming prevalent in their communities, adjusted it to their own farms, and followed the practices usual to their areas.<sup>18</sup>

Tennessee is a state of variation. In the words of Ray and Hudson:

Significant variation in topography, soils, climate, and physiological conditions are encountered in moving from east to west Tennessee. These variations determine to a great extent the types of agriculture which are feasible and economical within given areas.<sup>19</sup>

Despite this variation, the present analysis can give a general picture of the common problems and the ways to solve them. It will be easier for the farmers then to know how to change situations for improvement.

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<sup>17</sup> Agricultural Economics Extension Department of The University of Tennessee, Criteria for Selection and Procedures for Activation of Test Demonstration Farms (Unpublished article, The University of Tennessee, 1965), p. 1.

<sup>18</sup> Bradford and Johnson, op. cit., p. 69.

<sup>19</sup> R. M. Ray and E. H. Hudson, Tennessee's Rapid Adjustment Program - An Analysis of the First Six Farms, Bulletin 443 (Knoxville: The University of Tennessee Agricultural Experiment Station, 1968), p. 7.

## CHAPTER II

### PHYSICAL AND ECONOMIC FEATURES OF TENNESSEE

#### I. PHYSICAL FEATURES

Topography. Tennessee is divided into three broad divisions: East, Middle and West. Since the state is so long from east to west, it crosses six well defined topographic divisions, viz., Unaka mountains, Great Valley of East Tennessee, Cumberland Plateau, Highland Rim, Central Basin and Gulf Coastal Plain. The surface slopes from east to west in general.

Soil. Fertile soil of limestone origin is in the Central Basin, the less elevated parts of the valley of East Tennessee, and parts of the outer portions of the Highland Rim. Along many of the rivers there are narrow strips of rich alluvium. On the mountains, on the ridges of the valley of East Tennessee and on the eastern slope of the East Gulf Plains, the soils vary greatly, according to the routes from which they are derived. The soil for the most part is sandy in the Cumberland Plateau, in the inner portion of the Highland Rim and in the higher parts of the western slope of the East Gulf Plains.

Climate. Tennessee has a temperate climate. The mean annual precipitation exceeds 55 inches in the higher areas and is more than 45 inches everywhere. Over most of the state, the average annual number of

days with snow cover is less than ten, and even in the mountains is less than thirty. At all seasons precipitation occurs. Over most of the state, average winter temperature is between 30 degrees and 40 degrees being somewhat higher in the Southeast. Average summer temperatures are higher than 75 degrees in the west and are lowest in the mountains of the east. Near Memphis, the average number of days without killing frost is 220, and declines to about 180 in the eastern mountains.

## II. ECONOMIC FEATURES

With the rise of industrial activity as a primary base of the state's economy and the decline in the relative importance of agriculture, the economic pattern in Tennessee has vastly changed since the 1930's. Industry is characterized by an even greater division of labor, and agriculture is increasingly mechanized. The influence of organized labor has grown much. It has led to state laws prohibiting closed and union shops.

About one-fourth of the population is engaged in agriculture. The non-agricultural labor force was distributed in the following manner in 1960, expressed as a percentage of the total: government, 15.6; manufacturing, 35.2; wholesale and retail trade, 21.4; service industries, 11.3; construction, 5.7; transportation, communications, and other public utilities, 6.1; mining and quarrying, 0.8; and finance, insurance and real estate, 3.9.

Income. Per capita personal income in Tennessee rose from \$377 in 1929 to \$1,565 in 1958. This represents a rise from 54 to 70 percent of the national average. Only 1.15 percent of the national income belonged to Tennessee which amounted to \$982 million. By 1946, the state's share of the national income had risen to 1.50 percent. Thereafter, it declined to 1.41 percent in 1955 and 1.39 percent in 1960. In 1960 it amounted to \$5,591 million. Relative decline in farm income was the main cause for this.

Agriculture. A long growing season and mild climate are conducive to the diversified farming in Tennessee. For almost all temperate zone crops precipitation is sufficient. Cotton, tobacco, corn, and hay are the chief crops, accounting for almost four-fifths of the cash crop income.

Tennessee is one of the nation's leading producers of cotton which is the state's largest cash crop. In 1963 and 1964, Tennessee ranked second among the southeastern states in cotton yield per acre, with an average of over 600 pounds per acre. Cotton growing is centered in West Tennessee.

In seventy-two of the state's ninety-five counties, tobacco is grown and ranks second in crop value. These seventy-two counties are mainly located in upper East Tennessee, northwest Middle Tennessee, and the northeastern part of West Tennessee. In terms of acreage corn and hay are the leading crops, but as sources of cash income are not as



important since they are principally used as feed crops. Soybeans also provide an important source of income.

Almost half of the cash farm income is derived from the sale of livestock and livestock products. There is an abundance of pasture and water and suitable conditions for the production of a variety of feeds which make Tennessee an excellent place for both beef and dairy cattle.

Land in farms in Tennessee declined from 18,493,000 acres to 16,081,285 acres between 1940 and 1959. The number of farms decreased much more rapidly in the same period. Their number fell from 247,617 to 157,688 resulting in an increase in average acreage from 74.7 to 102 acres.

Manufacturing. In the second half of the 20th Century, Tennessee has experienced a rapid industrial development. The number of manufacturing establishments and their employees approximately tripled from the early 1930's to the 1960's. Chemicals, food and kindred products, textiles, apparel, lumber and wood products, pulp and paper, furniture and fixtures, printing and publishing, primary metals, fabricated metals, leather and leather products were the chief industries. The giant aluminum plants at Alcoa, chemical plants at Kingsport and Old Hickory and newsprint mills at Calhoun are among the largest industrial installations.

Transportation. In Tennessee railway mileage was 4,078 miles in 1920. It had decreased to less than 3,500 miles by the 1960's. There

was a steady growth of the highway system which totaled more than 70,000 miles by the 1960's, of which about 8,000 miles were state roads and the remainder county. Highway trucking firms have taken over much freight formerly handled by railroads. Boats on the Tennessee and Cumberland rivers carry much additional freight.

Forests. Tennessee's forest lands totaled 12,408,000 acres in the 1960's and contributed a large portion of the state's agricultural and industrial income.

Minerals. Tennessee ranks about 27th among the states in the value of its mineral products. Coal, cement, stone, phosphate rock, zinc and copper are the principal minerals. Most of the copper mined in the southeastern states is produced by Tennessee. The coal producing area is in the Cumberland Plateau. From the eastern part of the state comes the building marble, for which the state is famous. In Middle Tennessee the phosphate deposits are localized.

Commerce and trade. An inland waterway totaling about 1,000 miles of navigable canal is provided by the Mississippi, Tennessee and Cumberland rivers.

In Tennessee's economy commerce is an important factor. About 140,000 persons were employed in retail trades in 1963 and their sales totaled \$4,009,128,000. About 60,000 persons were employed by wholesale establishments.

Population. In 1860, 95.8 percent of population in Tennessee was rural and in 1950 it was 55.9 percent. By 1960, 52.3 percent was the urban population.

## CHAPTER III

### ANALYSIS OF THE GENERAL FARMS

#### The Relationship Between Family Farm Income and the Given Factors

The present study is mainly concerned with general farms. "Farms were classified as general farms if 50 percent of the gross farm income did not come from beef, swine, and sheep enterprises as a group or from the dairy enterprises."<sup>20</sup>

In the present analysis, family farm income is taken as the unit for the purpose of comparison instead of net cash farm income, because the former gives a more realistic picture of the farmer's success than the latter because it takes into account the inventory changes. Family farm income is the "gross farm income minus total farm expenses. It is the amount of income the farm family earned with labor, capital and management."<sup>21</sup>

"A study of farm income over a period of years serves as a strong reminder of the many factors causing change."<sup>22</sup> There is a vast array of factors that affect farm income and all of them cannot

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<sup>20</sup> Agricultural Economics Extension Department of The University of Tennessee, Farm Business Analysis for General Farm (unpublished article, The University of Tennessee, 1967), p. 1.

<sup>21</sup> Ibid., p. 2.

<sup>22</sup> National Fertilizer Development Center, Income Estimates and Related Statistics - Elk River Counties, 1959-1967 (unpublished booklet, Tennessee Valley Authority, 1969), p. 1.

be considered in one study. Factors like the age, education, motivational level of farmers are not considered in the present study. Major economic factors like value of farm inventories, farm receipts, expenses, value of crops. Major physical factors like the total acres, open acres, yield per acre of major crops are considered. In other words, those factors that could be altered by the farmers to increase their farm income are considered, which may be called the dynamic factors.

#### The Grouping of the Farms

Before going to regular analysis, it is necessary to know that many farms remained in the same income group and how many changed their groupings. Only twelve farms out of forty-two remained in the same groups for all of the four years. There were only two farms which remained in the high income group for all four years. For the middle income group, it was eight farms and for the low income group, it was only two. The remaining thirty farms have changed their groupings for one or more years during the same four year period.

But, if the groupings for 1965 and 1966 are ignored and the groupings are considered for a period of four years as a whole, then the following was the outcome:

Both in 1964 and 1967, twenty-one farms out of forty-two remained in the same groupings. Six farms remained in high income group, eleven farms remained in the middle income group, and four farms remained in

the low income group. From 1964 to 1967, twenty-one farms had changed their groupings. Out of these twenty-one farms, ten farms had improved their group positions as follows: five farms had gone to the middle income group from the low income group; three farms had gone to high income group from the middle income group; and two farms had gone to the high income group from the low income group.

For the same period from 1964 to 1967, the remaining eleven farms had gone down in their group positions. Four farms had gone to the middle income group from the high income group; six farms had gone from the middle to the low income group; and only one farm had gone from the high income group to the low income group.

#### Correlation Coefficient Between the Family Farm Income and the Factors

In the analysis a fourth "group" is also considered. That is, for some purposes all of the forty-two farms are included as a single group. The fourth group consists of the average of each factor for all of the farms for each year. Similarly, the fourth group for family farm income consists of the average of family farm income for all farms for each year. Correlation coefficient has been found for each group in the factor to the corresponding group in the family farm income. So, there are four correlation coefficients for each factor.

Correlation coefficients between family farm income and the different factors were found by using the formula:

$$r = \frac{\Sigma xy}{\sqrt{(\Sigma x^2)(\Sigma y^2)}}$$

$r \geq 0.878$ <sup>23</sup> is considered to be significant (at 95 percent level).

$r \geq 0.959$ <sup>24</sup> is considered to be highly significant (at 99 percent level).

### Family Farm Income

Before starting the comparisons between family farm incomes and the factors, a clear idea about the family farm income situation is a necessity. Table 3 shows various family farm income groups for each year. When change in family farm income is considered over the period from 1964 to 1967, it rose for all the groups. The percentage increase was highest for the middle income group with 22.7 and it was lowest for the high income group with 14.8. For low income group and all income group, it was 22.0 and 19.7, respectively. When percentage change is considered from year to year, there was an increase for all groups from 1964 to 1965 and from 1965 to 1966. For the year 1966-1967, the middle and high income groups experienced a decrease in the family farm income. While the low income group had an increase in family farm income from 1966 to 1967, it is only 1.1 percent. The highest percent increase was

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<sup>23</sup>Robert G. D. Steel and James H. Torrie, Principles and Procedures of Statistics (New York: McGraw Hill Book Company, Inc., 1960), p. 453.

<sup>24</sup>Ibid., p. 453.

TABLE 3  
 DEFLATED<sup>a</sup> AVERAGE OF FAMILY FARM INCOME FOR THE GROUPS  
 OF FARMS FROM 1964 TO 1967 AND THE PERCENT CHANGE

Year	Income Group	Deflated Average of Family Farm Income	Percent Change (Yearly)	Percent Change (1964 to 1967)
1964	Low	450		
1965		409	4.2	22.0
1966		543	15.8	
1967		549	1.1	
1964	Middle	1,747		
1965		2,058	17.8	14.8
1966		2,771	34.6	
1967		2,143	-22.8	
1964	High	4,791		
1965		6,582	37.4	14.8
1966		7,683	16.7	
1967		5,626	-26.8	
1964	All farms	2,205		
1965		2,827	28.2	19.7
1966		3,474	22.8	
1967		2,638	-24.1	

<sup>a</sup>United States Bureau of the Census, Statistical Abstract of the United States, 1968 (Washington, D.C.: Government Printing Office, 1968), Consumer Price Index, p. 347.



for the high income group for 1964 to 1965 and the lowest percent increase was for the low income group for 1966 to 1967. The highest percent decrease was for the high income group for 1966 to 1967 and the lowest percent decrease was for the middle income group for 1966 to 1967.

### Farm Inventories

Farm inventories constitute the major cost in farming. It costs too much for the farmer to have excess inventories due to increasing opportunity cost. In the traditional societies, due to limited opportunities outside agriculture, land is considered to be the greatest of all assets and in such societies the income from such an asset is not as important as in the modern society. Land is the most important of all the farm inventories in terms of cost. When a farmer has surplus inventories, he must either rise to the occasion and make use of them most efficiently or he should dispense with some of them to bring them down to his managerial capacity. When the managerial capacity of a person is fixed, then a large farm which may be running under loss may be made a profitable farm by dispensing with the excess inventories.

Total inventories. Comparison between the family farm income and the value of total inventories gives an idea to what extent it is economical to have the inventories. Table 4 shows that none of the groups is significantly correlated. The low income group is negatively correlated with correlation coefficient  $-0.3836$  and the middle, high, and all income groups are positively correlated with correlation coefficients

TABLE 4  
 DEFLATED<sup>a</sup> AVERAGE OF THE VALUE OF TOTAL INVENTORIES FOR FARM  
 GROUPS FROM 1964 TO 1967 AND THE PERCENT CHANGE

Year	Income Group	Deflated Average of Total Inventories	Percent Change Yearly	Percent Change 1964-67	Correlation Coefficient
1964	Low	32,415			-0.3836
1965		27,829	-14.1	-28.7	
1966		32,717	17.6		
1967		23,096	-29.4		
1964	Middle	31,112			0.2650
1965		32,956	5.9	17.7	
1966		33,168	0.6		
1967		36,643	10.5		
1964	High	52,988			0.0783
1965		47,222	-10.9	0.2	
1966		55,266	17.0		
1967		53,106	- 3.9		
1964	All farms	37,183			0.4548
1965		35,350	- 4.9	0.6	
1966		38,838	9.8		
1967		37,407	- 3.7		

<sup>a</sup>United States Department of Agriculture, Agricultural Statistics, 1968 (Washington, D.C.: Government Printing Office, 1968), Farm Real Estate Value, p. 430.

0.2650, 0.0783, and 0.4548, respectively. The reason for the low income group being negatively correlated is of crucial importance. It may be due to excess of inventories or due to bad management. The actual figures of the weighted average of total inventories show that for the low income group, it is less than that of the other groups. So the possibilities of excess of inventories is ruled out. Then the alternative reason is bad management. Again, there may be two reasons for bad management. One is due to the inefficient farm managers and the other is the concentration on the off-farm income which might not have given enough scope to manage the farm profitably. As it was observed earlier, only two farms remained in the low income group for all the four years. The reason for low income for these two farms may be due to inefficient management. Many of the remaining nine farms, for each year following 1964, are the farms which occupied positions either in the middle or the high income group in 1964. The reason for lowering of income for these groups may possibly be due to the concentration on the off-farm employment.

It is necessary to see the constituents of the total inventories to get an idea as to how they are related to family farm income individually. Land, buildings, feed and supplies, livestock, machinery and equipment are the different constituents of total inventories which are shown in Tables 5, 6, 7, 8, and 9, respectively.

Land. The land value is negatively correlated with family farm income as far as low, middle, and high income groups are concerned. But

TABLE 5  
 DEFLATED<sup>a</sup> AVERAGE OF LAND VALUE FOR FARM GROUPS  
 FROM 1964 TO 1967 AND THE PERCENT CHANGE

Year	Income Group	Deflated Average of Land Value	Percent Change Yearly	Percent Change 1964-67	Correlation Coefficient
1964	Low	16,027			
1965		20,701	29.2	22.0	-0.7604
1966		13,504	-34.8		
1967		12,501	- 7.4		
1964	Middle	15,790			
1965		16,576	5.0	19.1	-0.0909
1966		15,860	- 4.3		
1967		18,808	19.1		
1964	High	26,655			
1965		20,495	-23.1	- 4.7	-0.1021
1966		27,120	32.3		
1967		25,421	- 6.3		
1964	All farms	18,698			
1965		18,683	0.1	-42.1	0.1338
1966		18,193	- 2.6		
1967		10,828	-40.5		

<sup>a</sup>United States Department of Agriculture, Agricultural Statistics, 1968 (Washington, D.C.: Government Printing Office, 1968), Farm Real Estate Value, p. 430.

TABLE 6

DEFLATED<sup>a</sup> AVERAGE OF THE VALUE OF BUILDINGS FOR FARM GROUPS  
FROM 1964 TO 1967 AND THE PERCENT CHANGE

Year	Income Group	Deflated Average of Value of Buildings	Percent Change Yearly	Percent Change 1964-67	Correlation Coefficient
1964	Low	5,504			-0.8587
1965		3,777	-31.4	-45.4	
1966		3,317	-12.2		
1967		3,005	-9.4		
1964	Middle	4,260			0.6042
1965		5,022	17.9	-10.3	
1966		5,275	5.0		
1967		3,820	-27.6		
1964	High	8,254			-0.7993
1965		7,091	-14.1	-17.7	
1966		6,300	-11.2		
1967		6,632	5.3		
1964	All farms	5,632			-0.2801
1965		5,238	-7.0	-22.9	
1966		5,031	-4.0		
1967		4,343	-13.7		

<sup>a</sup>United States Department of Agriculture, Agricultural Statistics, 1968 (Washington, D.C.: Government Printing Office, 1968), Farm Real Estate Value, p. 430.

TABLE 7

DEFLATED<sup>a</sup> AVERAGE OF THE VALUE OF FEED AND SUPPLIES FOR FARM  
GROUPS FROM 1964 TO 1967 AND THE PERCENT CHANGE

Year	Income Group	Deflated Average of Value of Feed and Supplies	Percent Change Yearly	Percent Change 1964-67	Correlation Coefficient
1964	Low	2,696			-0.9329
1965		1,641	-39.1	-76.9	
1966		1,004	-38.8		
1967		623	-37.9		
1964	Middle	1,841			0.2606
1965		1,711	- 5.7	39.3	
1966		2,060	20.4		
1967		2,526	22.6		
1964	High	3,110			0.9706
1965		3,632	16.8	8.7	
1966		4,422	21.8		
1967		3,382	-23.5		
1964	All farms	2,397			0.1002
1965		2,196	- 8.4	- 6.0	
1966		2,402	9.4		
1967		2,252	- 6.2		

<sup>a</sup>United States Department of Agriculture, Agricultural Statistics, 1968 (Washington, D.C.; Government Printing Office, 1968), Prices Received by Farmers for Feed and Supplies, p. 470.

TABLE 8

DEFLATED<sup>a</sup> AVERAGE OF THE VALUE OF LIVESTOCK FOR FARM GROUPS  
FROM 1964 TO 1967 AND THE PERCENT CHANGE

Year	Income Group	Deflated Average of Value of Livestock	Percent Change Yearly	Percent Change 1964-67	Correlation Coefficient
1964	Low	4,156			
1965		3,941	- 5.2	-43.5	-0.9841
1966		2,815	-28.6		
1967		2,349	-16.6		
1964	Middle	4,283			
1965		4,039	- 5.7	32.7	0.0243
1966		4,359	7.9		
1967		5,684	30.4		
1964	High	9,125			
1965		8,570	- 6.1	10.1	-0.5208
1966		8,764	2.7		
1967		10,049	14.7		
1964	All farms	5,518			
1965		5,200	- 5.8	7.9	-0.5946
1966		5,108	- 1.8		
1967		5,954	16.6		

<sup>a</sup>United States Department of Agriculture, Agricultural Statistics, 1968 (Washington, D.C.: Government Printing Office, 1968), Prices Received by Farmers for Livestock and Products, p. 470.

TABLE 9

DEFLATED<sup>a</sup> AVERAGE OF THE VALUE OF MACHINERY AND EQUIPMENT FOR  
FARM GROUPS FROM 1964 TO 1967 AND THE PERCENT CHANGE

Year	Income Group	Deflated Average of Value of Machinery and Equipment	Percent Change Yearly	Percent Change 1964-67	Correlation Coefficient
1964		5,031			
1965	Low	5,002	- 0.6	- 1.9	-0.8016
1966		4,782	- 4.4		
1967		4,934	3.2		
1964		4,856			
1965	Middle	5,353	10.2	0.5	0.4819
1966		5,220	- 2.5		
1967		4,880	- 6.5		
1964		6,557			
1965	High	6,985	6.5	32.6	0.3161
1966		7,964	14.0		
1967		8,696	9.2		
1964		5,347			
1965	All farms	5,689	6.4	10.2	0.6797
1966		5,824	2.4		
1967		5,894	1.2		

<sup>a</sup>United States Department of Agriculture, Agricultural Statistics, 1968 (Washington, D.C.: Government Printing Office, 1968), Price of Industrial Production, p. 430.



none of them is significant. However, for the low income group, correlation coefficient =  $-0.7604$  which is near significance level.

Buildings. In the value of buildings (Table 6), no group is significantly correlated. Low, high, and all income groups are negatively and middle income group is positively correlated. But low and high income groups have correlation coefficients =  $-0.8527$  and  $-0.7993$  which are near the significance level.

Feed and supplies, Table 7 shows how the value of feed and supplies is related to family farm income. Low and high income groups are significantly and highly significantly correlated with family farm income with correlation coefficients =  $-0.9329$  and  $0.9706$ , respectively. This negative sign for low income group shows that the inverse in value of feed and supplies decreases the family farm income. There is a high percent decrease ( $-76.9$  percent) in the value of feed and supplies from 1964 to 1967 and for the same period there is a 22 percent increase in family farm income. The highly significant correlation of the high income group is noteworthy. For this group the farm income may be further increased by increased investment on feed and supplies.

Livestock. The low income group of the value of livestock (Table 8) is highly significantly correlated with family farm income with correlation coefficient =  $-0.9841$ . This value corresponds with the value of feed and supplies for the same income group. This means that for the

low income group, the lower value of livestock and feed and supplies are associated with higher income.

Machinery and equipment. The efficiency of modern agriculture has increased due to mechanization. Those farmers who are not efficient are left behind. The way to increase efficiency of labor is mechanization. If machinery is not used properly during a particular year, it does not mean it should be dispensed with. On the contrary, it should be retained and proper use of it be made. This theory holds good for the low income group in Table 9, page 34, which has a correlation coefficient of  $-0.8016$ . The all income group has a correlation coefficient  $= 0.6797$  which gives an indication that the efficiency of machines is considerable when all the farms are taken as a whole. So, as a general recommendation to the farmers of the Test Demonstration Program, it could be said that it is relevant to mechanize the farms.

#### Productive Man Work Units

Productive man work units is one of the measures of performance which shows the general effectiveness with which labor is employed. Table 10 shows that middle, high, and all income groups are positively correlated which means that as labor increases, the farm income increases which conforms to the intuitive feeling.

#### Total Open Acres

Size of business is a measure of performance and the area of the farm is a measure of size of business and can be used to compare the

TABLE 10  
 AVERAGE OF THE PRODUCTIVE MAN WORK UNITS FOR THE FARM GROUPS  
 FROM 1964 TO 1967 AND THE PERCENT CHANGE

Year	Income Group	Average of Productive Man Work Units	Percent Change Yearly	Percent Change 1964-67	Correlation Coefficient
1964	Low	134			-0.9006
1965		158	17.9	-35.8	
1966		94	-40.5		
1967		86	- 8.5		
1964	Middle	150			0.4567
1965		142	5.3	43.3	
1966		186	31.0		
1967		215	15.6		
1964	High	119			0.5060
1965		215	80.7	207.6	
1966		320	48.8		
1967		366	14.4		
1964	All farms	138			0.2424
1965		165	19.6	60.1	
1966		173	4.8		
1967		221	27.7		

farms of similar enterprises. Table 11 shows that for the middle, high, and all income groups, as the size of the cropped area increases, the farm income increases. The mere increase in the cultivated area would not have increased the farm income without labor efficiency. For middle, high and all income groups, there is substantial increase in the number of open acres over a period from 1964 to 1967. The percent increase is 33.3, 82.4, and 34.3 for the middle, high, and all income groups, respectively. This trend of increase in open acres increasing the farm income is well manifested in today's American agriculture where the size of the farms is on the increase and the number of farms is on the decrease.

#### Farm Receipts

Gross farm income. Generally, gross farm income is closely related to net farm income. The relationship between the gross farm income and family farm income gives the clue to which direction the farm has to move, i.e., whether it has to expand or contract the business or stay where they are. For a low profit farm, it will be useful to increase size as long as the proportion of expenses is the same or decreasing or negligibly increasing. Table 12 reveals that for the middle income group, the gross farm income is significantly correlated with family farm income with correlation coefficient = 0.9306. In such a case it could be said that it will definitely increase the family farm income by increasing the farm business if the proportion of expenses is

TABLE 11

AVERAGE OF TOTAL OPEN ACRES FOR THE FARM GROUPS FROM  
1964 TO 1967 AND THE PERCENT CHANGE

Year	Income Group	Average of Total Open Acres	Percent Change Yearly	Percent Change 1964-67	Correlation Coefficient
1964		100			
1965	Low	127	27.0	-12.0	-0.7363
1966		70	44.9		
1967		88	25.7		
1964		105			
1965	Middle	104	- 1.0	33.3	0.4786
1966		125	20.2		
1967		140	12.0		
1964		108			
1965	High	143	32.4	82.4	0.5872
1966		192	34.3		
1967		197	2.6		
1964		105			
1965	All farms	120	14.3	34.3	0.4698
1966		128	6.7		
1967		141	10.2		

TABLE 12

DEFLATED<sup>a</sup> AVERAGE OF GROSS FARM INCOME FOR THE FARM GROUPS  
FROM 1964 TO 1967 AND THE PERCENT CHANGE

Year	Income Group	Deflated Average of Gross Farm Income	Percent Change Yearly	Percent Change 1964-67	Correlation Coefficient
1964	Low	8,128			-0.9640
1965		8,460	4.1	-41.3	
1966		4,155	-50.9		
1967		4,774	14.9		
1964	Middle	6,426			0.9306
1965		8,211	27.8	52.7	
1966		11,117	35.4		
1967		9,815	-11.7		
1964	High	18,066			0.7102
1965		22,571	24.9	49.5	
1966		28,116	24.6		
1967		27,008	- 3.9		
1964	All farms	9,920			0.8628
1965		12,037	21.3	31.0	
1966		13,746	14.2		
1967		12,998	- 5.4		

<sup>a</sup>United States Department of Agriculture, Agricultural Statistics, 1968 (Washington, D.C.: Government Printing Office, 1968), Prices Received by Farmers, p. 470.

maintained in either of the three ways mentioned above. For high and all income groups, the correlation coefficients = 0.7102 and 0.8628, respectively, which are near to the significance level. Because correlation coefficient = 0.8628 for all income group, it could be generalized that for farms in the region of study it is worth while to increase the gross farm income under the prevalent conditions.

Capital assets. Table 13 shows that there is a general trend of increased family farm income with the increased capital assets. For the middle income group, it is highly significant with correlation coefficient = 0.9958 and for the all income group it is significant with correlation coefficient = 0.8908 and for the high income group, it is near the significant level with a correlation coefficient = 0.8183. From this trend it could be said that it pays to increase the capital assets.

Increase in inventory. When a farm has optimum inventories, then increase in inventories may cause to reduce the farm income accordingly. But when the farm has less than optimum inventories, then it pays to increase the inventories as long as the optimum level is not reached. So the relationship between the value of increase in inventory and family farm income shows whether, for the farm groups, the optimum level of inventory exists or not. Table 14 reveals that there is a general trend which is quite significant of increase in family farm income with the increase in the value of increase in inventory. For middle and all income groups, correlation coefficients were 0.8919 and 0.9394,

TABLE 13

DEFLATED<sup>a</sup> AVERAGE OF CAPITAL ASSETS FOR FARM GROUPS  
FROM 1964 TO 1967 AND THE PERCENT CHANGE

Year	Income Group	Deflated Average of Capital Assets	Percent Change Yearly	Percent Change 1964-67	Correlation Coefficient
1964		240			
1965	Low	201	16.3	-100.0	-0.9984
1966		0	-100.0		
1967		0	--		
1964		30			
1965	Middle	157	423.3	596.7	0.9958
1966		412	162.4		
1967		209	-49.3		
1964		319			
1965	High	369	15.7	60.8	0.8183
1966		2,624	611.1		
1967		125	-95.2		
1964		161			
1965	All farms	224	39.1	-18.1	0.8908
1966		883	294.2		
1967		132	-85.1		

<sup>a</sup>United States Department of Agriculture, Agricultural Statistics, 1968 (Washington, D.C.: Government Printing Office, 1968), Prices Received by Farmers, p. 470.



TABLE 14

DEFLATED<sup>a</sup> AVERAGE OF THE VALUE OF INCREASE IN INVENTORY FOR  
FARM GROUPS FROM 1964 TO 1967 AND THE PERCENT CHANGE

Year	Income Group	Deflated Average of Increase in Inventory	Percent Change Yearly	Percent Change 1964-67	Correlation Coefficient
1964		2,008			
1965	Low	613	-69.5	-82.9	-0.7941
1966		390	-36.4		
1967		343	-12.1		
1964		894			
1965	Middle	1,368	53.0	10.5	0.8910
1966		1,792	31.0		
1967		988	-44.9		
1964		1,829			
1965	High	3,634	88.7	204.0	0.7487
1966		6,570	80.8		
1967		5,561	-15.4		
1964		1,431			
1965	All farms	1,764	23.3	41.0	0.9394
1966		2,676	51.7		
1967		2,017	-24.6		

<sup>a</sup>United States Department of Agriculture, Agricultural Statistics, 1968 (Washington, D.C.; Government Printing Office, 1968), Farm Real Estate Value, p. 430.

respectively, which are significant. For the high income group, the correlation coefficient was 0.7487 which is near the significance level. So with this trend, it could be said that it pays to increase the value of inventory.

Government payments. It could be expected from the economic point of view that government payments increase the farm income; such is the case with the farms under study. For all the groups, government payments (Table 15) are positively related to family farm income. For low, middle, high and all income groups, the correlation coefficients were 0.7480, 0.9687, 0.5148, and 0.7759 in the same order, out of which for the middle income group it is highly significant. Though there is positive relationship for all groups, to increase the government payment involves the political aspect and, therefore, this cannot be recommended as a measure to increase the farm income under normal conditions.

Crop receipts. For any general farm crop receipts is one of the major items of receipts. So proper crop management could be expected to lead to a higher income. In Table 16 middle and all income groups are significantly correlated with correlation coefficients which were 0.9032 and 0.8906, respectively. This shows that for the region of the study, as a general measure it could be advocated that it pays to increase crops. For high and low income groups, correlation coefficients were -0.8692 and -0.6842, respectively. This negative relationship may be due to the high cost of production of crops. In such a case, probably

TABLE 15  
 DEFLATED<sup>a</sup> AVERAGE OF GOVERNMENT PAYMENTS FOR FARM GROUPS  
 FROM 1964 TO 1967 AND THE PERCENT CHANGE

Year	Income Group	Deflated Average of Government Payments	Percent Change Yearly	Percent Change 1964-67	Correlation Coefficient
1964		0			
1965	Low	548			0.7480
1966		483	-11.9	40.5	
1967		803	66.3		
1964		0			
1965	Middle	410			0.9687
1966		1,085	164.6	61.2	
1967		661	-39.1		
1964		0			
1965	High	530			0.5148
1966		1,191	124.7	168.4	
1967		1,424	19.6		
1964		0			
1965	All farms	478			0.7759
1966		955	99.8	87.9	
1967		898	- 6.0		

<sup>a</sup>United States Bureau of the Census, Statistical Abstract of the United States, 1968 (Washington, D.C.: Government Printing Office, 1968), Consumer Price Index, p. 347.

TABLE 16  
 DEFLATED<sup>a</sup> AVERAGE OF CROP RECEIPTS FOR FARM GROUPS  
 FROM 1964 TO 1967 AND THE PERCENT CHANGE

Year	Income Group	Deflated Average of Crop Receipts	Percent Change Yearly	Percent Change 1964-67	Correlation Coefficient
1964	Low	2,026			-0.6842
1965		3,404	68.1	-23.7	
1966		1,330	-60.9		
1967		1,545	16.2		
1964	Middle	2,418			0.9032
1965		2,716	12.3	- 8.2	
1966		5,246	93.2		
1967		2,219	-57.8		
1964	High	4,583			-0.8692
1965		4,188	- 8.6	5.9	
1966		3,785	- 9.6		
1967		4,855	28.3		
1964	All farms	2,882			0.8906
1965		3,282	13.9	- 5.2	
1966		3,838	16.9		
1967		2,733	-28.8		

<sup>a</sup>United States Department of Agriculture, Agricultural Statistics, 1968 (Washington, D.C.: Government Printing Office, 1968), Prices Received by Farmers for All Crops, p. 470.

it may be more beneficial to reduce the cost of crop production instead of reducing the crop receipts unless the crops are produced at the minimum cost.

Livestock receipts. Livestock is one of the major forms of receipts. For the farms under study, livestock receipts make up more than any other form. The percentage change for different groups is considered over a period of years from 1964 to 1967 (Table 17) and for all groups it has increased. For low, middle, high and all income groups, the percent increase is 9.6, 28.6, 63.3, and 31.4, respectively. Middle, high and all income groups are positively correlated with correlation coefficients of 0.6416, 0.5967 and 0.6937, respectively. But the low income group the correlation of livestock receipts with income was -0.9249 and the reason for this might be the high cost of production of livestock.

Miscellaneous receipts. All groups of miscellaneous receipts (Table 18) have decreased. The percent decrease is -29.1, -43.7, -54.4, and -47.6 for low, middle, high and all income groups, respectively. Only the middle income group is significantly correlated with a correlation coefficient of -0.8861 and the high and all income groups have correlation coefficients of -0.8050 and -0.8127 which are near the significant level. The low income group has a low correlation coefficient of -0.1866.

TABLE 17

DEFLATED<sup>a</sup> AVERAGE OF LIVESTOCK RECEIPTS FOR FARM GROUPS  
FROM 1964 TO 1967 AND THE PERCENT CHANGE

Year	Income Group	Deflated Average of Livestock Receipts	Percent Change Yearly	Percent Change 1964-67	Correlation Coefficient
1964	Low	3,012			-0.9249
1965		3,595	19.4	9.6	
1966		1,666	-53.7		
1967		1,517	- 8.9		
1964	Middle	3,889			0.6416
1965		3,045	-21.7	28.6	
1966		5,188	70.4		
1967		5,003	- 3.6		
1964	High	8,223			0.5967
1965		12,730	54.8	63.3	
1966		12,333	3.1		
1967		13,429	8.9		
1964	All farms	4,794			0.6937
1965		5,726	19.4	31.4	
1966		6,137	7.2		
1967		6,297	2.6		

<sup>a</sup>United States Department of Agriculture, Agricultural Statistics, 1968 (Washington, D.C.: Government Printing Office, 1968), Prices Received by Farmers for Livestock and Products, p. 470.

TABLE 18

DEFLATED<sup>a</sup> AVERAGE OF MISCELLANEOUS RECEIPTS FOR FARM  
GROUPS FROM 1964 TO 1967 AND THE PERCENT CHANGE

Year	Income Group	Deflated Average of Miscellaneous Receipts	Percent Change Yearly	Percent Change 1964-67	Correlation Coefficient
1964		842			
1965	Low	130	-84.6	-29.1	-0.1866
1966		305	134.6		
1967		597	95.7		
1964		833			
1965	Middle	382	-54.1	-43.7	-0.8861
1966		211	-44.8		
1967		469	122.3		
1964		3,112			
1965	High	657	-78.9	-54.4	-0.8050
1966		1,006	53.1		
1967		1,418	41.0		
1964		1,432			
1965	All farms	388	-72.9	-47.6	-0.8127
1966		457	17.8		
1967	751	64.3			

<sup>a</sup>United States Department of Agriculture, Agricultural Statistics, 1968 (Washington, D.C.: Government Printing Office, 1968), Prices Received by Farmers, p. 470.

## Farm Expenses

Total farm expenses. Farm economy does not lie in how little one spends but how wisely one spends. Increasing expenditures do not necessarily mean the lowering of income. When the increased expenditure brings increased income, it means money has been spent economically. On the contrary, if the increased expenditures has decreased income, it means that money has not been spent economically. Table 19 shows that expenditures for middle, high and all income groups have increased with the family farm income. The percent increase over the period of years is 16.2, 65.5, and 33.4 for middle, high, and all income groups. But for the low income group, there is -44.4 percent decrease in expenses. Only the middle income group is significantly correlated among the positively correlated groups with correlation coefficient of 0.9167, and the high and all income groups have correlation coefficients of 0.4848 and 0.7453, respectively. This trend gives a clue that, generally speaking, the farms are operating with a good deal of economy. But the low income group has a correlation coefficient of -0.9421 which is significant as it shows that there is no economy in spending for this group. This fact is evidence to the gross farm income being negatively correlated (correlation coefficient = -0.9640) in Table 12, page 40, for the low income group.

Cost of hired labor. In an affluent country like the United States there is no wonder that the cost of labor is high. There are two



TABLE 19

DEFLATED<sup>a</sup> AVERAGE OF TOTAL FARM EXPENSES FOR FARM GROUPS  
FROM 1964 TO 1967 AND THE PERCENT CHANGE

Year	Income Group	Deflated Average of Total Farm Expenses	Percent Change Yearly	Percent Change 1964-67	Correlation Coefficient
1964		8,047			
1965	Low	8,851	7.3	-44.4	-0.9421
1966		4,230	-54.1		
1967		4,890	12.9		
1964		6,751			
1965	Middle	6,496	- 6.1	16.2	0.9167
1966		10,699	58.2		
1967		8,572	-21.8		
1964		13,932			
1965	High	16,916	18.5	65.6	0.4848
1966		23,623	34.2		
1967		25,220	4.2		
1964		8,971			
1965	All farms	9,842	9.7	33.4	0.7453
1966		12,390	25.9		
1967		11,968	- 3.4		

<sup>a</sup>United States Department of Agriculture, Agricultural Statistics, 1968 (Washington, D.C.; Government Printing Office, 1968), Prices Paid by Farmers for All Commodities Bought Including Interest, Taxes, and Wage Rates, p. 471.

alternatives to decrease labor costs. One is mechanization and the other is using family labor. All the work on the farm may not be done by machines. There are two reasons for this. Either the machines may not be able to do some particular farm job or, in cases where the work is too small to be done by machines, it may be less costly to hire the labor when the farm family is either engaged in work on the farm or has off-farm employment. In such cases it is unavoidable to hire the labor though it is costly. Table 20 shows that except for the middle income group, all the remaining groups show negative correlation. For the middle income group, the correlation coefficient of 0.7992 which is near the level of significance and so for this group, it is all right to hire the labor. For the low, high and all income groups, correlation coefficients = -0.5109, -0.8674, and -0.5702, respectively, and with the present data, it cannot be said whether this cost is avoidable or unavoidable for the above mentioned groups.

Cost of feed purchased. The cost of feed purchased has some peculiar characteristics associated with it. When the type of feed purchased is cheap but does not have much effect on the final product, it will be worthwhile to add or substitute some feed though it may be apparently costly, but has a desired effect on the final product. In some other cases, the cost of feed may be costly and still it may not have the desired effect because of the wrong proportion of the feed mixture. By having the right proportion in the feed mixture, it may apparently increase the cost but may increase the income much more or it

TABLE 20

DEFLATED<sup>a</sup> AVERAGE OF THE COST OF LABOR HIRED FOR FARM GROUPS  
FROM 1964 TO 1967 AND THE PERCENT CHANGE

Year	Income Group	Deflated Average of Cost of Labor Hired	Percent Change Yearly	Percent Change 1964-67	Correlation Coefficient
1964		280			
1965	Low	898	220.7	-15.7	-0.5109
1966		217	-75.8		
1967		236	8.8		
1964		315			
1965	Middle	270	-14.3	1.0	0.7992
1966		401	48.5		
1967		318	-20.7		
1964		1,738			
1965	High	1,246	-28.3	-17.7	-0.8674
1966		1,280	2.7		
1967		1,430	11.7		
1964		679			
1965	All farms	690	1.6	-13.4	-0.5702
1966		583	15.5		
1967		588	0.9		

<sup>a</sup>United States Department of Agriculture, Agricultural Statistics, 1968 (Washington, D.C.: Government Printing Office, 1968), Prices Paid by Farmers as Wage Rates for Hired Farm Labor, p. 471.

may decrease the cost and increase the income. Table 21 shows that the middle and high income groups are positively correlated and the low and all income groups are negatively correlated and none among the four groups is significant.

Cost of fertilizer and lime. Cost of fertilizer and lime also has some peculiar characteristics associated with it. Time, the proper mixture, and method of application are important whether cost is more or less. Just because cost has negative relationship with farm income, it does not necessarily mean that there is an excess of the use of fertilizer and lime. It might be due to improper use which might have had an adverse effect on yield. It may be due to applying less than the minimum requirement even with substantial cost but not enough to have sufficient effect to increase the yield. So the effect of cost of fertilizer and lime on farm income without some other considerations may not give a meaningful idea. Table 22 shows the cost of fertilizer and lime and its association with family farm income. Though for the low income group, the correlation coefficient =  $-0.9752$  which is highly significant, at once it cannot be said that there is excess of the use of fertilizer and lime. On the other hand, deflated average of the cost of fertilizer and lime shows that, for the low income group as a whole, it is less than that of any other group as a whole. So to get a meaningful idea, it is necessary to consider some other details which were discussed above. Middle and high income groups have positive and all income group has negative relationship with family farm income.

TABLE 21

DEFLATED<sup>a</sup> AVERAGE OF THE COST OF FEED PURCHASED FOR FARM  
GROUPS FROM 1964 TO 1967 AND THE PERCENT CHANGE

Year	Income Group	Deflated Average of Cost of Feed Purchased	Percent Change Yearly	Percent Change 1964-67	Correlation Coefficient
1964	Low	548			
1965		790	44.2	-16.2	-0.7165
1966		282	-64.3		
1967		459	62.8		
1964	Middle	818			
1965		368	-55.0	23.2	0.1724
1966		840	128.3		
1967		1,008	20.0		
1964	High	2,862			
1965		3,535	23.5	44.0	0.1843
1966		3,369	- 4.7		
1967		4,122	22.4		
1964	All farms	1,283			
1965		1,308	1.9	30.9	-0.0244
1966		1,356	3.7		
1967		1,680	23.9		

<sup>a</sup>United States Department of Agriculture, Agricultural Statistics, 1968 (Washington, D.C.: Government Printing Office, 1968), Prices Paid by Farmers for Feed, p. 471.

TABLE 22

DEFLATED<sup>a</sup> AVERAGE OF THE COST OF FERTILIZER AND LIME FOR  
FARM GROUPS FROM 1964 TO 1967 AND THE PERCENT CHANGE

Year	Income Group	Deflated Average of Cost of Fertilizer and Lime	Percent Change Yearly	Percent Change 1964-67	Correlation Coefficient
1964		784			
1965	Low	802	2.3	-56.5	-0.9752
1966		441	45.0		
1967		341	-22.7		
1964		758			
1965	Middle	595	-21.5	117.3	0.0432
1966		824	38.5		
1967		1,647	99.9		
1964		1,132			
1965	High	1,049	- 7.3	18.6	0.2220
1966		1,307	24.6		
1967		1,342	2.7		
1964		863			
1965	All farms	768	-11.0	41.9	-0.2056
1966		850	10.7		
1967		1,225	44.1		

<sup>a</sup>United States Department of Agriculture, Agricultural Statistics, 1968 (Washington, D.C.: Government Printing Office, 1968), Prices Paid by Farmers for Fertilizers, p. 471.

Cost of capital assets. Modern agriculture is becoming more and more capital intensive. Capitalistic agriculture is not only labor saving but also cost reducing device in most cases in the agriculturally advanced countries. There is not only two major divisions of traditional agriculture which is labor intensive, and modern agriculture which is capital intensive, there are many degrees inbetween these two. So as long as the optimum level of capital is not present, it pays to increase the capital assets. Table 23 shows that for the middle, high and all income groups the cost of capital assets, correlation coefficients of 0.9008, 0.6762 and 0.9357 which means for the middle and all income groups, it is significant and for the high income group, it is near the significance level. This trend shows that there is a lot of scope to increase the capital assets for the farms in these groups.

Livestock expenses. Table 24 shows how the livestock expenses are related to family farm income. The middle income group is the only group that has significant correlation with a correlation coefficient of 0.8960. The high and all income groups have correlation coefficients of 0.5498 and 0.7542 which are quite considerable. This gives a trend that reveals that increase in the livestock would benefit the farm to increase its income as increased livestock involves the cost.

Value of decrease in inventory. As it could be expected that the decrease in inventory may have a negative relationship with farm income, so also all the groups under study are negatively correlated. But only

TABLE 23

DEFLATED<sup>a</sup> AVERAGE OF THE COST OF CAPITAL ASSETS FOR FARM  
GROUPS FROM 1964 TO 1967 AND THE PERCENT CHANGE

Year	Income Group	Deflated Average of Cost of Capital Items	Percent Change Yearly	Percent Change 1964-67	Correlation Coefficient
1964		1,928			
1965	Low	1,889	- 2.0	-61.5	-0.9870
1966		664	-64.8		
1967		742	11.7		
1964		814			
1965	Middle	1,892	132.4	76.3	0.9068
1966		2,429	28.4		
1967		1,435	-40.9		
1964		1,918			
1965	High	2,579	34.5	235.3	0.6762
1966		8,819	242.0		
1967		6,432	-27.1		
1964		1,395			
1965	All farms	2,071	48.5	83.7	0.9357
1966		3,640	75.8		
1967		2,562	-29.6		

<sup>a</sup>United States Department of Agriculture, Agricultural Statistics, 1968 (Washington, D.C.: Government Printing Office, 1968), Prices Paid by Farmers for All Commodities Bought Including Interest, Taxes, and Wage Rates, p. 471.



TABLE 24

DEFLATED<sup>a</sup> AVERAGE OF THE LIVESTOCK EXPENSES FOR FARM GROUPS  
FROM 1964 TO 1967 AND THE PERCENT CHANGE

Year	Income Group	Deflated Average of Livestock Expenses	Percent Change Yearly	Percent Change 1964-67	Correlation Coefficient
1964		793			
1965	Low	203	-74.4	-82.0	-0.7432
1966		174	-14.3		
1967		143	-17.8		
1964		619			
1965	Middle	392	-36.7	77.2	0.8960
1966		1,931	392.6		
1967		1,097	-43.2		
1964		1,268			
1965	High	1,976	55.8	84.2	0.5498
1966		2,081	5.3		
1967		2,336	12.3		
1964		835			
1965	All farms	757	- 9.3	40.4	0.7542
1966		1,510	99.5		
1967		1,172	-22.4		

<sup>a</sup>United States Department of Agriculture, Agricultural Statistics, 1968 (Washington, D.C.: Government Printing Office, 1968), Prices Paid by Farmers for Livestock, p. 471.

the middle income group is highly significant in its correlation with a correlation coefficient of -0.9921 (see Table 25). The low, high and all income groups have correlation coefficients of -0.5547, -0.5714, and -0.6762 in the same order.

Other expenses. Table 26 shows that, except for the low income group, no other group in other expenses is significantly related to family farm income. The different constituents of other expenses are seeds and plants, machine hire, veterinary and medicine, supplies, repair and maintenance, breeding fees, gasoline, oil and other fuel, storage and warehousing, taxes, insurance, interest, utilities, hauling, auto, cash rent, and miscellaneous.

#### Operator's Earnings

Operator's earnings indicates the amount of income the operator received for his labor and management plus the value of farm privileges for one year. Table 27 shows that three groups in operator's earnings are almost perfectly correlated with family farm income, Middle, high and all income groups have correlation coefficients of 0.9989, 0.9934 and 0.9891 in the same order which reveals an interesting fact that the farms under study have efficient labor and management, except for farms belonging to low income group for which the correlation coefficient is -0.7099.

TABLE 25

DEFLATED<sup>a</sup> AVERAGE OF THE VALUE OF DECREASE IN INVENTORY FOR  
FARM GROUPS FROM 1964 TO 1967 AND THE PERCENT CHANGE

Year	Income Group	Deflated Average of Decrease in Inventory	Percent Change Yearly	Percent Change 1964-67	Correlation Coefficient
1964		734			
1965	Low	1,123	53.0	- 3.3	-0.5547
1966		623	-44.5		
1967		710	14.0		
1964		535			
1965	Middle	474	-11.4	-17.4	-0.9921
1966		348	-26.6		
1967		442	27.0		
1964		523			
1965	High	85	-83.7	201.1	-0.5714
1966		--	-100.0		
1967		1,575			
1964		584			
1965	All farms	542	- 7.2	38.5	-0.6762
1966		329	-39.3		
1967		809	145.9		

<sup>a</sup>United States Department of Agriculture, Agricultural Statistics, 1968 (Washington, D.C.: Government Printing Office, 1968), Farm Real Estate Value, p. 430.

TABLE 26  
 DEFLATED<sup>a</sup> AVERAGE OF OTHER EXPENSES FOR FARM GROUPS  
 FROM 1964 TO 1967 AND THE PERCENT CHANGE

Year	Income Group	Deflated Average of Other Expenses	Percent Change Yearly	Percent Change 1964-67	Correlation Coefficient
1964	Low	3,325			-0.9764
1965		3,117	- 6.3	-43.9	
1966		1,511	-51.5		
1967		1,865	23.4		
1964	Middle	2,892			0.3569
1965		2,326	-19.6	- 6.0	
1966		2,993	28.7		
1967		2,718	- 9.2		
1964	High	4,121			0.3733
1965		5,923	43.7	40.2	
1966		4,993	-15.7		
1967		5,779	15.7		
1964	All farms	3,327			-0.5602
1965		3,475	4.4	- 0.9	
1966		3,129	10.0		
1967		3,296	5.3		

<sup>a</sup>United States Department of Agriculture, Agricultural Statistics, 1968 (Washington, D.C.: Government Printing Office, 1968), All Commodities Bought Including Interest, Taxes, and Wage Rates, p. 471.

TABLE 27

DEFLATED<sup>a</sup> AVERAGE OF OPERATOR'S EARNINGS FOR FARM  
GROUPS FROM 1964 TO 1967 AND THE PERCENT CHANGE

Year	Income Group	Deflated Average of Operator's Earnings	Percent Change Yearly	Percent Change 1964-67	Correlation Coefficient
1964	Low	1,052			-0.7099
1965		1,411	34.1	-12.9	
1966		799	-43.4		
1967		916	14.6		
1964	Middle	1,298			0.9989
1965		1,467	13.0	19.0	
1966		1,947	32.7		
1967		1,544	-20.7		
1964	High	3,689			0.9934
1965		5,165	40.0	25.5	
1966		6,224	20.5		
1967		4,629	-25.6		
1964	All farms	1,857			0.9891
1965		2,421	30.4	17.8	
1966		2,767	14.3		
1967		2,188	-20.9		

<sup>a</sup>United States Bureau of the Census, Statistical Abstract of the United States (Washington, D.C.: Government Printing Office, 1968), Consumer Price Index, p. 347.

### Value of Crops

Though the correlation of crop receipts does tell whether it has contributed to increased income or not, it does not tell which particular crop or crops are responsible. The farmer needs to know whether he has to discontinue growing of any crop or to produce more of some crops in order to increase his income and the relationship of the value of different crops with the family farm income gives him an idea for this purpose. Value of soybeans (see Appendix) is significantly correlated with family farm income with a correlation coefficient of 0.8799 for middle income group and, therefore, it pays for the farmers of this group to grow soybeans. The value of tobacco for the high income group (see Appendix) has a correlation coefficient of 0.7632 which is near the significance level. For some farms, when the crop receipts as a whole are negatively related to family farm income, some particular crops may be positively related. Such a case is seen for the low income group, the crop receipts of which are negatively related to family farm income, but the value of wheat is positively correlated with a correlation coefficient of 0.9691 (see Appendix). So it appears to be advisable for the low income group to grow more wheat.

### Yield Per Acre of Crops

Yield per acre of crops gives further evidence to a farmer who has doubt whether to grow or not to grow a particular crop when this crop has a low correlation coefficient for the value of the crop. When such a crop has a higher figure for the yield per acre, then it gives a

clue to the farmer that increasing the value of that crop by increasing the yield per acre, it is useful for him. Such a case is seen for yield per acre of corn (see Appendix) for the high income group which has a correlation coefficient of 0.8262, and the same group has a much lower correlation with the value of corn. So for the high income group, it is better to increase the value of corn by increasing the yield per acre. Yield per acre of wheat (see Appendix) has a correlation coefficient of 0.9675 for the low income group so it may be better for the low income group to increase the yield per acre of wheat.

## CHAPTER IV

### SUMMARY AND CONCLUSIONS

#### Summary

Agriculture is lagging behind in Tennessee compared to other southeastern states. In 1954 the net income per farm in Tennessee was \$1452 and its rank was fifth among the southeastern states and in 1964 though the net income per farm had increased to \$1801, its relative position occupied the lowest place. From 1954 to 1969, the percent increase in net income per farm was lowest for Tennessee with only twenty-four percent, whereas four other states have increased it by more than 100 percent; so there is a great need to improve the agriculture in Tennessee.

The basic data for the present study was selected from the records of the Tennessee farms in Unit Test Demonstration program. The basic data for 42 general farms was selected for a four year period from 1964 to 1967, as far as possible using as a criteria that these are classified as general farms for at least three out of the four years. These 42 general farms are located in 25 counties of the state of Tennessee, and cover all the six crop reporting districts of Tennessee.

The selected 42 farms were divided into three groups for each year based on the family farm income. The high, middle and low income groups are the three divisions which have the averages for 11, 20 and



11 farms respectively. The fourth group is the average for all the farms for each year.

The correlation coefficient between family farm income and all the main factors affecting was determined using the formula:

$$r = \frac{\Sigma xy}{\sqrt{(\Sigma x^2) (\Sigma y^2)}}$$

/ r /  $\geq$  0.0878 is significant (at 95 percent level).

/ r /  $\geq$  0.959 is highly significant (at 99 percent level) and the analysis is made.

Correlation coefficients show the degree of association between variables, but it does not tell the extent to which one is the cause for the other. An example will make it clear. A farmer who increases seeding rate, fertilizer and water application may find that all these independent variables are significantly correlated with increased income. But correlation coefficients do not tell that to what extent one variable is the cause for the other. It might have even so happened that the new seeding rate may not be any better than the old seeding rate. Income might have increased only because of increased fertilizer and water application. Because there is a chance of being misled in such a case, one has to exercise caution while considering the recommendation measures based on correlation coefficients alone.

The percent change for family farm income and all the main factors has been found out for year to year and also for 1964 to 1967 as a whole.

Farm inventories constitute the major cost in farming. The relation between the family farm income and the value of inventories gives an idea as to what extent it is economical to have the inventories. Table IV, page 28, shows that none of the groups are significantly correlated. Low income group is negatively correlated with correlation coefficients = 0.2050, 0.0783 and 0.4558, respectively. The reason for the low income group being negatively correlated is of crucial importance. It may be due to excess of inventories or due to bad management. The actual figures of the weighted average of total inventories show that for low income group, it is less than that of other groups. So, the possibility of excess of inventories is ruled out. Then the alternative reason is inefficient management. Again there may be two reasons for inefficient management. One is due to inefficient farm managers and the other is the concentration on the off-farm income, which might not have given enough scope to manage the farm efficiently. Only two farms remained in the low-income group for all four year. The reason for the low income for these farms may be due to the inefficient management. Many of the remaining nine farms for each year following 1964 are the farms which occupied positions either in the middle or high-income group in 1964. The reason for lowering of income for these groups may probably be due to the concentration on the off-farm employment.

For a farm with profit, it is advantageous to increase the gross farm income as long as the proportion of expenses is the same or

decreasing or negligibly increasing. For middle, high and all income groups in gross farm income, correlation coefficients = 0.9306, 0.7102 and 0.8628 which shows that it pays to increase the gross farm income for these groups. For the low-income group, correlation coefficient = 0.9640 which means the proportion of expenses is too high and the best way to increase the farm income would be to have economy in the cost of production.

Farm economy does not lie in how little one spends but how wisely one spends. Increasing expenditure does not necessarily mean the lessening of income. When the increased expenditure brings increased income, it means money has been spent economically. On the contrary, if the increased expenditure has decreased income, it means that money has not been spent economically. Middle, high and all income groups in total farm expenses have correlation coefficient = 0.9167, 0.4848 and 0.7453 which shows that the income could be increased for these farms by more expenditure with at least the same efficiency as it was before. Low-income group correlation coefficient = -0.9421 which means that there is no economy in spending and this serves as evidence for the rationale of the previously considered fact of the relationship between gross farm income and family farm income for the same group.

Operator's earnings indicates the amount of income the operator received for his labor and management plus the value of farm privileges, for one year. For middle, high and all income groups in operator's earnings correlation coefficients = 0.9989, 0.9934 and 0.9891 which

shows that for farms under study in these groups, the labor and management is good. Low-income group correlation coefficient = 0.7099, which though not significant, is considerable. So the solution for the problem of low-income group largely is efficient labor and management.

Middle income group for value of soybeans has correlation coefficient = 0.8799 with family farm income, and it is highly recommended to grow more of this crop.

For high income group, in the yield per acre of corn correlation coefficient = 0.8262, with family farm income, which is near significance level and it will be quite profitable to increase the yield per acre of this crop for this group.

Causes for the change in the grouping positions of the individual farms from low to high income group and vice versa were looked into. Out of seven farms which have moved from low to high income group or vice versa, during any of the four years, only two have moved to low income group from high income group and again have gone up to high income group. Out of the remaining five farms, four farms have gone up to high income group from low income group and only one farm has gone down to low income group from high income group.

One farm which went down to the low income group in 1965 from the high income group in 1964, had a decrease in family farm income of 92 percent. This decrease was mainly accompanied by 67 percent increase in open acres, 33 percent increase in gross farm income, 1690 percent increase in cost of capital assets, 104 percent increase in farm expenses, 456 percent increase in value of soybeans and 70 percent increase in

productive man work units and a decrease in operator's labor earnings of 30 percent. Cost of capital assets include purchase cost of items like land, machinery and equipment. The same farm went up to high income group in 1967 with an increase in family farm income by 1010 percent. This increase was mainly accompanied by decrease in the cost of capital assets and total farm expenses by 93 percent and 34 percent respectively and increase in government payments from \$36 to \$5670.

The second farm which went down to low income group in 1965 from high income group in 1964 had a decrease in family farm income by 60 percent. This was accompanied by the following major changes: The cost of capital assets increased by \$1795 in 1965 which was 0 in 1964. Operator's labor earnings decreased by 57 percent. Productive man work units went to 345 in 1965 from 289 in 1964. The same farm increased its family farm income by about 11 times in 1966 from 1965 and went to high income group in 1966. This was mainly accompanied by decrease in the cost of labor hired and the cost of capital assets by 58 percent and 72 percent respectively and increase in productive man work units from 345 to 382.

The third farm went to high income group in 1967 from low income group in 1964 with 520 percent increase in family farm income. This was mainly accompanied by increase in livestock receipts, gross farm income and value of tobacco by 88 percent, 60 percent, and 253 percent, respectively.

The fourth farm went up to the high income group in 1966 from low income group in 1964 with an increase in family farm income by about 22 times. This was mainly accompanied by 77 percent increase in gross farm income, 6300 percent increase in cost of capital assets, 90 percent increase in operator's labor earnings and 33 percent increase in per acre yield of tobacco, and the government payment increased by \$1084 from 0. Receipts from miscellaneous items increased by \$3706 from 0.

The fifth farm went to high income group in 1967 from low income group in 1965 with an increase in family farm income by 580 percent. This was mainly associated with 350 percent increase in livestock receipts, 383 percent increase in gross farm income, 2399 percent increase in operator's labor earnings and 491 percent increase in productive man work units and decrease in other expenses and total farm expenses by 56 percent and 63 percent respectively.

This sixth farm increased its family farm income by about 13 times from 1964 to 1965 and went up to the high income group from low income group. This was mainly associated with 63 percent increase in open acres, 126 percent increase in gross farm income, 215 percent increase in cost of capital assets, 53 percent increase in total farm expenses, 690 percent increase in operator's labor earnings and 3420 percent increase in the value of soybeans. Increase in inventory and government payments increased by \$5754 and \$738 in 1965 from nothing in both the cases in 1964. The value of corn went down by 62 percent.

The seventh farm went down to the low income group in 1967 from high income group in 1964 with a decrease in family farm income by 79

percent. This was mainly accompanied by increases of 825 percent in cost of livestock, 41 percent in total farm expenses and 83 percent in productive man work units and a decrease in operator's labor earnings of 82 percent. This farm poses a strange case. In spite of very high increase in livestock expenses and high increase in total farm expenses and productive man work units, why was there decrease in family farm income? Probably, the farmer might have added too much livestock during that year and was beyond his managerial capacity. This might have resulted in very high increase in livestock expenses. It is possible that this livestock involved too much of work which increased his productive man work units. Because of too much work he might not have been able to do the work at the proper time which might have adversely affected his family farm income. The livestock he bought might be of poor quality which might have increased his expenses. Probably he might not have had sufficient feed supplies for the increased livestock and this might have brought his income down. Since livestock expenses are part of the total farm expenses, it seems reasonable that total farm expenses increased by 41 percent after livestock expenses have increased by 825 percent.

The above discussion reveals that many of the factors like cost of capital assets, total farm expenses, productive man work units, open acres, value of soybeans have moved in the same direction as family farm income in some farms. Government payments and livestock receipts have contributed to the high income group. The only factor that could be said to be distinctively influencing family farm income is operator's labor

earnings. Wherever it has increased it is associated with high income group and wherever it has decreased it is associated with low income group.

### Conclusions

The reason for the higher income of the middle and high income groups is the favorable relationship between the major factors and the family farm income. The reason for the low income of the low income group is the preponderance of unfavorable relationship between major factors and family income.

Though no group shows significant correlation between family farm income and total inventory, middle and high income groups are positively related and low income group is negatively correlated which shows that the farm inventories could have been more efficiently used especially for low income group.

The expenditure for middle and high income groups is quite economically incurred; whereas, for the low income group it has not been so. So, economic spending is very necessary for the low income group.

For the middle and high income groups, returns to labor and management are good, The low income needs to increase its labor and managerial efficiency to a very great deal to increase family farm income.

For middle income group, it is highly recommended to increase the value of soybeans by growing more of that.

For high income group it will be worthwhile to increase the yield per acre of corn.





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**APPENDIX**

TABLE 28

DEFLATED<sup>a</sup> AVERAGE OF NET MACHINERY COST FOR FARM GROUPS  
FROM 1964 TO 1967 AND THE PERCENT CHANGE

Year	Income Group	Deflated Average of Net Machinery Cost	Percent Change Yearly	Percent Change 1964-67	Correlation Coefficient
1964	Low	1,847			-0.6626
1965		2,208	19.5	- 3.6	
1966		1,495	-33.9		
1967		1,780	22.0		
1964	Middle	1,817			0.6422
1965		2,110	16.1	- 2.6	
1966		2,148	1.8		
1967		1,769	-17.6		
1964	High	2,718			-0.3438
1965		2,712	- 0.2	28.3	
1966		2,660	- 1.9		
1967		3,488	31.1		
1964	All farms	2,061			0.0811
1965		2,289	11.1	7.8	
1966		2,102	- 8.2		
1967		2,222	5.7		

<sup>a</sup>United States Department of Agriculture, Agricultural Statistics, 1968 (Washington, D.C.: Government Printing Office, 1968), Price of Industrial Production, p. 430.

TABLE 29

DEFLATED<sup>a</sup> AVERAGE OF INTEREST ON CAPITAL FOR FARM GROUPS  
FROM 1964 TO 1967 AND THE PERCENT CHANGE

Year	Income Group	Deflated Average of Interest or Capital	Percent Change Yearly	Percent Change 1964-67	Correlation Coefficient
1964	Low	1,285			-0.7149
1965		1,573	22.4	-16.7	
1966		1,198	-23.8		
1967		1,070	-10.7		
1964	Middle	1,227			0.3318
1965		1,362	11.0	32.4	
1966		1,399	2.7		
1967		1,625	16.2		
1964	High	2,262			-0.8845
1965		1,810	-20.0	- 9.2	
1966		1,860	2.8		
1967		2,054	10.4		
1964	All Farms	1,513			-0.5190
1965		1,535	1.4	5.2	
1966		1,467	- 4.2		
1967		1,592	8.5		

<sup>a</sup>United States Bureau of the Census, Statistical Abstract of the United States, 1968 (Washington, D.C.: Government Printing Office, 1968), Consumer Price Index, p. 347.

TABLE 30  
 AVERAGE OF MAN EQUIVALENT FOR FARM GROUPS FROM  
 1964 TO 1967 AND THE PERCENT CHANGE

Year	Income Group	Average of Man Equivalent	Percent Change Yearly	Percent Change 1964-67	Correlation Coefficient
1964		1.21			
1965	Low	1.35	11.6	-15.7	-0.8347
1966		1.09	-19.3		
1967		1.02	- 6.4		
1964		1.26			
1965	Middle	1.36	7.9	-13.5	0.1188
1966		1.30	- 4.4		
1967		1.09	-16.2		
1964		1.66			
1965	High	1.96	18.0	5.4	-0.1206
1966		1.56	-20.4		
1967		1.75	12.2		
1964		1.35			
1965	All farms	1.51	11.9	- 8.4	-0.0259
1966		1.31	-13.2		
1967		1.24	- 5.3		



TABLE 31

DEFLATED<sup>a</sup> AVERAGE OF GROSS FARM INCOME PER MAN EQUIVALENT FOR  
FARM GROUPS FROM 1964 TO 1967 AND THE PERCENT CHANGE

Year	Income Group	Deflated Average of Gross Farm Income/Man Equivalent	Percent Change Yearly	Percent Change 1964-67	Correlation Coefficient
1964	Low	6,995			
1965		7,372	5.4	- 0.8	-0.6017
1966		5,401	-26.7		
1967		6,936	28.4		
1964	Middle	10,398			
1965		7,610	-26.8	- 6.2	-0.1971
1966		9,272	21.8		
1967		9,758	5.2		
1964	High	13,965			
1965		14,526	4.0	15.1	0.8001
1966		19,381	33.4		
1967		16,074	-17.0		
1964	All farms	10,441			
1965		9,359	-10.4	2.2	0.2228
1966		10,906	16.5		
1967		10,673	- 2.1		

<sup>a</sup>United States Department of Agriculture, Agricultural Statistics, 1968 (Washington, D.C.: Government Printing Office, 1968), Prices Received by Farmers, p. 470.

TABLE 32

DEFLATED<sup>a</sup> AVERAGE OF INVESTMENT PER MAN EQUIVALENT FOR  
FARM GROUPS FROM 1964 TO 1967 AND THE PERCENT CHANGE

Year	Income Group	Deflated Average of Investment Per Man Equivalent	Percent Change Yearly	Percent Change 1964-67	Correlation Coefficient
1964	Low	29,632			-0.0388
1965		43,775	47.7	20.5	
1966		33,633	-23.2		
1967		35,712	6.2		
1964	Middle	39,388			-0.8162
1965		29,116	-26.1	-11.1	
1966		26,930	- 7.5		
1967		35,029	30.1		
1964	High	45,135			-0.5705
1965		30,460	-32.5	-22.7	
1966		36,775	20.7		
1967		34,890	- 5.1		
1964	All farms	38,338			-0.9687
1965		33,307	-13.1	- 8.3	
1966		31,264	- 6.1		
1967		35,172	12.5		

<sup>a</sup>United States Department of Agriculture, Agricultural Statistics, 1968 (Washington, D.C.: Government Printing Office, 1968), Farm Real Estate Value, p, 430.

TABLE 33

AVERAGE OF THE WORK UNITS PER MAN EQUIVALENT FOR THE FARM  
GROUPS FROM 1964 TO 1967 AND THE PERCENT CHANGE

Year	Income Group	Average of Work Units Per Man Equivalent	Percent Change Yearly	Percent Change 1964-67	Correlation Coefficient
1964	Low	112			-0.0460
1965		167	49.1	32.1	
1966		112	33.0		
1967		148	32.1		
1964	Middle	142			0.1506
1965		120	-15.5	43.7	
1966		153	27.5		
1967		204	33.3		
1964	High	145			0.4267
1965		184	26.9	66.9	
1966		213	15.8		
1967		242	13.6		
1964	All farms	135			0.1586
1965		149	10.4	47.4	
1966		158	6.0		
1967		199	25.9		

TABLE 34  
 AVERAGE OF TOTAL ACRES FOR FARM GROUPS FROM  
 1964 TO 1967 AND THE PERCENT CHANGE

Year	Income Group	Average of Total Inventories	Percent Change Yearly	Percent Change 1964-67	Correlation Coefficient
1964		152			
1965	Low	165	8.6	- 2.6	-0.6626
1966		119	-27.9		
1967		148	24.4		
1964		160			
1965	Middle	164	2.5	30.0	0.0389
1966		164	0		
1967		208	26.8		
1964		185			
1965	High	160	-13.5	48.1	0.1411
1966		242	51.3		
1967		274	13.2		
1964		165			
1965	All farms	163	- 1.2	27.3	-0.0355
1966		173	6.1		
1967		210	21.4		

TABLE 35

DEFLATED<sup>a</sup> AVERAGE OF GROSS FARM INCOME PER OPEN ACRE FOR  
FARM GROUPS FROM 1964 TO 1967 AND THE PERCENT CHANGE

Year	Income Group	Deflated Average of Gross Farm Income Per Open Acre	Percent Change Yearly	Percent Change 1964-67	Correlation Coefficient
1964		83			
1965	Low	59	-28.9	-38.6	-0.7778
1966		59	0		
1967		51	-13.6		
1964		88	-3.4	-8.0	0.7984
1965	Middle	85	25.9		
1966		107	-24.3		
1967		81			
1964		183			
1965	High	173	-5.5	-14.8	-0.4997
1966		161	-6.9		
1967		156	-3.1		
1964		112			
1965	All farms	101	-9.8		
1966		109	7.9	-17.0	0.0253
1967		93	-14.7		

<sup>a</sup>United States Department of Agriculture, Agricultural Statistics, 1968 (Washington, D.C.: Government Printing Office, 1968), Farm Real Estate Value, p. 470.

TABLE 36

DEFLATED<sup>a</sup> AVERAGE COST OF LIME AND FERTILIZER PER ACRE FOR  
FARM GROUPS FROM 1964 TO 1967 AND THE PERCENT CHANGE

Year	Income Group	Deflated Average of Cost of Lime and Fertilizer	Percent Change Yearly	Percent Change 1964-67	Correlation Coefficient
1964	Low	8.7			-0.7863
1965		6.5	-25.3	-43.6	
1966		6.6	1.5		
1967		4.9	-25.6		
1964	Middle	6.6			0.3374
1965		6.7	1.1	26.1	
1966		7.3	9.4		
1967		8.3	14.0		
1964	High	10.4			-0.9194
1965		7.6	-27.2	- 3.3	
1966		7.5	- 1.8		
1967		10.1	35.4		
1964	All farms	8.1			-0.7109
1965		6.9	-14.8	- 2.5	
1966		7.2	4.3		
1967		7.9	9.7		

<sup>a</sup>United States Department of Agriculture, Agricultural Statistics, 1968 (Washington, D.C.: Government Printing Office, 1968), Prices Paid by Farmers for Fertilizer, p. 471.

TABLE 37

DEFLATED<sup>a</sup> AVERAGE VALUE OF CORN FOR FARM GROUPS  
FROM 1964 TO 1967 AND THE PERCENT CHANGE

Year	Income Group	Deflated Average Value of Corn	Percent Change Yearly	Percent Change 1964-67	Correlation Coefficient
1964	Low	1,532			
1965		1,802	17.6	-25.3	-0.8732
1966		1,000	-44.5		
1967		1,145	14.5		
1964	Middle	1,790			
1965		2,684	50.0	100.3	0.1217
1966		2,287	-14.8		
1967		3,585	56.8		
1964	High	2,455			
1965		3,568	45.3	79.7	0.3640
1966		3,579	0.3		
1967		4,412	23.3		
1964	All farms	1,897			
1965		2,085	-41.5	66.7	0.1334
1966		2,288	-14.8		
1967		3,163	-38.2		

<sup>a</sup>United States Department of Agriculture, Agricultural Statistics, 1968 (Washington, D.C.: Government Printing Office, 1968), Prices Received by Farmers for Food Grains, p. 470.

TABLE 38  
 DEFLATED<sup>a</sup> AVERAGE VALUE OF COTTON FOR FARM GROUPS  
 FROM 1964 TO 1967 AND THE PERCENT CHANGE

Year	Income Group	Deflated Average Value of Cotton	Percent Change Yearly	Percent Change 1964-67	Correlation Coefficient
1964	Low	1,730			-0.5425
1965		8,205	374.3	-76.8	
1966		1,407	-82.9		
1967		401	-71.5		
1964	Middle	3,085			0.2116
1965		2,550	-17.3	-88.2	
1966		3,442	35.0		
1967		364	89.4		
1964	High	7,202			-0.5293
1965		6,205	-13.8	-61.1	
1966		2,944	-52.6		
1967		2,798	- 5.0		
1964	All farms	3,808			-0.0923
1965		4,988	31.0	-73.5	
1966		2,779	-44.3		
1967		1,011	-63.6		

<sup>a</sup>United States Department of Agriculture, Agricultural Statistics, 1968 (Washington, D.C.: Government Printing Office, 1968), Prices Received by Farmers for Cotton, p. 470.



TABLE 39  
 DEFLATED<sup>a</sup> AVERAGE OF VALUE OF SOYBEANS FOR FARM GROUPS  
 FROM 1964 TO 1967 AND THE PERCENT CHANGE

Year	Income Group	Deflated Average of Value of Soybeans	Percent Change Yearly	Percent Change 1964-67	Correlation Coefficient
1964		90			
1965	Low	3,078	3320.0	337.8	0.1347
1966		--	-100.0		
1967		3,130			
1964		1,167			
1965	Middle	950	- 18.6	6.2	0.8799
1966		2,049	115.7		
1967		1,239	- 39.5		
1964		604			
1965	High	1,778	194.4	181.6	-0.0394
1966		616	- 65.4		
1967		1,701	176.1		
1964		738			
1965	All farms	1,724	133.6	151.4	0.1817
1966		1,137	- 34.0		
1967		1,855	63.1		

<sup>a</sup>United States Department of Agriculture, Agricultural Statistics, 1968 (Washington, D.C.: Government Printing Office, 1968), Prices Received by Farmers for Oil Bearing Crops, p. 470.

TABLE 40  
 DEFLATED<sup>a</sup> AVERAGE VALUE OF TOBACCO FOR FARM GROUPS  
 FROM 1964 TO 1967 AND THE PERCENT CHANGE

Year	Income Group	Deflated Average Value of Tobacco	Percent Change Yearly	Percent Change 1964-67	Correlation Coefficient
1964	Low	1,578			-0.7836
1965		1,840	16.6	-47.1	
1966		1,393	-24.3		
1967		835	-40.1		
1964	Middle	1,202			0.4903
1965		1,535	27.7	11.2	
1966		1,430	- 6.8		
1967		1,337	- 6.5		
1964	High	1,806			0.7632
1965		1,822	0.9	8.3	
1966		2,194	20.4		
1967		1,956	-10.8		
1964	All farms	1,463			0.5678
1965		1,690	15.5	- 6.5	
1966		1,620	- 4.1		
1967		1,368	-15.6		

<sup>a</sup>United States Department of Agriculture, Agricultural Statistics, 1968 (Washington, D.C.: Government Printing Office, 1968), Prices Received by Farmers for Tobacco, p. 470.

TABLE 41  
 DEFLATED<sup>a</sup> AVERAGE VALUE OF WHEAT FOR FARM GROUPS  
 FROM 1964 TO 1967 AND THE PERCENT CHANGE

Year	Income Group	Deflated Average Value of Wheat	Percent Change Yearly	Percent Change 1964-67	Correlation Coefficient
1964	Low	--			0.9691
1965		--			
1966		257			
1967		208	-19.1		
1964	Middle	239			0.4884
1965		408	70.7	116.7	
1966		414	1.5		
1967		518	25.1		
1964	High	1,091			-0.5503
1965		497	-54.4	-42.3	
1966		740	48.9		
1967		629	-15.0		
1964	All farms	400			0.2660
1965		325	-18.7	16.5	
1966		458	40.9		
1967		466	1.7		

<sup>a</sup>United States Department of Agriculture, Agricultural Statistics, 1968 (Washington, D.C.: Government Printing Office, 1968), Prices Received by Farmers for Food Grains, p. 470.

TABLE 42

AVERAGE YIELDS (IN BUSHEL) PER ACRE OF CORN FOR FARM GROUPS  
FROM 1964 TO 1967 AND THE PERCENT CHANGE

Year	Income Group	Average Yield Per Acre of Corn	Percent Change Yearly	Percent Change 1964-67	Correlation Coefficient
1964	Low	72.6			-0.4254
1965		77.0	6.1	-14.2	
1966		77.0	0		
1967		62.3	-19.1		
1964	Middle	67.9			-0.1554
1965		79.7	17.4	14.6	
1966		68.9	-13.6		
1967		77.8	12.9		
1964	High	66.7			0.8262
1965		89.6	34.3	7.5	
1966		83.9	- 6.4		
1967		71.7	-14.5		
1964	All farms	67.4			0.5440
1965		82.6	22.6	7.0	
1966		75.0	- 8.5		
1967		72.1	- 4.0		

TABLE 43

AVERAGE YIELD (IN POUNDS) PER ACRE OF COTTON FOR FARM GROUPS  
FROM 1964 TO 1967 AND THE PERCENT CHANGE

Year	Income Group	Average Yield Per Acre of Cotton	Percent Change Yearly	Percent Change 1964-67	Correlation Coefficient
1964	Low	377.5			-0.2382
1965		772.0	104.5	-47.7	
1966		676.6	-12.4		
1967		197.5	-70.8		
1964	Middle	1,014.8			-0.5227
1965		718.3	-29.2	-77.7	
1966		527.4	-26.6		
1967		226.0	-57.1		
1964	High	774.2			-0.0387
1965		752.7	- 2.8	-58.3	
1966		597.7	-20.6		
1967		323.0	-46.0		
1964	All farms	784.9			-0.1528
1965		741.4	- 5.5	-68.9	
1966		584.9	-21.1		
1967		243.9	-58.3		

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TABLE 44

AVERAGE YIELD (IN BUSHEL) PER ACRE OF SOYBEANS FOR FARM  
GROUPS FROM 1964 TO 1967 AND THE PERCENT CHANGE

Year	Income Group	Average Yield Per Acre of Soybeans	Percent Change Yearly	Percent Change 1964-67	Correlation Coefficient
1964		12.0			
1965	Low	32.0	166.7	83.3	-0.3345
1966		--	-100.0		
1967		22.0			
1964		23.0			
1965	Middle	27.0	17.4	18.7	-0.1006
1966		23.6	-12.6		
1967		27.3	15.7		
1964		24.5			
1965	High	18.0	-26.5	19.2	-0.2590
1966		25.0	38.9		
1967		29.2	16.8		
1964		20.5			
1965	All farms	26.0	26.8	28.8	-0.3752
1966		17.8	-31.5		
1967		26.4	48.3		

TABLE 45

AVERAGE YIELD (IN POUNDS) PER ACRE OF TOBACCO FOR FARM  
GROUPS FROM 1964 TO 1967 AND THE PERCENT CHANGE

Year	Income Group	Average Yield Per Acre of Tobacco	Percent Change Yearly	Percent Change 1964-67	Correlation Coefficient
1964	Low	2,405			-0.6625
1965		2,437	1.3	-13.2	
1966		2,390	- 1.9		
1967		2,088	-12.6		
1964	Middle	2,143			0.5026
1965		2,039	- 4.9	-10.0	
1966		2,266	11.1		
1967		1,929	-14.9		
1964	High	2,344			-0.3675
1965		2,227	- 5.0	36.1	
1966		2,264	1.6		
1967		3,191	41.0		
1964	All farms	2,264			0.1857
1965		2,193	- 3.2	1.6	
1966		2,298	4.8		
1967		2,301	0.1		

TABLE 46

AVERAGE YIELD (IN BUSHEL) PER ACRE OF WHEAT FOR FARM GROUPS  
FROM 1964 TO 1967 AND THE PERCENT CHANGE

Year	Income Group	Average Yield Per Acre of Wheat	Percent Change Yearly	Percent Change 1964-67	Correlation Coefficient
1964		--			
1965	Low	--			0,9675
1966		40.0			
1967		32.0	-20.0		
1964		130.0			
1965	Middle	41.0	-68.5	-79.7	-0.6446
1966		38.0	- 7.3		
1967		26.3	-30,8		
1964		28.0			
1965	High	32.7	16.8	17.9	-0.2484
1966		26.5	-19.0		
1967		33.0	24.5		
1964		69.2			
1965	All farms	28,1	-59.4	-57.4	-0.6204
1966		35.5	26.3		
1967		29.5	-16.9		

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## VITA

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