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Reorganization and Development of Tenant Farms on the Ames Plantation, West Tennessee 1956 thru 1968

University of Tennessee Agricultural Experiment Station

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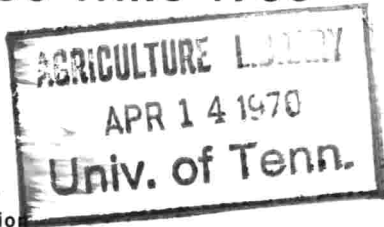
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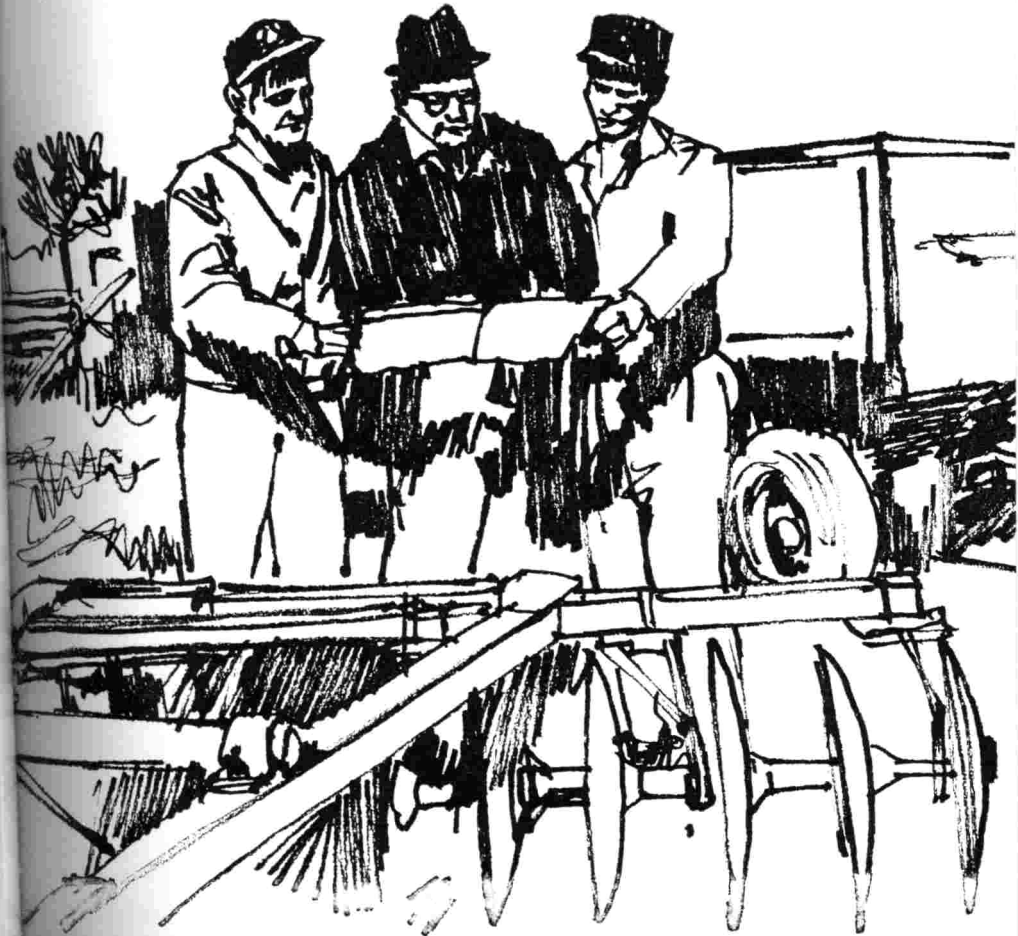
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Reorganization and Development of Tenant Farms ON THE AMES PLANTATION, WEST TENNESSEE 1956 THRU 1968



by
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SUMMARY

Reorganization and Development of Tenant Farms on The Ames Plantation, West Tennessee, 1956 through 1968

A research project to evaluate the growth of farms and to identify those characteristics that contribute to greater net farm incomes was initiated on the Ames Plantation, a Field Station of the Tennessee Agricultural Experiment Station, in 1956.

Before 1956, the Ames Plantation had many tenant farmers who were working primarily on a "standing rent" basis and who paid about two bales of cotton as rent for each 10 acres of cotton grown. No rental charge was made to the tenants on other crops grown or livestock raised. Gross incomes usually averaged less than \$2,000 per tenant farm, which meant that both the tenant and Plantation received a low rate of return on resources used. After World War II, many tenants were leaving the Plantation for other job opportunities.

In 1956 a professional farm manager was employed by the University to work with the tenants and to make recommendations for improving the existing farm income situation. It was soon recognized that the system of farming would have to be changed on tenant units if these units were to serve as a pattern for future agricultural adjustments. Three major objectives seemed desirable:

- 1) To increase total production and net farm income on tenant-operated farms by applying improved production and management techniques.
- 2) To develop rental arrangements which would allow both the tenants and the Plantation to share in the increased production and net farm income.
- 3) To develop methods of financing these adjustments.

In 1957, five tenant operators expressed an interest in working with the farm manager in reorganizing their system of farming to improve farm income. The size of farm was increased to an average of 83 acres of open land and emphasis was placed primarily upon increasing the acreage and yields on cotton and corn. Later, soybeans were added as a cash crop. Hogs were added as a major livestock enterprise on four farms, while a Grade A dairy was established on one farm.

With the exception of the dairy farm, the rental arrangement was a two-thirds and one-third sharing. Under this system the tenant generally provided all the labor, farm machinery and equipment, two-thirds of the operating cost, and two-thirds of the capital investment in breeding stock. The Plantation provided the land and other permanent improvements and one-third of the operating cost. On the dairy farm, the basic rental arrangement was on a 50-50 basis except that the tenant provided all the labor and the Plantation provided land and permanent improvements.

Between 1957 and 1968, the number of tenants on this program ranged from 5 to 8. The average size of farm increased from 83 acres of open land to 222 acres by 1968. Gross income per tenant farm increased from \$6,904 in 1957 to \$21,728 in 1967. Gross income per farm declined slightly in 1968 to an average of \$20,746.

Net farm income per farm available to pay for land, labor, and capital ranged from \$3,697 in 1957 to \$10,095 in 1967. The tenants' share of net farm income per farm ranged from \$2,382 in 1959 to \$6,443 in 1967, while the Plantation's share ranged from \$1,279 in 1957 to \$3,652 in 1967.

The capital investment per farm increased from an average of \$10,884 in 1957 to \$56,459 in 1968.

Many factors influenced the operation of these tenant units over the 12-year period, 1957 through 1968, but four factors probably had the greatest impact. First, cotton harvesting was mechanized in 1959. This reduced the peak labor load in the fall. Second, the adoption of chemical weed control methods reduced or eliminated the labor requirements for such jobs as chopping or hoeing cotton as well as for cultivating many crops. Third, all of the tenants shifted from two to four-row equipment in 1961 and this allowed the substitution of more equipment for labor. Fourth, soybeans became an important cash crop in the area and on tenant units.

The contributions made by particular resources to net farm income are hard to evaluate. However, a farm operator must choose types and quantities of resources to use to maximize his objectives. In this report, net farm income is allocated among the following resources: land, operator and family labor, capital, and management.

Land was valued at \$80 per acre in 1957 and it was appreciated

at the rate of 7.5% per year thereafter. The assumed annual rate of return to land was a 5% return on investment. The Plantation's share of net farm income averaged above this figure over the 12-year period.

Labor returns per man equivalent were assumed to range from \$1,464 in 1957 to \$3,000 in 1968. The tenants' share of net farm income averaged higher than this over the 12-year period.

Both the tenants and Plantation had adequate net farm incomes to provide a 5% return on capital investment for items such as buildings, farm improvements, machinery, and livestock over the entire period.

The residual return to management after paying the estimated market price for other factors of production ranged from \$408 per farm in 1957 to \$4,744 in 1967. The Plantation's share of net income provided a residual return to management during 11 out of the 12 years, while the tenants' shares of net farm income did likewise in 9 out of 12 years.

The number of farms which one professional farm manager could manage would depend upon many factors, such as level of supervision to be provided, educational level of the farm operator, and complexity of the farm organization. The current farm manager has estimated that if less emphasis was placed on the educational aspect and more emphasis on business management, about 25 to 30 farms might be managed by one man provided the supervisor lived within approximately 60 miles of each farm.

Reorganization and Development of Tenant Farms

ON THE AMES PLANTATION, WEST TENNESSEE
1956 THROUGH 1968

by

T. J. Whatley, R. J. Goddard, C. F. Lard*

INTRODUCTION

Economic growth and reorganization of farms have been significant phenomena in U. S. agriculture for the past two decades. These dynamic changes have been present in Tennessee agriculture as characterized by the increases in: 1) farm size; 2) gross sales per farm; 3) value of assets controlled per farm; 4) capital requirements; and 5) the level of managerial ability of farm operators required for efficient operation of their units. These changes are likely to continue in the future at a more rapid pace than has already been observed.

In view of the above changes taking place in Tennessee agriculture, a research project was begun in 1956 to evaluate the process of growth of farms and to identify those characteristics or factors that contribute to greater net farm incomes. This research project was set up on the Ames Plantation, a Field Station of the Tennessee Agricultural Experiment Station.

Ames Plantation

The Ames Plantation consists of about 18,450 acres and is located about 50 miles east of Memphis and 45 miles south of Jackson, Tennessee in Fayette and Hardeman Counties (Figure 1). It is located in the heart of the cotton-producing section of West Tennessee, known as type-of-farming area 3.¹

*Professor and Head, Assistant Professor, and former Associate Professor, respectively, Department of Agricultural Economics and Rural Sociology.

¹Joe A. Martin and B. H. Luebke, "Types of Farming in Tennessee," Tenn. Agric. Expt. Sta. Bul. 311, March, 1960.

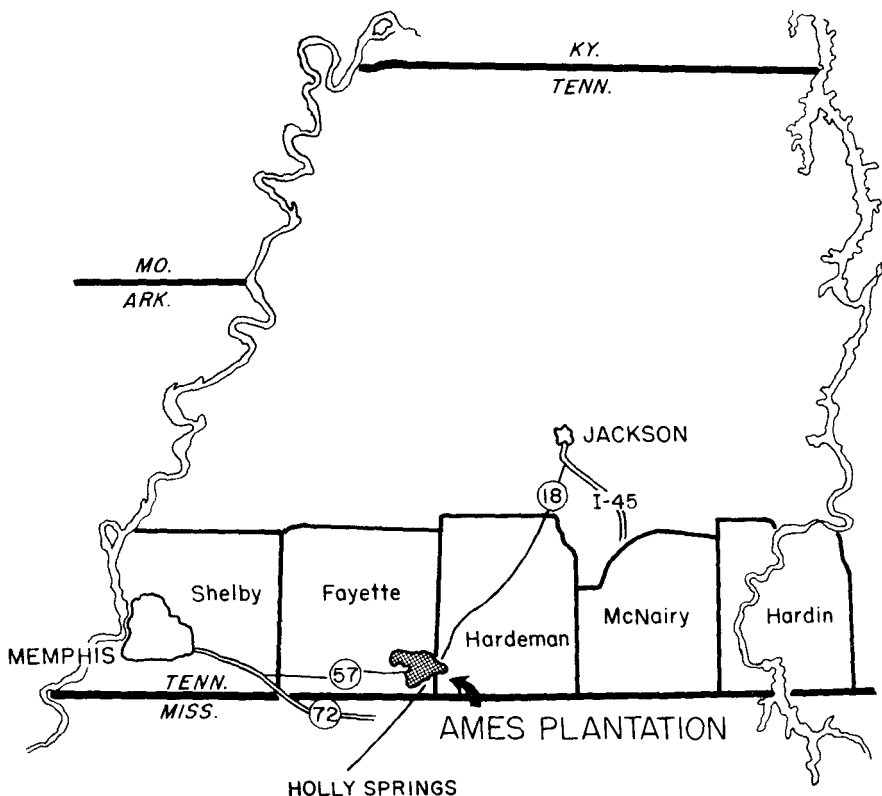


Figure 1. Location of the Ames Plantation in West Tennessee.

Type-of-Farming Area 3

In the 1954 Census of Agriculture, 82% of the farms in this 10-county area were classified as commercial farms and 70% of the total farms were classed as cotton farms.² No other type of commercial farm accounted for as much as 1% of the total farms except for livestock farms which amounted to 3.8%. Non-commercial farms comprised 18% of all farms and these were divided into residential and part-time farms which accounted for 10.8% and 7.2% of all farms, respectively. The average size farm in 1954 contained 77 acres.

The number of commercial farms declined 49.5% between 1954 and 1964 (Table 1). Cotton farms continued to predominate, com-

²To be classified as a particular type, a farm had to have sales of a particular product or group of products amounting in value to 50% or more of the total value of all farm products sold during the year.

Table 1. Farm size, number of cotton and commercial farms and percentage change in numbers, Type-of-Farming Area 3, Tennessee, 1954 through 1964

Item	Years		
	1954	1959	1964
Average size farm in acres	77	101	129
Percent change, 1954-64			+67.5
Number cotton farms	26,481	18,605	14,005
Percent change, 1954-64			-47.1
Number commercial farms	30,772	20,135	15,531
Percent change, 1954-64			-49.5
Total number farms	37,798	27,353	20,625
Percent change, 1954-64			-45.4

Source: U. S. Census of Agriculture, 1954, 1959, and 1964, Bureau of Census, Washington, D. C.

prising 68% of all farms in both 1959 and 1964. The total number of farms declined 45% between 1954 and 1964 while the average size of farm increased 68%.

As late as 1954, over 54% of the farms in the area were operated by tenants. Between 1954 and 1964, the number of tenants declined by 10,862, or 55%, (Table 2). During this period the number of full owners declined 37% while the number of part-owners remained relatively constant.

The most pronounced change in major crops grown in the area was the increase in soybean acreage between 1959 and 1964 (Table 3). In 1954, cotton acreage exceeded soybean acreage for beans by 293,000 acres; however, by 1964 soybeans exceeded cotton, the second most important crop acreagewise, by 31,000 acres. Cotton

Table 2. Number and percentage change in farms by tenure of operator, Type-of-Farming Area 3, Tennessee 1954 through 1964

Item	Years		
	1954	1959	1964
Number full owners	11,575	8,769	7,322
Percent change, 1954-64			-36.7
Number of part owners	4,561	4,444	4,431
Percent change, 1959-64			-2.8
Number of tenants	19,675	14,049	8,813
Percent change, 1954-64			-55.2

Source: U. S. Census of Agriculture, 1954, 1959, and 1964, Bureau of Census, Washington, D. C.

Table 3. Acreages and percentage change in acreage of major crops grown in Type-of-Farming Area 3, Tennessee, 1954 through 1964

Item	Years		
	1954	1959	1964
Cotton Acreage (1,000 Ac)	399.2	350.6	351.4
Percent change, 1954-64			-11.9
Corn Acreage (1,000 Ac)	391.7	287.2	220.6
Percent change, 1954-64			-43.7
Soybean Acreage (1,000 Ac)	106.0	229.6	382.4
Percent change, 1954-64			+260.8
Total hay acreage (1,000 Ac)	87.7	102.2	92.9
Percent change, 1954-64			+5.9
Total major crop acreage (1,000 Ac)	984.6	969.6	1,047.3
Percent change, 1954-64			+6.4

Source: U. S. Census of Agriculture, 1954, 1959, and 1964, Bureau of Census, Washington, D. C.

acreage declined 11.9% between 1954 and 1964 while corn acreage declined 43.7% and hay acreage increased 5.9%.

The Memphis-Loring and Grenada-Loring-Memphis Soil Associations predominate in the area. On the bottomland area, Collins, Falaya, and Waverly soils are usually found. Rainfall in the area averages 48 inches annually, and the growing season ranges from 200 to 226 days. In general, the soil and climatic conditions in the area favor the production of a wide range of crops. Historically, the system of farming in the area has not placed much emphasis on livestock production except for home use.

Use of Ames Plantation by the Institute of Agriculture

The University of Tennessee is a beneficiary of a perpetual Trust under terms of the Will of the late Julia C. Ames. Under this Will, the Ames Plantation is to be operated for research and educational purposes for the benefit of the College of Agriculture.³ Since 1953, five major research projects have been developed through the joint efforts of the Will Trustees of the Hobart Ames Foundation and the University of Tennessee.

First, a forestry research program was started in 1953 on the 9,000 to 10,000 acres of land either currently used for forestry or planned for such use.

³The name, College of Agriculture, was officially changed to The Institute of Agriculture, effective July 1, 1968.

Second, a Pilot Farm was started in 1954 on a 310-acre tract of land in order to study the adjustments which could be made to increase the net income of West Tennessee farmers.⁴

Third, in 1955 a research project was initiated with livestock enterprises on the so-called "Central Unit" of the Ames Plantation. The Central Unit consists of about 3,000 acres of open cropland and pasture which is operated by hired labor. The principal enterprises on this unit have been a Purebred Aberdeen Angus herd of approximately 300 brood cows, a swine herd of about 120 brood sows, cotton, corn, soybeans, and forage crops. Most of the research on this unit is conducted by the Animal Husbandry Department and is related to production testing of beef cattle and swine.

The **fourth** research project was started in 1956 and it involves farm management research with the tenant units on the Plantation. A presentation of the results of this project is the principal concern of this report.

The **fifth** research project was initiated in Agronomy in 1967 and is related to variety testing, fertilizer experiments and other similar agronomic problems.

Characteristics of Tenant Units on Ames Plantation in 1954

The late Hobart Ames used the Ames Plantation primarily as a hunting preserve during his lifetime. Although he was not interested in developing the agricultural potential of the numerous small farms that he bought to make up the Plantation, he did not disturb the existing small tenant farms beyond insisting that tenants refrain from cutting timber or destroying the vegetative cover for quail.

In 1954 a survey indicated that there were 54 tenants on the Plantation. In earlier years, according to some of the older residents on the Plantation, there were over 100 tenants but the number decreased substantially after World War II because of low farm incomes and attractive job opportunities outside of agriculture.

Since the tenants only used the open land and livestock of several families often grazed a common shared pasture, farm size

⁴Thomas J. Whatley, "Planning and Operating a Pilot Farm on the Ames Plantation in Tennessee," Tenn. Agric. Expt. Sta. Bul. 273, June, 1958.

Table 4. Size of farm and average acreage of various crops grown on 54 tenant units, Ames Plantation, 1954

Item	Size of farm in acres					Average for all farms
	Under 10	10 to 19	20 to 29	30 to 39	40 to 49	
Crops: Acres						
Cotton	5.2	9.0	11.7	17.1	22.2	12.7
Corn	—	4.8	10.0	14.7	18.8	9.7
Hay	—	1.0	2.3	1.5	1.3	1.4
Sorghum	—	.1	.9	1.2	.9	.7
Total size: Acres	5.2	14.9	24.9	34.5	43.2	24.5
No. of farms	5	15	14	16	4	—

was measured by acres of open cropland. The size of farm ranged from under 10 acres to 49 acres (Table 4).

The average acreage of cotton per farm was 12.7, or .6 of an acre less than the average per farm in Tennessee in 1954. Cotton yields averaged 394 pounds of lint per acre and this provided an average gross cash income of about \$1,700 per farm. Most of the tenants worked on a "standing rent" basis and paid about two bales of cotton as rent for each 10 acres of cotton grown. This annual rental rate ranged from approximately \$250 to \$350 per farm. No rental charge was made to the tenants on other crops grown or livestock raised. Gross cash income from livestock was low since the average number of livestock per farm was four head of cattle; seven head of swine; and two workstock. Only six of the farmers had tractors and they were all on farms larger than 20 acres.

The Plantation, as landlord, advanced money each spring for the operators to buy fertilizer, seed, food, and other items needed in farm production or for family living expenses. After deducting rental charges at the end of the crop harvest, the total income available to pay operating and family living expenses amounted to slightly less than \$1,400 per farm.

These operators were characterized by having few economic assets and a low educational level—most were negro. They were slightly older than the average farm operator in the State. Total farm assets averaged \$1,000 or less per operator. Only 11 out of the 54 operators had more than a 7th grade education and the average was 51.3 years compared with 48.2 in the State as a whole. Neither the tenants nor the Plantation were provided with a very profitable return for labor and other resources used in farming.

INITIAL PLANNING OF THE FARM MANAGEMENT TENANT UNITS

Objectives and Procedures

In early 1956, a professional farm manager was employed by the University to work with the tenant operators and to make recommendations for improving the existing farm income situation. It was soon recognized that the system of farming would have to be reorganized on tenant units if these units were to serve as a pattern for future agricultural adjustments in the area. Three major objectives were outlined for developing a farm management program for the tenant units:

- 1) To increase total production and net farm income on tenant-operated farms by applying improved production and management techniques.
- 2) To develop rental arrangements which would allow both the tenant and the landlord to share in the increased production and net farm income.
- 3) To develop methods of financing these adjustments.

One of the first major adjustments was to increase the land resources, as measured by acres of open land operated. The number of tenants was already decreasing on the Plantation, and this released land could be combined into larger operating units. The total open land being used on tenant units was about 1,400 acres. A doubling of this acreage was accomplished by removing hedgerows, enlarging fields, and reclaiming abandoned fields.

Additional capital was needed on the new tenant units for modern machinery and equipment, buildings, fencing, land clearing, and farm operating expenses. Most tenants working under the existing rental arrangements had poor housing and practically no facilities for producing livestock or storing harvested crops.

During 1956, the farm manager observed the farm operations on the existing tenant units and made recommendations concerning operators whom he thought could move into a more intensified modern farming program. Since many of the tenants were old or had noticeable physical handicaps, the number available for such a program was limited. Five operators expressed an interest in adjusting their farming systems if they could receive financial, as well as managerial assistance.



Field days in which the farm management project is discussed are well attended at Ames Plantation. The dwelling for Farm 5 is in the right background.

By using budgeting techniques, new systems of farming were planned for 1957 with the five tenants who expressed an interest in changing their farming systems. Since many combinations of crop and livestock enterprises were adaptable in the area, an attempt was made to set up a somewhat different system of farming on each of the five units. This permitted the tenant farms to be used as an educational aid for farmers visiting the tenant units who could appraise the feasibility of adding one or more of these enterprises on their own farms. The long range plans developed on these tenant units anticipated a minimum net farm income equal to the 1956 U. S. average of \$4,705 per farm.

Organization of the New Tenant Units in 1957

Resource Situations

Land: The predominate upland soils on the new tenant units were of the Memphis-Loring series with Collins and Falaya found on the bottomland. The value of the land suitable for crops and pasture was estimated at \$80 per acre in late 1956. Since many of the fields were 3 to 5 acres in size, it seemed desirable to enlarge them so more efficient use could be made of tractors and tractor-drawn equipment. The cost of enlarging the fields was capitalized into the land values. The amount of open land per tenant unit

ranged from 60 to 124 acres in 1957, depending upon the system of farming established (see Table 5).

Labor: The labor supply per tenant family was fairly typical of other farm families within the area, ranging from .8 to 1.5 man equivalents per farm on four of the units and with 3.0 man equivalents on the other farm. The labor supply usually consisted of the operator, his wife who was available for some work such as chopping and picking cotton, and children who were available for work when they were not attending school. Mechanical cotton pickers were not used for harvesting cotton in 1957.

Capital: The major limitation in implementing the new program with the tenants was the lack of capital improvements on the proposed tenant units and the amount of funds for making capital improvements and for operating expenses. New houses or dwellings were needed immediately on two of the units, and the other three dwellings needed replacing within 2 to 3 years. None of the units had storage facilities for over 300 bushels of grain. New wells along with completely new fencing and facilities for livestock had to be provided. Also, arrangements had to be made to obtain tractors or tractor services and other necessary equipment to put the proposed plans into operation.

Table 5. The resource and enterprise situations of the tenant farms on Ames Plantation, 1957

Enterprise	Unit or number	Tenant farm number				
		1	2	3	4	5
		Number				
Livestock:¹						
Dairy	Cows	30	—	—	—	—
Swine	Brood sows	—	4	3	2	4
Crops:						
Cotton	Acres	12.0	30.0	13.0	16.5	20.0
Corn	Acres	26.0	30.0	20.0	15.0	35.0
Small grain	Acres	33.0 ²			—	—
Millet	Acres	6.0			—	—
Hay	Acres	20.0	5.0	5.0	4.5	5.0
Improved pasture	Acres	17.0	5.0	2.0	4.0	12.0
Unimproved pasture	Acres	—	—	18.0	18.0	7.0
Silage	Acres	14.0	—	—	—	—
Other crops	Acres	2.0	5.0 ³	2.0	2.0	1.0
Total acres		130.0 ³	75.0	60.0	60.0	80.0

¹Livestock added after July 1, 1957.

²Six acres of small grain double-cropped with millet.

³Includes 3 acres of strawberries.

In 1957 the Will Trustees of the Hobart Ames Foundation agreed to set up a "Revolving Fund" of \$25,000 to finance the tenants working under old rental arrangements as well as the five tenants set up under the new program. These funds were to be used for both capital improvements and operating expenses. The Will Trustees further agreed that the Ames Plantation's share of net income on the five tenant units could be added to the "Revolving Fund" during future years.

Through the University of Tennessee Agricultural Experiment Station, some of the major farm machinery companies agreed to lease tractors and equipment on three of the tenant units for a 2-year period until the tenants were financially able to purchase these items. In addition, the Agricultural Experiment Station agreed to transfer 30 purebred Jersey cows from the West Tennessee Experiment Station in order to establish a Grade A Dairy on one of the tenant farms, provided sire evaluation studies would be conducted on the heifers produced. It was agreed that the initial herd could later be purchased or comparable cows could be returned to the Agricultural Experiment Station.

Commercial banks and agricultural credit agencies in the West Tennessee area were informed about the proposed program. Their representatives indicated that financial assistance might be provided the tenants after the first year or two of their successful operation.

Enterprises: The main enterprises included on the five initial tenant units were cotton and corn with hogs added on four of the farms. Strawberries were added on one unit where the operator's family had 3.0 man equivalents of labor. As indicated earlier, a Grade A dairy was included as the major enterprise on one unit. The primary reasons for including these enterprises were that the tenants were familiar with them, with the exception of strawberries, and they provided a quick "turnover" of scarce funds required for operating expenses as well as low capital investments (excluding the Grade A Dairy). In later years other enterprises such as soybeans, beef cattle, and sheep were added on some of the farms.

Rental Arrangements

As previously indicated, one objective of this program was to increase net farm income on tenant-operated farms, and the second

objective was to develop rental arrangements which would allow both the tenant and landlord to share equitably in the net farm income.

Bonser made a study of leasing arrangements that were considered successful in West Tennessee in 1947.⁵ Two general types of leasing arrangements seemed rather successful in Bonser's study. One was a 50-50 share rent on a dairy-crop farm. The landlord provided the land, buildings, and other permanent improvements as well as one-half of the following: dairy herd; farm machinery and equipment; and operating expenses. The tenant provided all the labor and 50% of the costs of items shared with the landlord. Valuing farm labor at the current wage rate and interest on investment at 5%, Bonser found that the tenant bore 54.3% of the total annual cost on the farm and received 52.6% of the gross returns.

The second type of lease which was viewed as satisfactory in Bonser's study was a one-third crop share lease. The landlord provided the land, buildings, all other permanent improvements, and one-third of the operating costs in producing crops with the exception of operating costs associated with farm machinery and equipment. The tenant provided all labor, power and equipment, and two-thirds of all other operating expenses. With interest on investment calculated at 5% and labor at the current wage rate, the tenant bore 77.8% of the total annual cost on the farm and received 71.3% of the gross returns.

The type of rental arrangements developed on the Ames Plantation tenant units followed the general patterns outlined by Bonser with some modifications. The one-third crop leasing arrangement was extended to include the hog enterprise shared on the one-third—two-thirds basis with the landlord owning one-third of the swine breeding stock on two of the tenant farms (Table 6). The original tenants on Farms 3 and 4 owned tractors and their rental arrangements during the period 1957 through 1960 were modified to allow them to receive three-fourths of the income from corn and hogs and pay the same proportion of expenses on these enterprises. Tenant units numbers 2 and 3 were discontinued on December 31, 1960, and the son of the original operator on Farm 4 took over the operation of that farm at the same time. Thereafter, the rental

⁵Howard J. Bonser, "Some Factors in Farm Organization and Returns to Tenants and Landlords by Type of Leasing Arrangements, West Tennessee, 1957," *Tenn. Agric. Expt. Sta. Bul.* 217, June, 1950.

Table 6. Rental arrangement and type-of-farming developed on five tenant units, Ames Plantation, 1957¹

Rental arrangement	Farm 1 Dairy Cotton Corn Hogs	Farm 2 Cotton Corn Hogs S'berries	Farm 3 Cotton Corn Hogs	Farm 4 Cotton Corn Hogs	Farm 5 Cotton Corn Hogs
Landlord	½ of income and expenses	½ of income and expenses	⅓ of income and expenses on cotton; ¼ of these expenses on corn and hogs	⅓ of income and expenses on cotton; ¼ of these expenses on corn and hogs	⅓ of income and expenses
Tenant	½ of income and expenses	⅔ of income and expenses	⅔ of income and expenses on cotton; ¾ of these expenses on corn and hogs	⅔ of income and expenses on cotton; ¾ of these expenses on corn and hogs	⅔ of income and expenses

¹Tenants provide all the labor, equipment, and fuel costs incurred in the farming operations except on Farm 1 where these costs are divided equally between the landlord and tenant. When Farms 6 through 9 were added at a later time, the rental arrangements were similar to those on Farm 5.

²Soybeans added at a later time on all farms.

arrangement on all new units added was the one-third—two-thirds arrangement already discussed. The rental arrangement on Farm 1, the Grade A dairy farm, was on a 50-50 basis of sharing income and expenses between the Plantation and tenant.

Role of the Farm Manager

The farm manager of the tenant units had a dual role: First, to develop an educational program with the tenants in farm planning and in implementing the farm plans; and, second, to supervise the expenditures of funds for both operating and capital items in accordance with the farm plans. Annual work plans and budgets are developed about October before the next calendar year. In implementing the plans, the manager often provides assistance in adjusting farm equipment, calculating kinds and quantities of herbicides to use, and supervises the installation of permanent improvements, such as dwellings, barns, and fences.



A modern dwelling on one of the farm management units.

Planning of and Experiences with the Tenant Units

Many changes have occurred in agriculture over the 12-year period since this program was initiated, but the full impact of these changes was not foreseen at the time long range plans were first developed. It was recognized that mechanization was proceeding at a rapid pace, the number of farms was decreasing, and managerial decision making was becoming more complex as farmers in the area shifted from predominantly cotton production to the systems of farming which made better use of all resources. Even though many factors influenced the operations of these tenant units over the 12-year period, the following four factors probably had the greatest impact:

First, mechanization of cotton harvesting was adopted in 1959. In 1957 and 1958 emphasis was placed upon using those combinations of practices that would increase cotton yields. This resulted in peak labor demands for handpicking which exceeded the family labor supply during the fall season. Since the farm labor supply was decreasing throughout the area, cotton harvest was often delayed a month or more after the cotton was ready to harvest—resulting in a reduction in the quality of the cotton.

Second, the adoption of chemical weed control methods reduced

or eliminated the labor requirement for such jobs as chopping and hoeing cotton as well as for cultivating many other crops. For example, some of the tenant units have produced crops for the past 8 years without using hand labor or cultivation.

Third, all of the tenant units shifted from two- to four-row equipment in 1961. This allowed the substitution of machinery for labor, and this coupled with the use of chemical weed control methods and mechanized harvesting of cotton made it desirable to increase the size of each of the units. The topography of the land in the area was suitable for using this equipment.

Fourth, soybeans became an important cash crop in the area and on the tenant units. Limitation under governmental programs on the acreage of cotton and feed grains and the increase in the price of soybeans in the early 1960's made soybeans a profitable alternative crop. In many instances, soybeans were grown on open farm land which had previously been idle.

Changes in Number of Tenant Units

The number of total tenants on the Ames Plantation decreased from 54 in 1954 to only 10 in 1968. At the time the farm management program was begun, it was anticipated that 15 or 20 of the new tenant units would be established. However, due to the factors previously mentioned, the tenant units were enlarged in size rather than increased in number. By 1968, there were only 3 tenants on the Plantation who remained under the rental arrangement existing in 1954, while 7 tenant units were under the intensive farm management program.

The number of tenant units under the intensive farm management program varied from 5 to 8 for the period 1957 through 1968 (Table 7). Two tenant units were added in 1959 and one was added in 1960 and another in 1966. Two of the tenant units were discontinued at the end of 1960 (Farms 2 and 3), and the land in these units was incorporated into the other existing units. The operator of Farm 2 bought a farm while the operator of Farm 3 left the Plantation to farm elsewhere. The leasing arrangement on Farms 6 through 9 was similar to that used on Farm 5 previously described, which is basically a one-third—two-thirds sharing arrangement.

Table 7. Number of tenant units on farm management program by years, 1957 through 1968

Years	Farm numbers									Total number of farms
	1	2	3	4	5	6	7	8	9	
1957	x	x	x	x	x					5
1958	x	x	x	x	x					5
1959	x	x	x	x	x	x	x			7
1960	x	x	x	x	x	x	x	x		8
1961	x			x	x	x	x	x		6
1962	x			x	x	x	x	x		6
1963	x			x	x	x	x	x		6
1964	x			x	x	x	x	x		6
1965	x			x	x	x	x	x		6
1966	x			x	x	x	x	x	x	7
1967	x			x	x	x	x	x	x	7
1968	x			x	x	x	x	x	x	7

Changes in Crop Yields

A survey of tenants on the Ames Plantation in 1954 indicated that the average yield per acre of the two principal row crops, cotton and corn, was 394 pounds of lint cotton and 20 bushels of corn. Starting in 1957, an intensive effort was exerted to increase the yields of these crops. Over the 12-year period, 1957 through 1968, the yield of cotton averaged 664 pounds per acre or 137 pounds of lint higher on the Ames Plantation than in the state as a whole (Table 8). During this same period, corn yields on the

Table 8. Average yields per acre of principal crops on the tenant units compared to State average yields, 1957 through 1968

Year	Lb. of lint cotton		Bushels of corn		Bushels of soybeans	
	Tenant	State	Tenant	State	Tenant	State
1957	658	427	44	31	a	22
1958	685	501	48	38	a	23
1959	691	620	55	39	14	23
1960	701	545	60	39	21	22
1961	560	493	61	43	22	22
1962	652	494	65	41	26	22
1963	696	621	75	53	25	21
1964	842	640	53	49	26	23
1965	686	611	52	53	27	23
1966	531	475	36	48	26	24
1967	619	295	81	57	28	25
1968	673	432	41	47	23	21
Average	664	527	56	43	25	23

*No soybeans grown on the Tenant Units for beans in these years.

Ames Plantation exceeded the state average by 13 bushels per acre per year. There was more variability in yields of corn than of cotton grown on the tenant units. Even though recommended practices were followed in growing both crops, corn was affected more by drought conditions than cotton. Soybeans did not become a major enterprise on tenant units until 1959. From then through 1968 soybean yields on the units averaged around 10% higher than in the State as a whole.

Enterprise Organization and Income Situations on Specified Farms

Farms 1, 5, 7, and 8 have been selected for purposes of indicating actual changes in enterprises, income, and expenses since this program was initiated. Each of these four units represents a different combination of crop and livestock enterprises.

Farm 1

This tenant unit was established to evaluate the role of Grade A dairying in a farming system. In 1957 a 30-cow dairy herd was started; the production program included 14 acres of cotton and the supporting crops for the dairy herd. By 1968 the size of the dairy herd had about doubled. Swine was produced in 1958 through 1961, then was dropped as an enterprise as the dairy herd expanded. Soy-



Some of the dairy cattle graze on Farm 1.

beans was added as a cash crop in 1966. In general, adequate supplies of corn silage, corn, small grain, and supplemental grazing crops were produced over the years for the dairy herd. The acreage of open land was increased from 124 in 1957 to 349 in 1967.

The income and expenses on Farm 1 are indicated in Table 9. Total cash income increased from \$4,070 in 1957 to \$53,474 in 1968. Cash expenses increased from \$5,030 in 1957 to \$27,198 in 1968. The net farm income available to pay for land, labor, capital, and management increased from \$531 in 1957 to \$19,106 in 1968.

Over the 12-year period, \$49,082 was invested in this farm by the Plantation for land improvements, buildings, and equipment. After deducting depreciation, the net investment in these items was \$29,182 on December 31, 1968. The investment in the dairy herd, consisting of about 60 milk cows and 50 replacement heifers, was \$15,590 on December 31, 1968; this herd was jointly owned on a 50-50 basis by the operator and the Plantation. The tractor and equipment have been leased from a machinery company and these costs have been shown as a cash cost rather than non-cash costs over the 12 years.

Farm 5

The organization of this farm was very similar to that of Farms 4 and 6. Primary emphasis was upon cash crops with a relatively small swine enterprise. It was anticipated that a swine herd of 10 brood sows would be maintained; however, the operator had less interest in swine than in cash crops and the swine herd usually ranged from 4 to 5 brood sows, farrowing twice yearly, and the litters were fed out as market hogs.

The total size of this farm was increased from 75 acres in 1957 to 196 acres by 1968. Over this period, corn acreage was increased from 35 to 40; cotton from 20 to 40; and soybeans from 0 to 75. The rental arrangement was a one-third—two-thirds sharing as indicated earlier.

Total cash income ranged from \$5,964 in 1957 to \$18,819 in 1964 (Table 10). Approximately 60% of the cash income was from cotton. Net farm income ranged from \$4,370 in 1959 to \$9,300 in 1964. A total of \$13,678 was invested by the Plantation for buildings and other permanent improvements between 1957 and 1968. After deducting depreciation charges, the net investment for these items was \$8,761 on December 31, 1968.

Table 9. The enterprise organization and income situation on Farm 1, (Grade A Dairy), Ames Plantation, 1957 through 1968

Enterprise or product sold	YEARS											
	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968
	Dollars											
Livestock and livestock products												
Milk	2,468	8,556	10,322	13,560	17,729	18,519	22,745	27,226	26,032	33,474	36,985	40,845
Cattle	8	106	288	694	583	2,335	477	3,416	1,892	1,822	1,927	3,300
Swine	—	606	1,290	1,073	252	—	—	—	—	—	—	—
Sub-total	2,476	9,268	11,900	15,327	18,564	20,854	23,222	30,642	27,924	35,296	38,912	44,145
Crops												
Cotton	1,594	2,066	4,588	3,784	4,950	6,862	5,266	6,419	4,727	3,257	3,551	2,297
Soybeans	—	—	—	—	—	—	—	—	—	800	2,636	3,089
Corn or small grain	—	—	36	756	—	—	2,734	—	—	45	593	333
Sub-total	1,594	2,066	4,624	4,540	4,950	6,862	8,000	6,419	4,727	4,102	6,780	5,719
Misc. cash income ¹	—	92	—	136	188	348	561	863	2,036	1,846	696	3,610
Total cash income	4,070	11,426	16,524	20,003	23,702	28,064	31,783	37,924	34,687	41,244	46,388	53,474
Total cash expenses	5,030	8,595	10,318	11,441	12,494	15,797	16,176	21,306	18,770	19,185	24,620	27,198
Net cash income	960	2,831	6,206	8,562	11,208	12,267	15,607	16,618	15,917	22,059	21,768	26,276
Net farm income ²	531	7,940	5,366	7,229	11,299	6,502	13,795	8,035	8,866	15,151	16,997	19,106

¹Includes government payments.

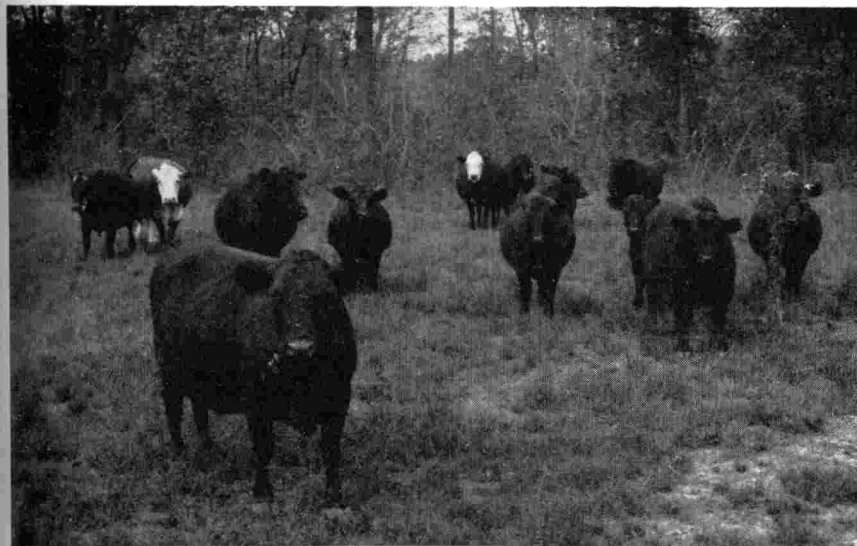
²Available as return to land, labor, capital, and management.



This is an example of some of the facilities and some of the hogs grown on one of the farm management units.

Farm 7

This farm was added to the program in 1959 on a portion of the Plantation having a more rolling topography and less productive soils than most of the other farms. In addition to swine,



A look at part of the beef cattle herd on Farm 7.

Table 10. The enterprise organization and income situation on Farm 5, Ames Plantation, 1957 through 1968

Enterprise or product sold	YEARS											
	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968
	Dollars											
Livestock												
Swine	1,151	3,318	1,542	3,417	2,745	2,510	2,457	1,438	1,572	—	2,746	3,174
Crops												
Cotton	4,178	4,225	5,123	5,355	6,175	7,125	8,038	10,292	7,176	5,305	7,593	4,196
Corn	—	2,091	1,927	983	2,127	1,285	3,537	2,266	1,614	1,686	900	2,269
Soybeans	—	—	709	820	1,821	2,857	2,991	3,885	3,360	3,633	3,806	3,836
Wheat	—	—	—	—	—	—	—	—	—	—	1,439	574
Sub-total crops	4,178	6,316	7,759	7,158	10,123	11,267	14,566	16,443	12,150	10,624	13,738	10,875
Misc. cash income ¹	635	1,217	778	627	—	905	904	938	1,163	3,704	1,495	4,573
Total cash income	5,964	10,851	10,079	11,202	12,868	14,682	17,927	18,819	14,885	14,328	17,979	18,622
Total cash expenses	2,805	3,858	4,729	5,225	6,503	6,913	6,784	7,840	7,885	6,031	9,143	11,085
Net cash income	3,159	6,993	5,350	5,977	6,365	7,769	11,143	10,979	7,000	8,297	8,836	7,537
Net farm income ²	4,834	5,619	4,370	6,120	4,585	6,893	8,403	9,300	5,397	7,126	8,574	4,564

¹Includes government payments.

²Available as returns to land, labor, capital, and management.

Table 11. The enterprise organization and income situation on Farm 7, Ames Plantation, 1959 through 1968

Enterprise or product sold	YEARS									
	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968
	Dollars									
Livestock										
Beef cattle	—	153	1,379	2,335	1,323	1,674	2,203	1,878	2,172	2,280
Swine	894	1,223	1,496	2,991	3,936	1,451	3,120	3,157	2,331	3,872
Sub-total	894	1,376	2,875	5,326	5,259	3,125	5,323	5,035	4,503	6,152
Crops										
Cotton	4,209	4,116	4,341	5,334	7,937	8,305	6,998	4,211	7,334	3,239
Corn	—	941	1,259	291	645	—	415	—	—	1,112
Soybeans	769	1,009	318	795	1,080	1,316	1,373	1,682	4,445	2,627
Wheat	—	—	—	—	—	—	—	—	452	174
Sub-total	4,978	6,066	5,918	6,420	9,662	9,621	8,786	5,893	12,231	7,152
Misc. cash income ¹	227	642	67	3,860	1,905	2,681	2,479	2,821	1,611	4,389
Total cash income	6,099	8,084	8,860	15,606	16,826	15,427	16,588	13,749	18,345	17,693
Total cash expenses	3,350	3,469	5,213	4,908	7,621	8,282	9,622	7,002	9,723	10,678
Net cash income	2,749	4,615	3,647	10,698	9,205	7,145	6,966	6,747	8,622	7,015
Net farm income ²	3,538	3,932	3,058	9,684	7,241	5,101	4,679	4,116	8,612	5,405

¹Includes government payments.

²Available as returns to land, labor, capital, and management.

cotton, and soybeans, a cow-calf herd was included to utilize pasture and roughages produced on the steeper slopes. The farm size was increased from 76 acres in 1959 to 232 acres in 1968. Principal crops in 1968 were 35 acres of cotton, 40 acres of corn, 80 acres of soybeans, and 77 acres used for hay and pasture. Grazing of stalk fields supplemented the fall and winter feed for the 25 beef cows. A swine herd of 5 to 7 brood sows was maintained for producing market hogs. The leasing arrangement was the one-third—two-thirds sharing.

Over the 10-year period, the Plantation's investment in land improvements, buildings, and equipment totaled \$22,007, and after deducting depreciation, amounted to \$14,254 on December 31, 1968. Total farm investment in swine and beef cattle was \$7,050 at the end of 1968.

Farm 8

This farm was organized in 1960 with cotton, corn, and soybeans as the major crop enterprises. A flock of sheep was added in 1961 to utilize forages produced on the rolling land. The basic leasing arrangement was the one-third—two-thirds sharing. The total size of the farm was increased from 61 acres in 1960 to 232 acres by 1968. Over this period soybean acreage was increased from 20 to 100, cotton from 15 to 26, and pasture acreage from 8 to 66.

The peak in number of sheep on the farm was 281 in December 1964, and by December 1968 the number had declined to 115. Income from the sheep enterprise was highest in 1967 when 145 lambs and cull ewes were sold. A new tenant operator moved on this farm in 1967, and due to this—plus the limited number of sheep in this area—it is anticipated that the sheep enterprise will be discontinued in 1969.

Total cash income on this farm ranged from a low of \$4,421 in 1961 to a high of \$22,341 in 1964 (Table 12). Net farm income for these respective years was \$523 and \$9,950 which was the lowest and highest over the 9-year operation of this farm. Net farm income was lower in 1968 than any year since 1961. Cotton receipts were down in 1968 due to lower prices received for lint cotton rather than reduced yield. Actually, cotton yields averaged 730 pounds of lint per acre in 1968. Livestock receipts were almost

Table 12. The enterprise organization and income situation on Farm 8, Ames Plantation, 1960 through 1968

Enterprise or product sold	YEARS								
	1960	1961	1962	1963	1964	1965	1966	1967	1968
	Dollars								
Livestock and livestock products									
Sheep	—	—	688	1,443	1,477	1,158	1,267	1,862	717
Wool	—	—	249	599	638	718	696	442	189
Swine	—	593	2,346	1,146	—	—	—	—	—
Sub-total	—	593	3,283	3,188	2,115	1,876	1,963	2,304	906
Crops									
Cotton	4,885	3,536	11,286	10,314	14,811	11,220	6,294	7,899	4,493
Corn	—	198	—	768	1,367	1,137	1,902	56	—
Soybeans	371	94	1,512	3,209	2,459	3,153	2,798	4,973	6,463
Oats and hay	—	—	—	—	—	—	—	743	211
Sub-total	5,256	3,828	12,798	14,291	18,637	15,510	10,994	13,671	11,617
Misc. cash income ¹	632	—	1,827	764	1,589	928	4,421	1,810	4,179
Total cash income	5,888	4,421	17,908	18,243	22,341	18,314	17,378	17,785	16,252
Total cash expenses	3,171	3,576	9,811	8,013	9,949	9,185	7,542	8,573	10,964
Net cash income	2,717	845	8,097	10,230	12,392	9,129	9,836	9,212	5,288
Net farm income ²	3,022	523	6,196	8,265	9,950	4,772	6,708	7,009	3,122

¹Includes government payments.

²Available as return to land, labor, capital, and management.

\$1,400 lower in 1968 than in 1967, while cash expenses were the highest on record, or averaged around \$2,400 higher than in 1967.

Over the 9-year period, the Plantation's investment in land improvements, buildings, and equipment totaled \$19,106 and after deducting depreciation, amounted to \$7,324 on December 31, 1968.

An Analysis of the Results with the Farm Management Tenant Units

In this section, emphasis will be placed on the effects of the reorganization of the tenant units on their economic growth rate and on the productivity or earnings of the resources used. Since the central objective of the project was to increase the income of both the tenants and the landlord, both the levels and proportions of resources and enterprises were changed over the period of study as technologies and economic conditions changed. For example, the introduction of mechanical cotton pickers reduced the peak labor load on these farms during the fall, and the tenants were able to add more acres of grain crops such as soybeans and corn. The substitution of chemical weed control measures for hand hoeing and cultivation had a similar impact on resource use on these farms.

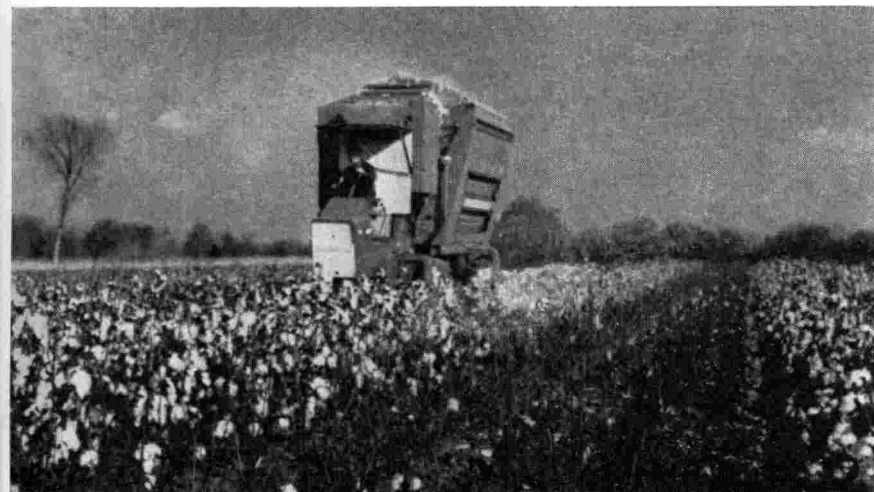


Harvesting corn, using the picker-sheller, on one of the farm management units.

One major concern of farmers is whether to buy specialized machinery or to obtain the use of such equipment through custom services. Examples of special equipment needed on these tenant units are combines, hiboyes, 1-row or 2-row cotton pickers or strippers, corn picker-shellers, and trailers. To provide for more efficient use of such equipment, a pooling of machinery for all the tenant units was followed. Items of equipment such as those mentioned above were either purchased or leased by the Plantation, and the services of these machines were made available to the tenants on a custom rental basis. A tenant operated the equipment and the charges for its use were similar to custom rates in the area and covered all costs—such as tenant's labor—and variable and fixed costs. Rates on harvesting principal crops in 1968 were as follows: Cotton, 6 cents per pound of lint; shelled corn, 30 cents per bushel; and soybeans 45 cents per bushel. Since one of these machines, such as a cotton picker, might be used to harvest 200 bales of cotton in a season rather than the 25 or 30 bales grown on an individual tenant unit, this resulted in cost savings on essential inputs for all the tenants.

Measures of Economic Growth

Economic growth on tenant units is measured in two ways: 1) an increase in the internally-generated earnings in terms of gross income and net farm income, and 2) an increase in the quantity of assets controlled over time.



Mechanical harvesting of cotton on one of the farm management units.

Gross Income

Economic growth of an enterprise or firm can be measured or indicated by the changes that occur in volume of output. In some cases, where a single enterprise dominates, the growth can be measured in volume of production. However, where no particular enterprise dominates, then a least common denominator or standard unit of measure must be used. Gross income is used as one such measure of economic growth on tenant units.

Average annual gross income increased from \$6,904 per farm in 1957 to \$20,746 in 1968. This represented an annual increase of 18.2% over this period. During the first 6-year period, 1957-1962, gross income ranged from \$6,904 in 1957 to \$16,759 in 1962 and averaged \$10,743. For the last 6-year period, 1963-1968, gross income ranged from \$16,581 in 1966 to \$21,728 in 1967 and averaged \$19,484. The average gross sales per farm over the 12-year period was \$15,113. Gross income by years is indicated in Figure 2.

GROSS INCOME (\$)

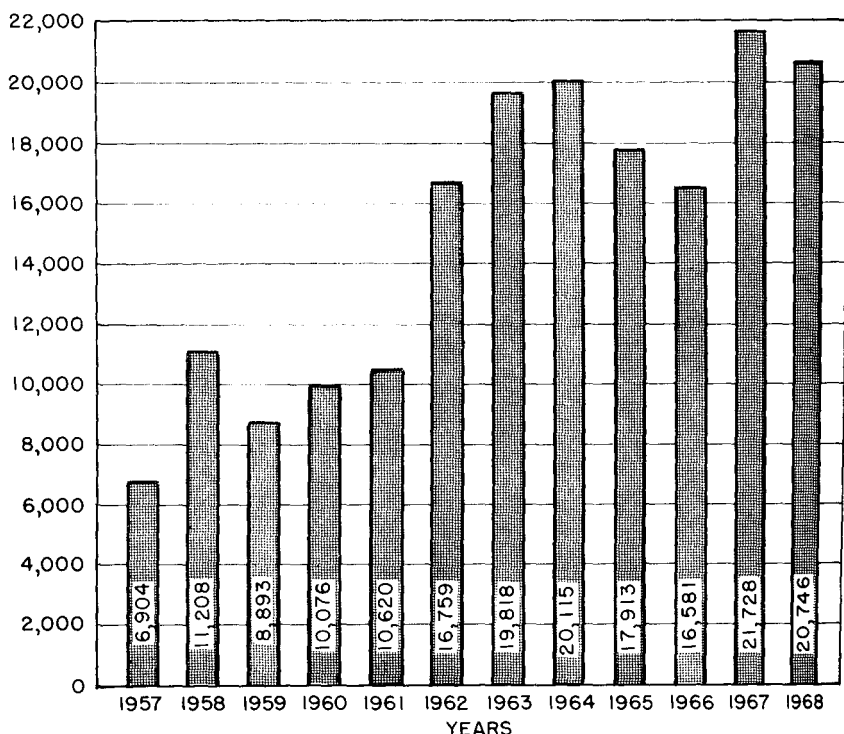


Figure 2. Average annual gross income per tenant farm, Ames Plantation, 1957 through 1968.

One limitation of using gross income as a measure of economic growth is that it does not consider changes in quantities and costs of inputs associated with given levels of gross income.

Net Farm Income

Net farm income is defined as that income remaining after paying cash operating expenses, deducting depreciation charges, and adjusting for inventory changes on farms. It is that income which is available to pay for the use of land, labor, and capital on a farm.

Average net farm income per farm ranged from \$3,697 in 1957 to \$10,095 in 1967 (Table 13). As previously shown, gross income was also lowest and highest for these respective years. During the first 6-year period, 1957 through 1962, net farm income per farm ranged from \$3,697 in 1957 to \$6,428 in 1958 and averaged \$4,814 for this period. For the second 6-year period, 1963-1968, net farm income per farm averaged \$7,539. Thus, average net farm income per farm was 56% higher during the period 1963-1968 than for the previous 6 years. The tenants' share of net farm income averaged 65% of the total over the 12-year period.

Table 13. Average annual net farm income per tenant farm, Ames Plantation, 1957 through 1968

Year	Number of farms	Average net farm income		
		Tenant's share	Landlord's share	Total
		Dollars		
1957	5	2,418	1,279	3,697
1958	5	4,102	2,326	6,428
1959	7	2,382	1,369	3,751
1960	8	3,002	1,660	4,662
1961	6	2,423	1,579	4,002
1962	6	4,319	2,023	6,342
Average 1957-1962		3,108	1,706	4,814
1963	6	5,467	3,187	8,654
1964	6	5,114	2,449	7,563
1965	6	3,882	1,770	5,652
1966	7	4,218	2,204	6,422
1967	7	6,443	3,652	10,095
1968	7	4,618	2,231	6,849
Average 1963-1968		4,957	2,582	7,539
Average 1957-1968		4,032	2,144	6,176

Resources Controlled

Economic growth of the tenant farms is also measured in terms of land, labor, and capital controlled by both the landlord and tenant operators (Table 14). The average size of farm increased from 83 acres of open crop and pastureland in 1957 to 222 acres in 1968. Farm size was increased to make more effective use of labor as shifts were made from hand chopping, hoeing, and hand-picking of cotton to use of chemical weed control methods and use of mechanical cotton pickers and strippers. Too, the shifting from 2-row to 4-row equipment allowed the farmers to handle more acres of crops such as corn and soybeans. With mechanization of crop production, especially cotton, less family labor other than that of the operator was used in farming. Around four times as many acres were operated per man equivalent in 1968 as in 1957.

The capital requirements on these farms, as shown in Table 14, are underestimated by about \$3,000 to \$5,000 per farm in terms of equipment used for land preparation and the production of crops. The tenants leased this equipment through the University

Table 14. Quantity of resources controlled per tenant farm on Ames Plantation, 1957 through 1968

Year	Acres open land	Man equiv. labor	Acres per man equiv.	Total capital investment			Total capital used	
				Landlord	Tenant	Total	Per acre land	Per man equiv. of labor
1957	83	1.5	55	9,445	1,439	10,884	131	6,297
1958	93	1.5	62	11,292	1,396	12,688	136	8,458
1959	99	1.21	81	14,156	1,309	15,465	156	12,780
1960	98	1.21	80	15,930	1,344	17,274	176	14,276
1961	114	1.08	105	21,201	3,520	24,721	228	22,889
1962	137	1.08	127	25,984	3,602	29,586	216	27,394
Avg. 1957-1962	104	1.26	84	16,334	2,102	18,436	174	15,349
1963	143	1.08	132	29,376	3,360	32,736	229	30,311
1964	148	1.08	137	31,876	3,437	35,306	238	32,690
1965	149	1.08	138	33,740	2,702	36,442	245	33,742
1966	158	1.08	146	36,116	2,321	38,437	243	35,589
1967	178	1.08	165	42,537	2,289	44,826	252	41,505
1968	222	1.04	213	53,758	2,701	56,459	253	54,287
Avg. 1963-1968	166	1.07	155	37,901	2,800	40,701	243	38,021
Avg. 1957-1968	135	1.17	117	27,118	2,451	29,569	209	26,685

from the machinery companies. Thus, the cost of such equipment was reflected as a cash operating cost for the tenants rather than as a capital investment. The rental rates normally varied from 10% to 20% of the retail price of the equipment plus freight and handling charges from the factory outlets. The tenants' cash farm operating costs were \$500 to \$1,000 higher than usually found on farms where all equipment was owned by the operator, and in a similar manner, depreciation charges or non-cash expenses were \$500 to \$1,000 lower on the tenant farms than would be expected if equipment were owned.

In 1957 when this project was started, it was estimated that unimproved land of similar quality in the area to that on the Ames Plantation was valued at \$80 per acre. Usually this land was in fields varying from 1 to 5 acres in size, and workstock were used as the source of power on most farms. Since 1957, bulldozers have been used to enlarge fields so that tractor power could be used more effectively and the costs associated with landclearing or field enlargement were capitalized into the land value. Since land values have appreciated at an estimated annual rate of 5% to 10% in Tennessee since 1957, it is assumed that the \$80 per acre land has appreciated 7.5% annually. By applying this annual rate, unimproved land valued at \$80 per acre in 1957 would be valued at \$177 per acre in 1968.

It can be noted in Table 14 that the average investment per farm increased fivefold between 1957 and 1968, or increased from \$10,884 to \$56,459 for these respective years. Total capital investment per acre of open cropland and pastureland ranged from \$131 in 1957 to \$253 in 1968. The capital investment per man-equivalent was over eight times higher in 1968 than in 1957.

Productivity or Earnings of Resources

The contributions made by particular resources to net farm income are very difficult to measure; therefore, certain assumptions must be made about the rates of returns expected from one set of resources while the remaining net income is attributed to the other resources. Even though these measurements are hard to make, a farm operator must choose types and quantities of resources to use in order to maximize his objectives. In this report, net farm income is allocated among the following resources: land, operator and family labor, capital, and management.

Distribution of Earnings by Resource

Returns to Land: Land is measured in terms of acres of open cropland and pastureland per farm. In early 1966, an outside appraiser made a detailed evaluation of the Ames Plantation assets. This appraiser placed the following values on different classes of open land: Class I, \$300 per acre; Class II, \$225 per acre; Class III, \$150 per acre; Class IV, \$125 per acre; and Class V, \$70 per acre. For this analysis, the weighted average value of Class II through Class V land on the Plantation should be fairly representative of the land on the tenant farms. This value was \$155 per acre in 1966, and was very close to the \$153 per acre estimated for land on tenant farms for that year.

If the annual returns to land are measured in terms of a 5% return on investment, the average annual returns to land per farm ranged from \$330 in 1957 to \$1,965 in 1968 (Table 15). Since the land is owned entirely by the landlord, this comprises a major portion of the Plantation's earnings.

Table 15. Average income and returns per farm for various resources on the farm management tenant units, Ames Plantation, 1957 through 1968

Year	Net farm income	Land	Distribution of income by type of resources					
			Operator & family labor	Other capital		Residual return to management		
				Landlord	Tenant	Landlord	Tenant	Farm total
Dollars								
1957	3,697	330	2,745	142	72	807	—399	408
1958	6,428	400	2,880	165	70	1,761	1,152	2,913
1959	3,751	455	2,396	252	65	662	—79	583
1960	4,662	485	2,468	311	67	864	467	1,331
1961	4,002	610	2,251	450	176	519	—4	515
1962	6,342	788	2,333	511	180	724	1,806	2,530
Avg. 1957-1962	4,814	511	2,512	305	105	890	491	1,381
1963	8,654	879	2,430	589	168	1,719	2,869	4,588
1964	7,563	984	2,560	610	172	855	2,382	3,237
1965	5,652	1,065	2,689	622	135	83	1,058	1,141
1966	6,422	1,209	2,981	597	116	398	1,121	1,519
1967	10,095	1,469	3,110	658	114	1,525	3,219	4,744
1968	6,849	1,965	3,120	705	135	—439	1,363	924
Avg. 1963-1968	7,539	1,262	2,815	630	140	690	2,002	2,692
Avg. 1957-1968	6,176	886	2,664	467	122	791	1,246	2,037

Returns to Operator and Family Labor: Between 1957 and 1960, unpaid family labor comprised about 25% to 50% of the total labor used on these tenant farms other than hired labor. Family labor was used during this period primarily for cotton chopping, hoeing, and picking and in the growing of strawberries on Farm 2. Since 1960, with the exception of the dairy unit, practically all labor used on these farms has consisted of the operators' time rather than members of their families. Therefore, no distinction has been made between operator and family labor in calculating returns to labor.

Calculated labor returns per man equivalent ranged from \$1,464 in 1957 to \$3,000 in 1968. The \$3,000 return per man equivalent in 1968 is identical to the wage rate used on commercial farms under the Tennessee Unit Test Demonstration Program. In addition to this labor return, the operators and their families are provided electrically heated two- or three-bedroom houses and are given an opportunity to have gardens and milk cows. Average man equivalents of labor used per farm are shown in Table 14, while the income allocated to operator and family labor is shown in Table 15. The lowest total labor returns per farm were \$2,251 in 1961 and the highest were \$3,120 in 1968.

Returns on Capital Investments: Included in this category of capital investments for the landlord and tenants are buildings, farm improvements, machinery, and livestock. As previously indicated, the investment by tenants in farm machinery and equipment is probably underestimated by \$3,000 to \$5,000 when compared to other commercial farms, since tractors and equipment were generally leased rather than owned. On the other hand, where equipment was leased, such costs were reflected in operating statements as a cash cost and resulted in lowering net cash incomes.

The landlord's capital investment in buildings, farm improvements, machinery, and livestock per farm ranged from \$2,837 in 1957 to \$14,108 in 1968, while the tenants' investments ranged from \$1,309 in 1959 to \$3,602 in 1962. The annual rate of return on capital was assumed to be 5% or similar to the rate used for land. Thus, the annual returns to these forms of capital range from \$142 to \$705 per farm for the landlord and from \$65 to \$180 for tenants (Table 15).

Returns to Management: The returns or earnings of management are difficult to measure; however, the results of superior

management are reflected in the net income of the farms. In this study, the returns to management are determined as a residual after all other resources have been paid their estimated opportunity cost. Part of this residual, or undistributed profit (or loss), is due to the management contributed by the Farm Manager and the remainder goes to the tenant operator. This division, presented in Table 15, has been made on the basis of leasing arrangements actually existing on tenant units over the period 1957 through 1968.

During 3 of the 12 years, the tenants had a negative return to management, while the landlord had a negative return to management for only 1 year. In reality, rather than a negative return to management, all other resources of the particular party received lower earnings during these periods than indicated. The average residual returns to tenants' management was negative 3 out of 6 years between 1957 and 1962, while the landlord had positive returns for each of these 6 years. Between 1963 and 1968, the landlord's residual return to management was negative only 1 year (1968), while the tenants' was positive for all 6 years.

The lowest combined residual return to management for both tenant and landlord was \$408 in 1957, while the highest return was \$4,744 in 1967 (Table 15). The landlord's residual return to management ranged from —\$439 per farm in 1968 to \$1,761 in 1958. Similar returns for the tenants ranged from —\$399 in 1957 to \$3,219 in 1967. During the first 6 years, the residual returns to management were about twice as high for the landlord as for the tenants, while during the last 6 years, the tenants' shares were almost triple the landlord's share.

The lower residual return to management for the landlord in comparison with the tenant during the last 6 years may be partly due to the following reasons: 1) As farm size increased and the cotton and feed grain programs limited the acreage of cotton and corn, the system of farming was shifted more to crops (primarily soybeans) having a lower gross and net value per acre; and 2) increasing the land value by 7.5% annually increased the allocation of returns to land and lowered the residual to the landlord's management.

Cost of Managerial Services: Many professional farm management organizations have been established over the country since World War II to provide assistance to owner-operators, tenants, and/or landlords in applying new technologies and business meth-

ods on their farms. Usually three questions are raised when professional farm management assistance of this type is considered. First, what is the cost of such service? Second, who pays the cost of this service? And, third, how many farms can a manager supervise?

In initiating this program on tenant units on the Ames Plantation, a professional farm manager was employed who had had about 10 years' experience in actual farm management. Even though the objective of this program did not include a measure of the cost of managerial services, perhaps some guidelines might be provided by observing the operation over the 12-year period.

The estimated cost of managerial services is based on the assumption that the farm manager would be a college graduate with about 5 years' experience when employed in 1957. It is further assumed that his beginning salary and fringe benefits would be \$7,062 and would increase at an annual rate of 5.5%. Travel expenses would include funds for maintaining and operating a one-half ton pickup truck and are estimated to amount to 10% of his base salary plus fringe benefits. Thus, total cost of managerial services would range from \$7,768 in 1957 to \$14,000 in 1968 (Table 16).

Earlier, an attempt was made to allocate net farm income on the average tenant unit to the various factors of production (Table 15). After paying the estimated market price for land, labor, and capital, a residual return was available in most instances to pay for management services. It could be argued that since the other factors of production were paid their estimated market price, the entire residual return to management is available to cover the cost of professional managerial services. On the other hand, as the tenant operators obtained experience in management, it could be argued that part of the residual return to management rightfully belongs to the tenant. Four alternative methods of paying for professional managerial services will be explored as follows: 1) the entire residual return to management will be used; 2) the landlord will pay all the cost of such services; 3) the tenant will pay the entire cost of the services; and 4) the cost of managerial services will be borne by both the landlord and tenant on the basis of existing rental arrangement (that is, in most instances, with the landlord paying one-third of the cost and the tenant, two-thirds). The total residual returns to management on tenant units on the Ames Plantation are indicated by years in Table 16.

Table 16. Estimated cost of managerial services with residual return to management, tenant units, Ames Plantation, 1957-1968

Year	Cost of managerial services ¹			Residual returns to management ²		
	Salary & fringe benefits	Travel expenses	Total	Landlord	Tenant	Total farm
			Dollars			
1957	7,062	706	7,768	4,035	—1,995	2,040
1958	7,450	745	8,195	8,805	5,760	14,565
1959	7,860	786	8,646	4,634	—553	4,081
1960	8,292	829	9,121	6,912	3,736	10,648
1961	8,748	875	9,623	3,114	—24	3,090
1962	9,229	923	10,152	4,344	10,836	15,180
Average 1957-1962	8,107	811	8,918	5,307	2,960	8,267
1963	9,737	974	10,711	10,314	17,214	27,528
1964	10,273	1,027	11,300	5,130	14,292	19,422
1965	10,838	1,084	11,922	498	6,348	6,846
1966	11,434	1,143	12,577	2,786	7,847	10,633
1967	12,063	1,206	13,269	10,675	22,533	33,208
1968	12,727	1,273	14,000	—3,073	9,541	6,468
Average 1963-1968	11,179	1,118	12,297	4,388	12,963	17,351
Average 1957-1968	9,643	964	10,607	4,848	7,961	12,809

¹These are assumed costs and do not represent the actual costs for such services on the project.

²Equals residual returns to management per farm as shown in Table 15 times number of tenant farms on the program during specific years as shown in Table 7.

Entire residual return to management used to pay for professional services: The number of tenant units on the Ames Plantation over the 12-year period ranged from 5 in 1957 to 8 in 1960 (Table 7), and the returns to management per farm ranged from \$408 in 1957 to \$4,744 in 1967 (Table 15). The funds available to pay for professional services fluctuated widely and ranged from \$2,040 in 1957 to \$33,208 in 1967 (Table 16). A comparison of the estimated cost of managerial services and the total residual returns to management indicates that adequate funds were available to pay for such services during 6 of the 12 years (Table 16). Any individual or organization planning on providing farm management services under this system of funding would need to have a long-range program rather than a 1- or 2-year program due to yearly fluctuations in income. During the first 6 years (1957-1962), the returns to management on the tenant units averaged \$651 per year

less than that required to pay for management services, while during the last 6 years (1963-1968) the returns to management exceeded the amount needed to pay for such services by \$5,054 per year. Over the 12-year period, the returns to management averaged 20% higher than the estimated cost of such service.

Landlord pay the cost of managerial services: Based on the rental arrangement on all tenant units other than the Dairy Farm, the Plantation or landlord receives about one-third of the net farm income to pay for use of land, buildings, and other improvements as well as for managerial services. After deducting a 5% return on investment, the landlord's residual returns for management services varied from —\$3,073 in 1968 to \$10,675 in 1967 (Table 16). Again, the cost of supporting managerial services must be viewed over a number of years rather than a year or two if a satisfactory program is to be developed. In only one year, 1958, did the landlord's residual return to management amount to more than the cost of managerial services. Actually the amount of funds available for such services averaged almost \$1,000 less per year during the last 6 years than during the first 6 years of the program. This reduction was partly due to appreciating the land values at 7.5% per year which increased the income allocated to land in the form of interest on investment and left a smaller residual for management services.

Over the 12-year period, the landlord had an average of \$4,388 per year to pay for managerial services costing \$10,607. It becomes obvious that the landlord cannot pay the cost of management services based on an average of about six farms per year operated similarly to the tenant units. On the other hand, if the landlord had 16 tenant units similar to the 6 described and supervision could be provided as effectively on the 16 as on the 6, then the landlord's residual returns to management would be adequate to cover management costs and provide a 5% return on the landlord's investment.

With the landlord paying all costs of managerial services, the tenant operators would have an additional \$1,246 in income per year to allocate to their labor and use of capital. This would represent a 45% increase in return to the tenants' labor and capital. Stated another way, the tenant would receive \$3,855 annually for labor plus approximately 7.5% on investment.

Tenant pay the cost of managerial services: The tenants'

shares of the residual income available to management ranged from a —\$1,995 in 1957 to a high of \$22,533 in 1967 (Table 16). In only 4 years out of 12 was this income adequate to pay for managerial services. During the first 6 years, 1957-1962, it failed to meet this requirement by \$5,958 annually, while during the last 6 years, it exceeded the cost of management services by \$666 annually. Over the entire 12-year period, the tenants' shares of residual income for payment of management was \$2,646 short of the requirement. For the tenants to be able to pay full cost of managerial services would have required about a one-third increase in the number of comparable tenants to those supervised on the Ames Plantation. This would have meant an average of about 10 tenants under the supervision of one manager.

If the tenants paid the full cost of managerial services, then the landlord would have a higher rate of returns to land and other capital investments than previously indicated. It may be recalled that land prices were appreciated at an annual rate of 7.5% between 1957 and 1968. Then a 5% return was calculated on land as well as other investments. Releasing the landlord's residual return to management (\$791 annually) and applying this fund as a return to capital would increase the landlord's overall returns to capital to 7.9% annually.

Managerial services paid for on basis of rental arrangement: Over the 12-year period the tenants' share of net farm income averaged 65% and the landlord's share, 35%. This closely approximates the division of expenses and income established under the existing rental arrangement. Since both the landlord and tenants should benefit from managerial services, it is suggested that the most equitable system of paying for such services would be to divide the cost on the basis of the leases.

On a yearly basis, the landlord would be able to pay his share of managerial costs 9 out of the 12 years, while the tenants could pay their share 6 out of the 12 years. On the average, over the 12-year period, both parties would have adequate funds to pay for these services out of their respective share of residual returns to management and still have a small surplus. This surplus would amount to \$169 per year per tenant and \$180 annually per farm to the landlord.

Returns on resources on specific farms: Two tenant units which were on the program over the entire 12 years have been

chosen to indicate the returns to various resources on specific farms by years. Farm 1 (Grade A Dairy) represented the largest investment of any farm, and was the only unit where the rental arrangement was on a 50-50 basis. The other unit, Farm 5, depended primarily upon crops for income. On both of these units, land values have been appreciated 7.5% annually and a return of 5% has been calculated on investments.

Farm 1: The total investment on the dairy farm over the 12-year period ranged from \$19,544 in 1957 to \$100,427 in 1968 (Figure 3). About 92% of this investment was supplied by the landlord and 8% by the tenant. The total farm investment was understated by about \$5,000, since tractor and equipment were leased rather than owned.

Total net farm income available to pay for the factors of production ranged from \$531 in 1957 to \$19,106 in 1968. Under the rental arrangement, the landlord's share of net farm income ranged

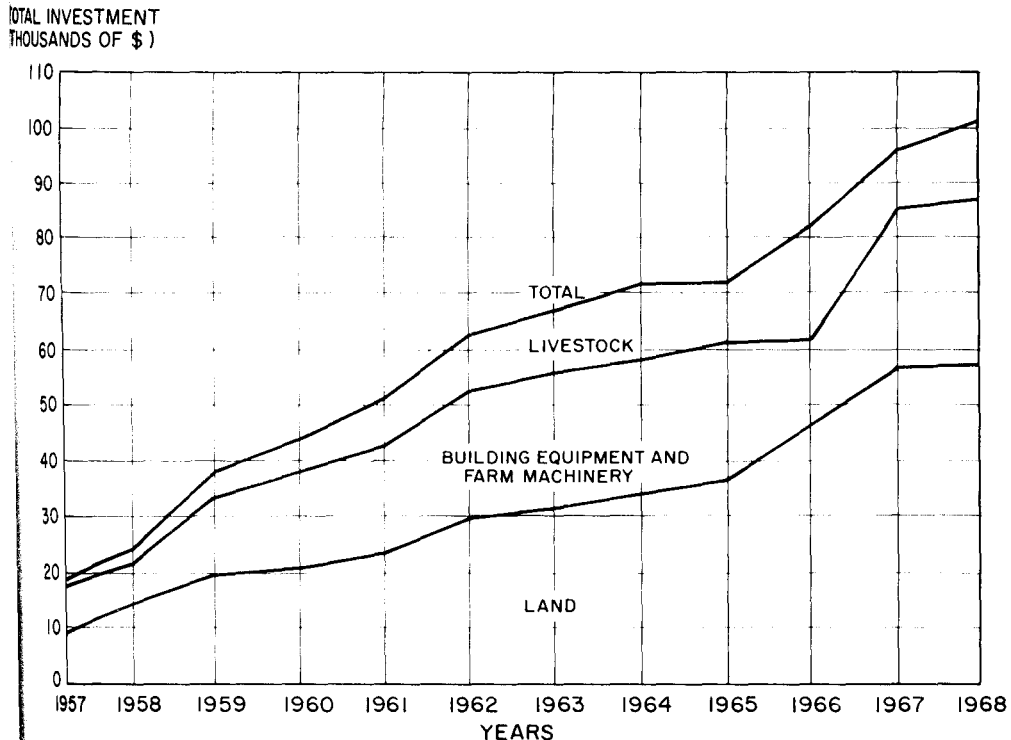


Figure 3. Changes in total investment by types of investment, Farm 1 Dairy Farm, Ames Plantation, 1957 through 1968.

from \$254 in 1957 to \$8,240 in 1967, while the tenants' share varied from \$277 in 1957 to \$10,952 in 1968 (Table 17). Over the 12-year period, net farm income averaged \$10,069 per year and the tenant received 57.6% of the total.

After paying the estimated market price for land, labor, and capital on this farm, an average of \$3,576 remained as residual to management. This residual return to management was about three times higher per year during the last 6 years (\$5,688) than during the first 6 years (\$1,463). Based upon the rental arrangement, the tenant received 60% of the residual for management.

If it is assumed that the landlord's total returns were credited to investments with no management charge, the rate of return on capital ranged from 1.4% in 1957 to 15.2% in 1958 and averaged 7.6% over the 12-year period.

In a similar manner, if the tenants' shares of the residual returns to management are allocated to the tenants for returns to labor and on investment, this would represent a 58% increase in these items. Then, the tenants would receive 7.9% on their investments and \$5,405 annually for labor. It might be argued that a tenant operating a Grade A dairy with a gross income up to \$50,000 annually and with an average net farm income of \$10,069 over a 12-year period should receive at least \$5,400 annually for his labor.

Table 17. Landlord's and tenants' shares of net farm income, investment, and rate of returns on landlord's investment by years, Farm 1, Ames Plantation, 1957 through 1968

Year	Net farm income			Investment			Rate of return on landlord's investment	
	Tenant	Landlord	Total farm	Tenant	Landlord	Total farm		
	Dollars							Pct.
1957	277	254	531	1,079	18,465	19,544	1.4	
1958	4,570	3,370	7,940	1,369	22,105	23,474	15.2	
1959	3,377	1,989	5,366	2,815	35,953	38,768	5.5	
1960	4,294	2,935	7,229	3,329	41,332	44,661	7.1	
1961	6,354	4,945	11,299	4,679	46,568	51,247	10.6	
1962	3,714	2,788	6,502	5,360	58,231	63,591	4.8	
1963	7,500	6,295	13,795	6,275	61,125	67,400	10.3	
1964	5,439	2,596	8,035	7,210	64,907	72,117	4.0	
1965	5,416	3,450	8,866	5,907	67,086	72,993	5.1	
1966	8,912	6,239	15,151	6,082	76,274	82,356	8.2	
1967	8,757	8,240	16,997	5,832	91,026	96,858	9.1	
1968	10,952	8,154	19,106	6,892	93,535	100,427	8.7	
Avg.	5,797	4,272	10,069	4,736	56,384	61,120	7.6	

Farm 5: The total investment on this farm which was devoted primarily to crop production ranged from \$11,513 in 1957 to \$44,338 in 1968 (Table 18). About 93% of this investment was supplied by the landlord. The total investment as well as the tenant's investment was understated by \$3,000 to \$5,000 annually, since the tractors and farm equipment were leased over part of this period. The tenant paid the total cost for leased items.

Net farm income ranged from \$4,370 in 1959 to \$9,300 in 1964. Income and operating expenses in general were shared on a one-third—two-thirds basis with the landlord providing the land and permanent improvements and the tenant providing labor and equipment. The tenant's share of net farm income over the 12-year period was 64.5% of the total.

After charging land, labor, and capital at their estimated market price, 42% of the net farm income was left as a return to management. This residual of \$2,667 for management was divided 60% to the tenant and 40% to the landlord.

If the landlord's share of net farm income was all allocated as a return on capital rather than partly for management, this rate of return varied from 3.1% in 1968 to 16.8% in 1957 and averaged

Table 18. Landlord's and tenants' shares of net farm income, investment, and rate of return on landlord's investment by years, Farm 5, Ames Plantation, 1957 through 1968

Year	Net farm income			Investment			Rate of return on landlord's investment
	Landlord	Tenant	Total	Landlord	Tenant	Total	Pct.
	Dollars						
1957	1,780	3,054	4,834	10,569	944	11,513	16.8
1958	2,002	3,617	5,619	12,796	1,017	13,813	15.6
1959	1,475	2,895	4,370	17,417	2,943	20,360	8.5
1960	2,018	4,102	6,120	18,992	2,763	21,755	10.6
1961	1,439	3,146	4,585	18,725	2,725	21,450	7.7
1962	2,276	4,617	6,893	22,313	2,954	25,267	10.2
1963	3,227	5,176	8,403	22,406	1,964	24,370	14.4
1964	3,291	6,009	9,300	25,276	1,488	26,764	13.0
1965	1,970	3,427	5,397	26,690	922	27,612	7.4
1966	2,532	4,594	7,126	29,133	1,184	30,317	8.7
1967	3,515	5,059	8,574	37,084	752	37,836	9.5
1968	1,346	3,218	4,564	43,662	676	44,338	3.1
Avg.	2,239	4,076	6,315	23,729	1,695	25,424	9.4

9.4% over the 12-year period. This rate of return on this crop farm was higher than on the dairy farm discussed earlier.

Professional managerial services: Based upon the experiences in this program, it was found that by using all the residual returns to management for both tenants and the landlord, adequate funds were available to pay for professional management services over the 12-year period with from 5 to 8 farms under supervision. On the other hand, if the tenants paid such cost, an average of about 10 comparable farms would be required to pay for management, and if the landlord bore the entire cost, 16 comparable units would be needed.

No attempt was made—either when this program was first started or later—to establish the number of tenant units which would ideally use the full-time services of a professional farm manager. The manager had the responsibility of planning and supervising capital expenditures, such as land clearing, fencing, and buildings, as well as planning the detail of farm operations with the tenants. All of these duties were conducted as part of the educational program of the University rather than strictly as a commercial business endeavor. Sometimes special equipment or materials were used in the educational program with the costs or losses underwritten by the landlord. For example, when chemical weed control was first tried on cotton, it was understood that any losses suffered by the tenants as a result of using this new technology would be borne by the landlord. It was thought that the adoption of such technologies on these tenant farms, if successful, would lead to the diffusion of practices to farmers in the area generally.

The number of farms which one person could manage would depend upon many factors, such as distance between farms, level of supervision to be provided, educational level of the farm operator, and complexity of the farm organization. The current farm manager has estimated that if less emphasis was placed on the educational aspects of the program and more emphasis was given to business management, approximately 25 to 30 farms might be managed by one man provided the supervisor lived within about 60 miles of each farm. This would assume that the turnover of farms in the program would not exceed about 20% during any given year. It is believed that a program of this dimension would be necessary to justify professional services over the long run.

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