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To the Graduate Council:

I am submitting herewith a thesis written by Albert C. Heaslett entitled "A Study of Herd Replacement Methods on Dairy Farms in North Alabama." 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.

Luther H. Keller
Major Professor

We have read this thesis
and recommend its acceptance:

C. E. Fuller

Robert L. Johnson

Accepted for the Council:

Hilton A. Smith
Dean of the Graduate School

A STUDY OF HERD REPLACEMENT METHODS ON DAIRY FARMS IN NORTH ALABAMA

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

Albert C. Heaslett

December 1962

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CHAPTER I

INTRODUCTION

Traditionally, dairy farmers have raised their own dairy replacements which later go into production on the same farm. With increased emphasis on higher milk production per cow and the advent of artificial breeding of dairystock, many dairymen have felt that raising of their own replacement stock was necessary in order to know the progeny of the replacement animals and to be assured of quality animals. In recent years with the advent of higher production costs and greater degrees of specialization, more farmers have given consideration to obtaining of dairy replacements by other means. Acquiring replacement animals from off-the-farm sources would enable the dairy farmer to have more of his dairy animals in production at a given time and could result in fuller utilization of specialized resources used in Grade A milk production. Specialized production of dairy replacement animals may be a profitable alternative to some farmers currently engaged in beef production or in the production of milk for manufacturing plants.

I. THE PROBLEM

Statement of the problem. The difficulty of securing desirable dairy herd replacement cows is a constant problem faced by Grade A dairymen. Between one-fourth and one-fifth of the dairy cows owned by

farmers are normally replaced each year in commercial herds. The Grade A dairyman has several alternatives available to him for obtaining his herd replacements. The dairyman must make a decision as to which particular alternative will be the most economical method of obtaining herd replacements. These methods include: raising his own heifers, contracting of heifers out to be raised to production age by other farmers or purchasing replacement stock. Replacement stock may be purchased as young calves, bred heifers, or producing cows and may be obtained either locally from other farmers or dealers. In some cases the replacements are purchased from out-of-state sources.

Statement of the objectives. It is the purpose of this study: (1) to determine the present dairy herd replacement methods used and attitudes toward purchasing replacement animals in the study area, (2) to determine the extent by which factors such as labor supply, bulk tank capacity, barn space, feed supply and capital availability would limit expansion of dairy herd if replacement animals were purchased, and (3) to estimate the effect on net farm income if replacement animals were produced on a contract basis rather than raised by the dairyman.

II. IMPORTANCE OF THE STUDY

In recent years there has been a definite trend toward greater degrees of specialization in all phases of agriculture and especially in the dairy enterprise. For farmers with limited capital, the costs of

getting established in Grade A milk production may be prohibitive. The high capital requirements for Grade A milk production result because of the wide use of such equipment as pipe line milkers, bulk milk tank, milking parlors, and silage storing and harvesting equipment, not to mention the many other smaller items which are presently used on dairy farms. An estimate of investment cost for various sizes of dairy herds for Oklahoma is shown in Table I.

The high capital requirement for Grade A milk production naturally puts pressure on the dairyman to expand his dairy herd in order to spread fixed cost over more units of production. Economic forces pressure farmers into adopting the latest methods of production in order to compete with other producers and at the same time keep production costs down.

Many dairy farmers are prohibited from expanding their herds due to their limited resources. For example, many of the dairymen in this study are located in areas which are becoming more industrialized. In many of these areas it is not feasible for the dairyman to acquire additional land for his dairy operation at the prevailing land values in that particular locality. Even when land is available at reasonable prices, many dairymen are further restricted by not being able to acquire the necessary capital for additional land as well as capital for modernizing their equipment and securing additional animals.

Raising their own replacement animals ties up resources which could otherwise be used for increasing the size of the dairy herd.

TABLE I

INVESTMENT REQUIREMENTS FOR REPRESENTATIVE DAIRY FARM ORGANIZATIONS*

Item	Investment in dollars with a cow herd size of:				
	20	25	32	46	84
	Dollars	Dollars	Dollars	Dollars	Dollars
Livestock	4,800	6,000	7,680	11,000	20,160
Farm machinery	7,265	7,265	8,030	11,740	20,100
Buildings and improvements	5,305	5,305	6,705	7,750	9,540
Specialized dairy equipment	3,660	3,660	4,855	5,720	6,735
Other investments	11,345	19,920	38,130	42,615	62,465
Total investments	32,375	42,150	65,400	78,825	119,000
Total investments per cow	1,619	1,686	2,004	1,714	1,417

*Source: Taken from Table 5, page 9, Dairy Farm Organization in Central and Northeast Oklahoma, by Clark Edwards and H. W. Grub, Oklahoma State University Experiment Station Bulletin Number B-573, February, 1961.

Thus, in considering the matter of raising replacements or acquiring them from off-the-farm sources, it is not simply a matter of comparing direct farm production costs with costs of acquiring animals by other means. In terms of opportunity cost concepts, the cost of raising dairy replacements is the income the resources used for this purpose would earn if they were used in their most profitable alternative use. One of these alternatives is in expanding the size of the dairy milking herd.

III. REVIEW OF PREVIOUS STUDIES

In a Cornell study it was found that from a random sample of 556 commercial dairy farms that 98 per cent of the farmers raised their own replacement heifers. In the same study it was found that the range of cost to raise a dairy heifer was $150 to $200 per heifer.[1]

To contrast the Cornell study with a study conducted in Tennessee and Florida, it was found that in Tennessee milksheds, only 60 per cent of all dairy replacement animals were raised on the farm while 40 per cent were purchased either as heifers or as mature cows.[2] In the Tennessee study the average price paid for purchased heifers was $255 and ranged from $182 to $290, depending on the source and breed. In the

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[1] L. C. Cunningham, Costs and Returns in Raising Dairy Heifers, Department of Agricultural Economics, Cornell University, Agricultural Experiment Station Bulletin 11 (Ithaca, N. Y.: December 1958), p. 27.

[2] M. Lloyd Downen and David Culver, The Dairy Cattle Replacements of Tennessee and Florida, Tennessee Agricultural Experiment Station, Bulletin 318 (Knoxville: September 1960), p. 2.

same study the average price paid for heifer replacements by Florida dairymen was $276.

In comparing the cost of buying replacements versus raising replacements, one author pointed out the implicit costs in purchasing replacements. For example, new animals brought on the farm should be isolated to reduce the possibility of bringing diseases into the dairy herd. Another consideration mentioned was that purchased replacements that are transported long distances often require several months for the animal to become acclimated or to completely recover from the trip.[3] The mortality and culling rate among young dairy animals is rather high. It has been estimated that 34 per cent of all dairy animals kept for replacement purposes will fail to enter the milking herd.[4]

IV. PROCEDURE

The information upon which this study was based was obtained from a group of 28 Grade A dairy farmers located on farms in the Tennessee Valley Watershed area of Alabama. All farms were participating in the Test Demonstration Program. It is assumed for the purposes of this study that this group of Test Demonstration farms are representative of all dairy farmers in the study area. Annual business records were available for analysis for each of the farms for the year 1960.

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[3] J. M. Wing, Raising Dairy Herd Replacements, Florida Experiment Station, Circular S-118 (Gainesville: January, 1960), p. 2.

[4] Ibid.

These business summaries provided such information as cropping programs, livestock numbers, labor supply, income and expense statements and capital investments for each farm and made it possible to place in the proper perspective the herd replacement problem faced by Grade A dairymen of the area.

Further and more detailed information regarding the replacement methods and attitudes regarding alternative replacement methods for each of the farms was obtained by a brief survey conducted in April and May of 1962. One of the objectives of this particular survey was to ascertain the extent by which such factors as labor supply, barn space, bulk tank, and capital availability might act as limitational factors with respect to expansion of herd size. Since one of the major reasons for acquiring replacement stock by means other than raising them on the farm would be to permit expansion of the dairy herd to more fully utilize the fixed resources of the dairy plant, alternative means of acquiring replacement stock are not likely to be feasible if other productive resources are severely limited in supply. Limitation of feed supply was not considered as limitational since part or all of the grain supply for the dairy herd can and is often purchased and certain forage supply would be released to permit expansion of the dairy herd should the farmer choose to obtain replacement stock through means other than raising on his own farm.

Three case farms representing three different herd size groups were selected for more detailed study. Three detailed farm plans are

presented for each of the case farms. The Present Farm Plan is simply a summary of the 1960 organization of the farm including land use and crop production, livestock numbers, capital investments and income and expense. Revision I is a revision of the 1960 plan assuming the farmer raises all the necessary dairy replacements on the farm. Since each of the three case farms were already raising most of their replacement animals, Revision I differs from the Present Farm Plan mainly in land use and in crop and livestock production practices. Revision I is then basically a revision of the Present Farm Plan designed to more efficiently utilize the farm resources. Revision II for each case farm differs from Revision I mainly in the method of acquiring replacement animals. In Revision II it was assumed that all replacement animals were produced on contract by another farmer at a cost of $200 per replacement animal. The dairyman was assumed to have retained title to the animals and assumes all death losses and pays breeding fees for the animals. The forage resources released by contracting for heifers, rather than raising them, were used to expand the size of the dairy herd.

CHAPTER II

DESCRIPTION OF AREA AND THE FARM GROUPS

I. DESCRIPTION OF THE AREA

The farms in this study are all located within the Tennessee River drainage area of Alabama, which includes fifteen northern Alabama counties. This entire area is generally referred to as the Tennessee Valley area of Alabama since the area lies adjacent to the Tennessee River and its tributaries.

The four major soil groups within the Tennessee Valley are: Limestone Valley, Applachian Plateau, Highland Rim, and the Upper Coastal Plains. The three case farms in this study are located in the Limestone Valley and the Upper Coastal Plains soil groups.

The climate of the Tennessee Valley is temperate, having an average range of approximately 35 degrees F. between the summer and winter temperatures. The average growing season is 200 days and the average rainfall measures 55 inches.[1]

Agriculture plays a significant role in the economy of the Tennessee Valley Area of Alabama as may be seen by the fact that the Valley received an income from all agricultural products of $165,194,174 in 1959 (Table II).

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[1] L. G. Brackeen, Soils of Alabama, Soil Survey, Department of Agriculture and Industry (Montgomery: 1953).

TABLE II

AGRICULTURAL INCOME RECEIVED BY THE FARMERS IN THE 15 COUNTIES[a] COMPRISING THE TENNESSEE VALLEY AREA OF ALABAMA, 1959[b]

Income source	Total from area (dollars)	Per cent of total
Field crops other than fruits and nuts	77,635,256[c]	47.0
Poultry and poultry products	55,078,111	33.3
Livestock other than poultry and dairying	22,653,704	13.3
Dairy products	6,874,930	4.4
Forest products and horticultural specialty crops	2,874,013	2.0
Value of all products	165,194,174	100.0

[a]For this particular table the data for the entire county were used even though the entire portion of some of the counties is not in the Tennessee Valley Area.

[b]Source: Bureau of the Census, United States Census of Agriculture 1959, Alabama Counties (Washington: Government Printing Office, 1961), pp. 153-58.

[c]Primarily cotton.

As would be expected in any given area, certain counties have a comparative advantage over other counties in the production of certain agricultural commodities. In the counties that are located near the Tennessee River, the land is predominately level and consequently well adapted to the production of cotton and other field crops. The more hilly counties in Northeast Alabama and along the southern boundary of the Tennessee Valley are generally considered to be better adapted to the poultry enterprise and other enterprises which require small quantities of land.

In 1959 field crops produced the largest income in the counties of the Tennessee Valley ($77,635,236 or 47 per cent of total income) with cotton being the number one cash crop of the group. Cotton is grown predominately in the counties comprising the Limestone Valley Soil Group.

Poultry and poultry products ranked second as a source of agricultural income. This commodity produced 33.3 per cent of the total income for the area in 1959.

Ranking third in the order of total income produced was livestock other than poultry and dairying. The main components of this classification were beef cattle and swine, with beef cattle providing the largest share of the income. In 1959, 13.3 per cent of the agricultural income in the area came from this source.

Sale of dairy products accounted for 4.4 per cent of the income in 1959. Blount County was the county with the greatest income from dairying.

The 1959 Census of Agriculture indicated that there were 38,483 farms in the Tennessee Valley counties of Alabama. Of the total, 55 per cent of the operators of the farms were classed as full owners, 21 per cent of the farm operators as part owners, and 20 per cent as tenants. The tenant classification included mostly crop share tenants and croppers (Table III).

The market for dairy products is expanding within the Tennessee Valley Area. Since the population of two concentrated areas within the study area is steadily increasing (Muscle Shoals and Huntsville), the demand for dairy products in the area is also increasing. A considerable amount of milk that is produced in the area is shipped into the Birmingham Milkshed, which is also an expanding industrial area.

Limestone Valley Soil Group. Two of the case farms in the study are located in the Limestone Valley Soil Group. The soils in this group are derived from predominantly pure limestone and are of the Dewey, Decatur and Abernathy series. These soils, which are red and brown clay loam, are deep and mostly level to slightly rolling and occur in relatively large uniform fields. The Limestone Valley soils are among the best in the state of Alabama. The Limestone Valley soils are inherently fertile, well adapted to a wide variety of crops and not severely damaged by erosion except for soils on the border areas where the soils are of a lighter texture.

TABLE III

TENURE CHARACTERISTICS OF THE FARMERS IN THE 15 COUNTIES[a] COMPRISING THE TENNESSEE VALLEY AREA OF ALABAMA[b]

Tenure system	Number of farms	Per cent of total farms
Full owners	20,670	55.0
Part owners	8,259	20.7
Managers	101	.3
Tenants:		
Crop share tenants	3,762	11.0
Croppers	3,039	7.0
Cash tenants	935	2.0
Other	1,717	4.0
Total number of farms	38,483	100.0

[a]Even though all of the area of the 15 counties are not a part of the Tennessee Valley Area, the data for the entire area of the counties was used for this table.

[b]Source: United States Bureau of the Census, United States Census of Agriculture, 1959, Alabama Counties (Washington: Government Printing Office, 1961), pp. 153-58.

The Upper Coastal Plains Soil Group. The third case farm in this study is located in the Upper Coastal Plains Soil Group of North Alabama. Although the soils of this farm are not typical of the soils found in the Upper Coastal Plains section, it is nevertheless in that particular soil area in Alabama. Since the drainage on this farm is toward the Tennessee Valley, this farm was selected as a Test Demonstration farm for the area.[2]

II. DESCRIPTION OF FARM GROUPS STUDIED

Group I. The study farms were classified into three groups based on the size of the dairy herd. Group I in the study was composed of all farms having an average of less than 40 milk cows per farm. The 10 farms that comprise this group had an average of 31.8 cows with an average production per cow of 7,141 pounds (Table IV). Five of the 10 farms of this group had cotton as another source of farm income.

The average capital investment for the group was $52,228 while the case farm representative of this group had an average capital investment of $37,743. The average net farm income for the group was $6,124, while the case farm netted $3,827.

The average size farm for the group was 251 acres while the acreage for Case Farm I was 210 acres.

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[2]The Test Demonstration Program is a cooperative program with the Land Grant Colleges and the Tennessee Valley Authority. The farmer agrees to keep complete records of all farming operations and the operation is used as a demonstration farm for the latest fertilizers manufactured by the Tennessee Valley Authority.

TABLE IV

SELECTED CHARACTERISTICS OF THE 28 TEST DEMONSTRATION FARMS AND THREE CASE FARMS BY SIZE OF HERD

Group	Number of farms	Average total acres operated	Average number cows	Average capital investment	Average farm income	Average production per cow (lbs.)
Group I (Less than 40 cows)	10	251	31.8	$52,228	$6,124	7,141
Case Farm I		210	34.0	37,743	3,827	6,803
Group II (40 to 60 cows)	13	373	46.7	73,227	8,370	6,526
Case Farm II		363	44.0	99,987	14,276	6,552
Group III (Over 60 cows)	5	804	97.5	143,252	25,220	7,848
Case Farm III		681	108.0	243,962	17,272	7,429
All Farms	28	404	50.5	78,232	10,577	6,982

Group II. This classification of farms in the study included all farms with an average of 40 to 60 cows in production.

This group included 13 farms. The average size of herd for the group was 46.7 cows with an average production per cow of 6,526 pounds.

The average capital investment for this group was $73,227 which was $20,999 more than was invested in Group I. The case farm for this group had a capital investment of $99,987.

This group was not as specialized as Group I since eight of the 13 farms in the group had cotton grown on the farm as a cash enterprise.

The average farm income for the group was $8,370 which was $2,246 more than for Group I.

The average size of the farms in this group was 373 acres.

Group III. This group was composed of five farms which had more than 60 dairy cows in production. The average size of each herd within the group was 97.5 cows. As indicated on Table IV this group had a higher milk production per cow than any of the other groups with an average of 7,848 pounds.

Group III appeared to be more specialized than any of the other groups within the study. Only one of the farms in the group of five indicated any appreciable income from enterprises other than dairying.

The average amount of capital invested for the group was $143,252 while the average net farm income for the group was $25,220.

III. PRESENT REPLACEMENT METHODS USED

Operators of all the 28 farms in the study were surveyed and questions relating to length of time cows were kept in herd, the percentage of replacements bought or raised, the farmers' reasons for raising or buying replacements, the source of any replacements bought and the farmers' reasons for not being able to expand further were asked each farmer and the results were summarized.

Livestock inventories. The kinds and numbers of livestock on the 28 farms in the Spring of 1962 are shown in Table V. Since most of the farmers were raising practically all their replacement animals, replacement heifers and calves were an important item in the livestock inventories of these farms. The average number of replacement animals on hand was 28.9 for Group I, 34.8 for Group II and 71.4 for Group III. For all the farms 43.9 per cent of all the dairy animals on these farms were replacement animals.

Nineteen of the 28 farmers used artificial breeding exclusively while nine of the farmers reported owning one or more dairy bulls. Only four of the farms in the study reported beef cattle and even then the beef cattle numbers were relatively small.

Swine were confined mainly to Group II farms. Of the 13 farms in the groups, five had brood sows with an average for the five of 6.8 sows.

TABLE V

LIVESTOCK INVENTORY OF 27 GRADE A DAIRY FARMERS IN NORTH ALABAMA, SPRING 1962[a]

Item	Group I		Group II		Group III	
	Number farms reporting	Average number per farm[b]	Number farms reporting	Average number per farm[b]	Number farms reporting	Average number per farm[b]
Dairy cows	10	31.8	12	46.7	5	95.5
Dairy heifers	10	12.7	12	17.5	5	32.8
Dairy calves	10	16.2	12	17.3	5	38.6
Total replacement animals	10	28.9	12	34.8	5	71.4
Dairy bulls	2	1.0	5	1.8	2	2.0
Beef cows	2	11.5	2	11.5	0	0.0
Sows	0	0.0	5	6.8	1	2.0
Layers	2	156.0	3	950.0	1	5,000.0

[a]In this and subsequent table, information presented for the total group of farms will refer to 27 farms only. One of the original dairy farmers included in the study discontinued his dairy operation in 1961.

[b]This column represents the average number for the farms reporting and not all the farms in the study.

Replacement methods. The farmers indicated in the study that cows were kept in production for an average of 4.4 years. This means that on the average 22.7 per cent of all cows were replaced each year (Table VI).

The study also indicated that 91 per cent of the farmers raised most of their own dairy replacements while nine per cent bought part or all of their needed replacements from various sources. The purchased replacements were bought as mature cows in production at an average price of $250 with a price range from $200 to $300 per animal.

Attitudes toward replacement methods. The most frequent reason given by farmers for raising their own replacements was that they had better knowledge of the backgrounds of both the sire and the dam of the replacements that were raised on their own farms (Table VII). The second most frequently stated reason was that fewer disease problems were encountered if replacement animals were raised on their own farms than if purchased from off-the-farm sources. Other reasons given by the farmers were: replacements can be raised cheaper on their own farm, replacements raised on the farm are acclimated to the local area and do not have to go through an adjustment period and good replacements are scarce in the area. One farmer indicated that his financial arrangements were easier to make when raising his own replacement animals, while another farmer indicated it was too risky to purchase replacement animals.

TABLE VI

HERD REPLACEMENT RATE BY SIZE OF HERD, 27 GRADE A DAIRY FARMS, NORTH ALABAMA

Item	Herd size			All farms
	Group I	Group II	Group III	
Average number of cows	31.8	46.7	95.5	50.5
Estimated replacement rate (per cent)*	20.0	25.0	21.2	22.7
Actual 1961 replacement rate (per cent)	21.7	16.1	18.1	18.2

*Based on farmers' estimates of average length of time milk cows were kept in the herd.

TABLE VII

REASONS FOR RAISING RATHER THAN PURCHASING REPLACEMENT ANIMALS, 26 GRADE A DAIRY FARMS, NORTH ALABAMA*

Reason given	Number of farms reporting	Percentage of farms reporting
Have records on ancestors	21	78
Healthier animals	17	63
Can raise cheaper than purchase	6	22
Eliminate acclimation problem	4	15
Scarcity of replacements	2	7
Simplifies financial arrangements	1	4
Too speculative	1	4

*One farmer did not respond to this question.

All the farmers in the study were questioned about their attitudes toward purchasing dairy replacements if they could be assured of getting good quality animals. Twelve farmers indicated that they would be interested in buying their replacements while 15 farmers indicated that they would not consider purchasing replacements.

Of the 15 farmers who were not interested in buying replacements, seven of the farmers were from group I, i.e., farmers with less than 40 cows per farm. In fact, seven out of the total of 10 farmers in Group I indicated that they were opposed to the purchasing of dairy replacements.

In Group II, comprising those farmers with 40 to 60 cows, 46 per cent of the farmers indicated that they would rather raise their own replacements even if good replacements were available from outside sources.

Only two of the five farmers in Group III indicated they would rather raise their own replacements.

Twenty-one farmers indicated that they could keep more dairy cows if replacements were purchased while five of the farmers indicated they could not keep any more cows since they were presently using all their farm facilities to full capacity. As indicated in Table VIII, there was a total increase of 448 cows among the 21 farmers or an average of 21.3 cows for each farmer who indicated that he could keep more cows if replacements were purchased. Based on these data, this change in replacement method would permit a 29 per cent expansion on the 21 farms

TABLE VIII

EXPANSION IN HERD SIZE LIMITS WHEN REPLACEMENTS PURCHASED RATHER THAN RAISED ON THE FARM*

Group	Total increase in cow numbers	Average increase per farm	
		Number of cows	Per cent
Group I (less than 40 cows)	93	9.3	23
Group II (40 to 60 cows)	172	13.2	20
Group III (over 60 cows)	183	36.6	28

*This table includes only data from the 21 farmers who indicated that they could increase the size of the herd if replacements were acquired off the farm. Five farmers indicated that they could not increase their herd while one farmer did not respond to the question.

or an average of 24 per cent expansion for the 26 farmers who responded to this question.

Limitations to expansion. In order to determine the reasons the farmers could not expand beyond the limits indicated above, the farmers were asked to indicate the most limiting factor to his further expansion from among the following listed items: labor, barn space, bulk tank, feed supply or finances. Twelve farmers indicated that a lack of adequate feed supply hindered their expanding any further. As shown on Table IX, eight farmers indicated that labor was the most limiting factor keeping them from any further expansion; several farmers further commented that the labor available was not capable of performing dairy work adequately. Three farmers listed barn space as the most limiting factor while three indicated their bulk milk tank would be too small for any further expansion. One farmer listed financial difficulties as the main factor keeping him from expanding herd size.

To further clarify the labor limitation on the farms, several of the farm operators in the study commented that due to the rapid rate of industrial growth in the area they (the operators) are in competition with the local industry for good quality labor. The farm operators further stated that it is very difficult to keep the labor for any length of time and train them for the high quality of work that is necessary for a successful dairy operation.

TABLE IX

FACTORS LIMITING FURTHER HERD EXPANSION, 27 GRADE A DAIRY FARMS, NORTH ALABAMA*

Limitation	Number of farmers reporting	Percentage of total farmers reporting
Feed supply	12	44
Labor	8	30
Barn space	3	11
Bulk tank	3	11
Finance	1	4
Total	27	100

*This table is in reference to item 10 in the 1962 survey (Appendix).

Replacements purchased. Several of the farmers in the study indicated that suitable replacements were not available from local sources. Three farmers indicated that they had purchased replacements from out-of-state sources, namely; Wisconsin, Illinois, and Tennessee. These farmers were well pleased with the replacements purchased from these sources.

CHAPTER III

EFFECTS OF REPLACEMENT METHODS ON FARM ORGANIZATION AND INCOME

I. INTRODUCTION

This chapter deals with the presentation and analysis of the results of two complete budgets on each of the three case farms in this study as well as presenting the present system used on the farms. Revision I involved the budgeting of the present acreage available on each farm assuming that the farmer raised all the replacement animals needed in his dairy operation. Practices, input levels, and production levels used assumed "good" management, as will be evident in comparing the Present Farm Plan and Revision I for each case farm. Production levels were generally higher than those currently being achieved.

Revision II involved the same cropping system that was used in Revision I only minor changes being made in the forage utilization practices. The additional milk cows planned for each farm in Revision II was determined by the number that could be handled effectively with the feed that was released by not having the replacements raised on the farm. In addition, it was assumed in Revision II that all dairy replacements were taken away from the farm at two days of age and raised under contract until two months before calving when the replacement animals were brought back to the farm. The dairyman was to pay the person raising the animals on contract an average of $200 for raising

each animal. The dairyman was to assume all death losses and also the artificial breeding fees which were calculated at eight dollars per animal.[1] The assumed annual feed requirements for the dairy animals used in Revision I and Revision II are shown in Table X. The budgets further assumed that all cows were producing an average of 10,000 pounds of milk annually, averaging 3.5 per cent butterfat. The feed requirements referred to above are assumed to be adequate for this level of production. Data were not available to determine specific feed input levels being used in the existing operation.

On some of the farms the operators had other enterprises. In these cases the enterprises were held constant at their present levels of production. For example, cotton was produced on two of the case farms. On these farms, the cotton acreage was held constant and the yields were held at the same rate as reported for the case farm in 1960. The Present Farm Plan for Case Farm II included 14 brood sows. On this farm the number of brood sows was held constant and each brood sow was assumed to produce two litters of pigs annually.

In the budgets all the acreage was assumed to be used for some productive purpose.

The pasture requirements for all dairy animals were calculated on a "cow acre day" basis. For example, it is estimated that a cow

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[1]Similar contractual arrangements are already being used in some areas for handling of dairy replacement animals.

TABLE X

ANNUAL REQUIREMENTS USED FOR DAIRY ANIMALS IN BUDGETS[a]

Item	Unit	Cow	Heifer	Calf
Pasture, permanent	C.A.D.[b]	210.0	158.0	52.5
Hay	Ton	2.0	1.6	1.1
Corn silage	Ton	6.2	2.7	0.0
Corn grain	Bushel	33.4	6.5	8.9
Oats	Bushel	0.0	0.0	6.3
Cottonseed meal	Pound	212.0	41.0	119.0
Dried skim milk	Pound	0.0	0.0	97.6
Salt	Pound	57.0	25.0	17.0
Steamed bone meal	Pound	10.6	2.1	7.5
Milk	Pound	0.0	0.0	50.0[c]

[a]Source: Theo Ellis and Earl Partenhimer, Costs and Returns from Livestock Production in the Limestone Valley Areas of Alabama, Agricultural Experiment Station, Auburn University, Auburn, Alabama, December, 1960, Table 8.

[b]A measure of pasture output based on the amount of air dried hay equivalent. Cow acre day is the amount of air dried hay equivalent a cow will consume per day. In this study it was assumed that one mature cow would consume approximately 30 pounds of air dried forage per day.

[c]This figure assumed that a calf would consume all milk produced from a cow for the first two days of production.

producing 10,000 pounds of milk annually will consume approximately 30 pounds of air dried forage per day during the assumed 210 day grazing period.

The crop yields for all crops in the budgets for the case farms were based on yield estimates contained in soil survey reports for the particular soils.[2] These estimates assumed good management levels and were based on such assumptions as fertilizing and liming according to soil tests, the use of recommended varieties and seeding rates, using adequate methods of weed control, seeding during recommended periods, the clipping of pastures and other recommended practices. In cases where particular fields or planning units included more than one soil type, yields were determined on the basis of weighted averages of the estimated yield for the various soils.

The feed requirements and cost data were based on enterprise budgets developed for the Limestone Valley Area of Alabama.[3]

In all the budgets developed for the case farms, all forage and most of the grain requirements were produced on the farm. Where additional feed was needed to meet the requirements for the livestock, grain was purchased from off-the-farm sources.

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[2]Field and soil maps for each case farm were obtained from the Soil Conservation Service.

[3]Theo H. Ellis and Earl J. Partenhimer, Costs and Returns From Livestock Production in the Limestone Valley Areas of Alabama, Agricultural Experiment Station, Auburn University, Auburn, Alabama, December, 1960.

II. ANALYSIS OF CASE FARM I

Present farm plan. This farm, selected to represent the less than 40 herd size group, had an average herd of 34 cows during 1960. The farm is located in northeast Lauderdale County near the Tennessee State Line. The farm operator is 33 years of age and operates a 210 acre farm. The operator actually owns only 24 acres but has use of 156 additional acres through a rental arrangement with his widowed mother, while an additional 30 acres was rented from another source on a year to year cash basis. The rental arrangement with the mother is renewed every five years.

The soils on this farm were predominately of the Dickson, Baxter and Cookeville series. The present cropping system on this farm consisted primarily of annual crops which support the feeding program of the dairy unit. The operator maintains a cotton allotment of eight acres on the farm which is rented out on an annual cash basis.

The cows on this farm were kept in the herd for an average of 4.5 years. All the dairy replacement animals were produced on this farm. There was no livestock other than dairy grown on this farm.

As indicated on Table XI, Case Farm I had eight acres of cotton in the Present Farm Plan. The cotton acreage was not worked by the farm operator but was rented out on an annual cash basis. The operator used 77 acres in the Present Farm Plan for temporary annual grazing, such as oats, crimson clover, barley and sudan grass.

TABLE XI

PRESENT AND PROPOSED LAND USE FOR CASE FARM I

Land use	Present farm plan	Revision I	Revision II
	Acres	Acres	Acres
Cotton	8	8	8
Corn:			
Grain	24	19	15
Silage	19	15	19
Improved pasture	0	39	39
Grain and clover	25	0	0
Alfalfa	32	40	40
Sericea lespedeza	25	8	8
Fescue	0	4	4
Oats	19	0	0
Oats and crimson	25	22	22
Barley	19	0	0
Truck crops	5	5	5
Sudan or millet	14	22	22
Woods pastured	36	36	36
Woods not pastured	7	7	7
Other land[a]	2	2	2
Total acres used[b]	260	227	227
Land double cropped	50	17	17
Total land	210	210	210

[a]Includes farm buildings, roadways and farmstead.

[b]Total acres used exceeds total land due to double cropping.

Sericea lespedeza was grown on 25 acres of the farm which was relatively infertile. Thirty-two acres of alfalfa were used for grazing and hay in the Present Farm Plan.

The operator grew all the forage requirements for the dairy enterprise and some of the grain requirements. The remaining requirements of grain were obtained from commerical sources. In 1960 the purchases of grain amounted to $2,800 (Table XII).

This farmer had an average capital inventory of $37,743 during 1960. This was a considerable increase over the previous year due mainly to the purchase of bulk tank and equipment and a new silage wagon. There was a net farm income of $3,827 during 1960 on the farm. Total expenses incurred on this farm were $13,443 for the same period.

Revision I. In this budget, it was determined that the farm could support 40 cows, 10 replacement heifers and 12 calves with approximately 10 per cent extra crop production to allow for crop yield fluctuations. Assuming a 90 per cent calf crop, an average of 36 calves would be born each year. With an assumed death loss of one calf, twelve calves were saved for replacements, while 23 calves would be sold immediately for an average of $15 each. This plan allows for loss through death, culling or other causes, of two of the replacement animals between the time they are contracted out and the time they would enter the milking herd.

Revision I involved some rather substantial changes in the cropping system for this farm. In the present system the operator

TABLE XII

A COMPARISON OF PRESENT FARM PLAN WITH PROPOSED PLANS FOR CASE FARM I

Item	Present farm plan	Revision I	Revision II
Total acres	210	210	210
Livestock:			
Number of cows	34	40	47
Number of heifers	20	10	12[a]
Number of calves	10	12	15
Expenses:			
Livestock bought	$3,250	0	$2,400[b]
Feed	2,800	$1,314	1,151
Seed	500	461	461
Fertilizer and lime	2,126	2,414	2,414
Hired labor	0	804	1,060
Machine repair	561	1,020	1,020
Taxes and insurance	308	308	308
Gas and oil	610	650	650
Livestock service fee	240	320	376
Rent	900	900	900
Milk hauling	808	1,394	1,637
Depreciation	600[c]	2,530	2,529
Vet. fee	200	209	212
Machine hire	0	90	90
Electricity and phone	0[d]	228	228
Grind, shell, mix feed	0[e]	614	600
Other expenses	540	629	643
Total expenses	$13,443	$13,885	$16,679
Receipts:			
Crops	927	373	373
Livestock	1,680	1,945	2,325
Milk	14,663	23,098	27,138
Total receipts	$17,270	$25,416	$29,836
Net farm income	$3,827	$11,531	$13,157
Capital invested	$37,743	$41,080	$43,935

TABLE XII (continued)

Item	Present farm plan	Revision I	Revision II
Capital charge[f]	$1,887	$2,054	$2,196
Operator labor earnings	$1,940	$9,477	$10,961

[a]The heifers and calves were included in the livestock inventory even though they were being raised under contract.

[b]This was the fee paid to the contractor for raising the replacements based on $200 per animal.

[c]This was for depreciation on machinery only on the Present Farm Plan whereas in the other plans it included depreciation on buildings and fences as well as machinery.

[d]The expenses for electricity and phone were included in other expenses for the Present Farm Plan.

[e]Since all concentrates were purchased, no cost for this item was incurred under the Present Farm Plan.

[f]Assumed a five per cent charge for capital.

relied mainly on small grains, sericea and limited acreage of annual summer grazing crops for pasture. The revised cropping system placed more emphasis on permanent sods for pasture and alfalfa for hay. Improved permanent pasture was increased from none to 39 acres, and alfalfa was increased from 32 to 40 acres. Small grains as a source of pasture were replaced with additional acreage of sudan and millet, fescue and the permanent pasture referred to above. Corn for grain and silage was reduced from 43 to 34 acres. This reduction in corn acreage was possible because the yield level assumed for the revised plans was 60 bushels per acre for grain and 12 tons of silage as compared to 30 bushels of grain and 10 tons of silage for the Present Farm Plan.

The 25 acres of sericea in the Present Plan were reduced to eight acres in Revision I. The acreage released by this change was to be shifted to improved permanent pasture. Acreage of sudan and millet was increased to compensate for the summer grazing needs.

No fescue was grown in the Present Plan whereas four acres were grown in Revision I as indicated on Table XI. The fescue was grown in Revision I in an area near the milking barn to be used as a loafing area for the cows.

In the Present Farm Plan the farm operator purchased 10 dairy cows which were in production at the time of the purchase. Revision I assumed that no additional cows were purchased and that all the required replacements were raised on the farm.

In all the budgets, five acres of land were set aside for truck crops. This acreage was in fruit trees, garden and other crops that were used for consumption by the two families on the farm. It was assumed that none of the truck crops were sold.

As indicated in Table XII, there was an increase in the depreciation in Revision I. This item was not completely itemized in the Test Demonstration records while it was in this revision. The total depreciation included depreciation on buildings as well as machinery and equipment. No allowance for building depreciation was shown on the Test Demonstration records for this farm.

The items with the greatest expense under this plan were: fertilizer ($2,414), depreciation ($2,530), feed ($1,314), and milk hauling ($1,394). The total of all expenses under this plan was $13,885. The gross receipts were $25,416 including income from milk, cull cows, calves and income from the cotton lease arrangement.

This plan produced a net farm income of $11,531. Assuming a five per cent charge to capital, operator's labor income was estimated to be $9,477. The total investment required for this revision was $41,080. The higher farm income for Revision I was due primarily to more cows being in production and a larger assumed production per cow.

The same machinery and equipment that was owned by the farm operator was adequate to handle the machinery requirements in this revision with the exception of a corn picker. It was assumed that the

operator would have the corn for grain custom harvested under this revision.

The additional labor required in this revision was obtainable from local sources at the rate of $6 per day.

It was assumed in this revision that the farm operator would have all feed custom ground and mixed, whereas in the Present Farm Plan, the feed was bought from commercial sources already processed.

The income from the cotton acreage was held constant in this revision. The operator received one-third of the income from this enterprise.

Revision II. The forage released by not raising replacements would allow the operator to maintain a herd of 47 cows under this plan using the same cropping system. With a 90 per cent calf crop, the number of calves born each year would be 42 with 15 of the heifers being transferred to another farm to be raised under contract for replacements. Since only 12 cows were needed for replacements, the extra calves allowed for death losses, culling, etc., which were inevitable. The remaining 27 calves would be sold immediately.

The feed expenses under this plan were $1,151 which were less than in Revision I since in this plan no commercial feeds were needed for the calf rations. The largest item of expense under this plan was $2,400 which was paid for 12 replacements. The total expenses

incurred under this plan were $16,679 with gross receipts amounting to $29,836.

The net farm income would amount to $13,157. The capital required in this plan would be $43,935. Assuming a five per cent charge to capital estimated operator's labor earnings would be $10,961 for Revision II.

Comparison of Revision I and Revision II. With essentially the same cropping system in both plans, Revision II would require less total expenditures for feeds than Revision I since the feed requirements for the calves and replacement heifers would be eliminated.

On the other hand, Revision II would require more expenditures for labor. In fact, there would be $256 more spent for hired labor in Revision II since there would be more cows. It should be pointed out that since this farm has the conventional type of stanchion milking barn, the labor requirements would be higher per cow on this farm than on farms with milking parlors.

The amount of capital required would be $2,855 greater in Revision II than in Revision I due to the investment in more milk cows.

The operator's labor earnings would be $10,961 in Revision II as compared to $9,477 in Revision I. This obviously would make a difference of $1,484 in favor of Revision II, which is due to replacements being raised off the dairy farm. In both of these plans, it was assumed that the same facilities that are presently available on the farm can accommodate these livestock inventories.

In Revision II the replacements were assumed to cost the farmer $200 each. Since net farm income was $1,484 greater in Revision II than in Revision I, in which replacements were raised, the opportunity cost of raising each replacement in Revision I could be estimated to be $348.40 ($200 + $1,484/10 = $348.40).

III. ANALYSIS OF CASE FARM II

Present farm plan. Case Farm II is located in the western section of Colbert County in the Cherokee Community which is adjacent to the Tennessee River. The 363 acres of this farm are typical Limestone Valley soils since they are mainly of the Abernathy, Decatur and Baxter-Dickson series. Dairying was one of the major enterprises and an average of 44 cows was in production during the year 1960. There was a cotton allotment of 41 acres which was fully used each year on the farm. Small grain was grown as a cash crop and 14 brood sows were maintained for the production of market hogs. The 42-year-old farm operator had the assistance of two full-time men and an additional man was employed for eight months of each year.

As shown in Table XIII, the operator had 122 acres of small grain which were used solely as a cash crop in addition to the 41 acre cotton allotment. Consequently, there was a need for seasonal labor, especially during peak periods. Although the labor was getting increasingly difficult to obtain, the labor was obtained from local sources.

TABLE XIII

PRESENT AND PROPOSED LAND USE FOR CASE FARM II

Land use	Present farm plan	Revision I	Revision II
	Acres	Acres	Acres
Cotton	41	41	41
Corn:			
Grain	0	102	102
Silage	0	40	40
Alfalfa	65	77	77
Improved permanent pasture	88	87	87
Oats	12	0	0
Wheat	110	40	40
Barley	41	0	0
Truck crops (garden)	3	3	3
Sudan or millet	38	0	0
Crimson clover and rye	17	0	0
Woodland pastured	25	25	25
Other land[a]	10	10	10
Total acres used	450	425	425
Land double cropped	87	62	62
Total land[b]	363	363	363

[a]Included farm buildings, roadways and farmstead.

[b]Total acres used exceeds total land due to double cropping.

Thirty-eight acres of temporary summer grazing crops were included in the Present Farm Plan on the land that was used for small grains in the other seasons of the year. Twenty-five acres which were classified as "woodland pastured" included an area of rough, rocky land which had a partial stand of permanent grass.

Although not included in further budgets, the operator was keeping most of the male calves produced by his dairy herd and selling them as fat steers which were marketed at 600 to 700 pounds. This was a means of utilizing inferior grades of roughage grown on the farm.

All the dairy replacements for the herd were grown on the farm. The cows were kept in the herd for an average of five years.

Since the land was used for cotton, cash grain, temporary grazing and other forages, the operator purchased most of the grain that was required in the rations of the livestock enterprises. For example, in 1960, 1650 bushels of corn were purchased as well as 6,000 pounds of other commercially mixed feeds. Total cost of corn and mixed feeds purchased in 1960 was $1,930.

The operator had an average capital inventory of $99,987 during 1960, with a net farm income of $14,276. The operator had labor earnings of $9,277. The total expenses of this farm amounted to $20,979 for the year 1960 (Table XIV). The increase in net farm income in Revision I over the Present Farm Plan was due mainly to the greater assumed production per cow in Revision I. Revision I assumed an average

TABLE XIV

A COMPARISON OF PRESENT FARM PLAN WITH PROPOSED PLANS FOR CASE FARM II

Item	Present farm plan	Revision I	Revision II
Total acres	363	363	363
Livestock:			
Number of cows	44	45	60
Number of heifers	20	11	15
Number of calves	24	13	18
Number of sows	14	14	14
Number of gilts	7	7	7
Number of boars	1	1	1
Expenses:			
Livestock bought	$ 20	$ 0	$ 3,000[a]
Feed	1,930	2,371	2,208
Seed	653	790	790
Fertilizer and lime	2,616	5,985	5,985
Hired labor	7,287	3,092	4,746
Machine repair	2,165	2,177	2,177
Taxes and insurance	374	374	374
Machine hire	0	1,635	1,635
Gas and oil	1,811	1,825	1,825
Ginning	504	708	708
Livestock service fee	48	360	480
Vet. fee	403	405	425
Insecticides	485	1,013	1,013
Rent	350	0	0
Hauling (milk)	84[b]	1,707	2,089
Interest on operator's loan	569	0[f]	0
Electricity and phone	147	150	150
Dairy supplies	261	261	275
Depreciation	1,272[c]	4,462	4,462
Shell, grind, mix feed	0[d]	1,600	2,187
Other expenses	0	363	203
Total expenses	$20,979	$29,278	$34,732

TABLE XIV (continued)

Item	Present farm plan	Revision I	Revision II
Receipts:			
Crops	$15,805	$14,575	$13,947
Livestock	2,685	9,629	10,404
Milk	15,361	25,969	34,626
Machine custom work	582	0	0
Milk hauling	822	0	0
Total receipts	$35,255	$50,173	$58,977
Net farm income	$14,276	$20,895	$24,245
Capital invested	$99,987	$106,927	$113,152
Capital charge	$4,999	$5,346	$5,657
Operator labor earnings	$9,277	$15,549	$18,588

[a]The heifers and calves were included in the livestock inventory even though they were being raised under contract.

[b]At the time this record was completed, the operator did not have a bulk milk tank.

[c]This was for depreciation on machinery only on the Present Farm Plan whereas in the other plans it included depreciation on buildings and fences for the Present Farm Plan.

[d]Since all concentrates were purchased, no cost for this item was incurred under Present Farm Plan.

[e]Prior to 1961, the operator did not have a bulk tank, therefore he hauled his own milk as well as other farmers, thus some income was derived from this source. At present, the milk is hauled by the milk processor by bulk tank trucks and thereby this item is now listed altogether as an expense.

[f]Interest on operating loan was included in the various costs of the items in Revisions I and II.

[g]Assumed a five per cent charge for capital.

annual production per cow of 10,000 pounds whereas the actual production per cow in the Present Plan was 6,553 pounds.

Revision I. In this plan the livestock inventory for the farm consisted of 45 cows in production, 11 replacement heifers, 13 calves, 14 brood sows, seven replacement sows and one boar. This plan could have possibly accommodated more dairy animals but allowances were made for crop yield fluctuations and some of the excess forage was sold for hay. This plan assumed that all cows were producing 10,000 pounds of milk annually.

The wheat that was produced on the farm was reduced from 110 acres in the Present Farm Plan to 40 acres in Revision I (Table XIII). A shift of these acres to uses which contribute more directly to producing feed for the dairy animals seemed to be a more profitable alternative. A part of the wheat acreage was retained in order to maintain a wheat allotment for the farm.

The three acres of truck crops that were indicated in Table XIII were used for consumption by the families on the farm and not as a source of farm revenue.

Rye and crimson clover were dropped from the land use in Revision I and II since it was thought that the farm resources could be used more efficiently if the acreage was used in another crop.

The cotton allotment of 41 acres was held constant in all the revisions. It was assumed that the cotton would be custom harvested

with mechanical equipment in Revision I and Revision II while the cotton crop was harvested by hand under the present system.

The estimated investment in capital assets was $106,927 for Revision I. The greatest item of expense in this plan was fertilizer and lime ($5,985). The total of all expenses amounted to $29,278. The gross income was $50,173, making a net farm income of $20,895. Charging five per cent interest on the investment, this plan produced an operator's labor earning of $15,549 (Table XIV). The increase in net farm income in Revision I over the Present Farm Plan was due mainly to the greater assumed production per cow in Revision I. Revision I assumed an average annual production per cow of 10,000 pounds whereas the actual production per cow in the Present Plan was 6,553 pounds.

The labor expenditure in the Present Farm Plan was higher than for Revision I. This is a result of the high labor requirements involved in hand picking of cotton in the Present Farm Plan. It should be noted that in the revisions, it was assumed that the cotton crop was harvested by custom mechanical harvesters.

Revision II. If replacements were raised on contract, the farmer could handle 60 cows. Using a 25 per cent replacement rate, 15 cows would be replaced each year. The cropping system was the same as in Revision I and the other livestock enterprises were held constant at the same level as in Revision I. With a 90 per cent calf crop, 54 calves were assumed to be born each year with 18 being selected for

replacements while the remaining 34 calves were sold immediately. It should be noted that a death loss of two calves was assumed in this situation. The calves selected for replacements were transferred to a farmer to raise the animals under contract until two months before calving with the owner assuming death losses and breeding fees.

The purchased feed requirements under this system would cost $2,208 and the labor would cost $4,746, assuming the cost of labor at $6 per day.

The total investment in farm buildings, machinery and land in this system was estimated to be $113,152. The total expenses would amount to $34,732, while the gross receipts would be $58,977. The net farm income would be $24,245. Deducting a five per cent charge for capital, this plan would yield an operator's labor income of $18,588 (Table XIV).

Comparison of Revision I and Revision II. In comparing the capital investment required for both of these revisions it was observed that there were $6,225 more needed for Revision II. This could be accounted for by the greater number of milk cows in production in Revision II than in Revision I. As was the situation with Case Farm I, Revision I required a greater expenditure for feed than did Revision II due to calf feeds not being required in Revision II. On the other hand, the labor requirements for Revision II were $1,654 more than for

Revision I due to the greater amount of labor required for the additional milk cows.

Comparing the incomes produced by the two systems, Revision II had $3,350 greater net farm income while the operator's labor earnings were $3,039 greater than for Revision I.

In terms of opportunity cost concepts, the dairy replacements in Revision I for Case Farm II would cost an estimated $505 each. In Revision II replacements were assumed to cost $200 each but since net farm income was increased by $3,350 in Revision II as compared to Revision I, the actual opportunity cost of raising the replacements would include the $200 plus $305 (if the additional income is divided by the number of replacements raised).

IV. ANALYSIS OF CASE FARM III

Present farm plan. This farm was representative of the farms in the study with an average of more than 60 cows during 1960. This farm had an average of 108 cows in production during 1960. Case Farm III is located on the upper boundary of the Upper Coastal Plains soil region of Alabama. The farm is located in northern Winston and southern Franklin counties with the major soils being of the Savannah and Albertville series. Of the 681 acres operated by this farmer, 391 acres are owned by the operator while 290 acres are rented from adjoining farms. The owned unit was used primarily to produce forage crops while the rented acreage was used to produce the grain and silage requirements

for the dairy enterprise (Table XV). The operator had the full time assistance of three full-time men and the necessary supplemental labor to take care of the labor requirements in peak seasons.

The one acre of truck crops shown in Table XV was grown for home consumption and not for sale as a cash crop. Only a limited amount of grazing was obtained from the 108 acres classified as woodland pastured.

Some of the land on the farm has been cleared in recent years and sericea added in order to build up the soil fertility. Winter grazing for the dairy herd was provided with 144 acres of oats and rye. Of the 681 total acres in the farm, 24 acres were classified as idle land in the Present Farm Plan.

In addition to the dairy herd, the operator maintained two brood sows which produced two litters of pigs annually and were used mainly as a source of meat for the operator and the other farm help. The hogs not needed for consumption on the farm were marketed either at weaning age or fed out and sold as market hogs.

All the dairy herd replacements were produced on the farm. The operator estimated that the average production period for his cows was five years.

As shown on Table XVI, the operator had an average capital investment of $243,962 in 1960. Net farm income in 1960 was $17,272 and the operator's labor earning was estimated to be $5,074.

TABLE XV

PRESENT AND PROPOSED LAND USE FOR CASE FARM III

Land use	Present farm plan	Revision I	Revision II
	Acres	Acres	Acres
Corn:			
Grain	0	180	172
Silage	60	44	52
Permanent pasture	15	128	128
Oats and crimson clover	0	62	62
Oats and rye	144	0	0
Alfalfa	60	169	169
Sericea lespedeza	107	5	5
Kudzu	2	0	0
Fescue	15	0	0
Crimson clover and rye	60	0	0
Fescue and clover	9	0	0
Sudan or millet	45	30	30
Truck crops	1	1	1
Woodland pastured	108	108	108
Woodland not pastured	26	11	11
Idle land	24	0	0
Other land[a]	5	5	5
Total acres used[b]	681	743	743
Land double cropped	0	62	62
Total land	681	681	681

[a]Includes farm buildings, roadways and farmstead.

[b]Total acres used exceeds total land due to double cropping.

TABLE XVI

A COMPARISON OF PRESENT FARM PLAN WITH PROPOSED PLANS FOR CASE FARM III

Item	Present farm plan	Revision I	Revision II
Total acres	681	681	681
Livestock:			
Number of cows	108	120	152
Number of heifers	52	30	39[a]
Number of calves	47	34	45
Number of sows	2	2	2
Expenses:			
Livestock bought	$1,180	0	$7,800[b]
Feed	11,594	$1,970	1,551
Seed	2,095	1,920	1,920
Fertilizer and lime	5,043	9,268	9,268
Hired labor	4,500	5,970	6,210
Machine repair	400	1,683	1,683
Taxes and insurance	646	646	646
Machine hire	1,360	1,080	1,032
Gas and oil	1,500	1,600	1,600
Livestock service fee	700	960	1,216
Vet. fee	350	355	375
Insecticides	50	50	50
Depreciation	2,154[c]	4,634	4,634
Hauling	3,989	4,179	5,293
Interest on operator's loan	800	0[d]	0
Electricity and phone	540	672	697
Grind, shell and mix feed	0[e]	1,248	1,383
Rent	0	2,900	2,900
Other expenses	0	1,310	1,150
Total expenses	$36,901	$40,445	$49,408
Receipts:			
Livestock	$3,808	$6,293	$7,973
Custom work	500	0	0
ACP (Government payment)	1,871	0	0
Milk	47,994	69,252	87,719
Crops	0	5,800	4,805
Total receipts	$54,173	$81,345	$100,497

TABLE XVI (continued)

Item	Present farm plan	Revision I	Revision II
Net farm income	$17,272	$40,900	$51,089
Capital invested	243,962	262,272	275,674
Capital charge	12,198	13,113	13,782
Operator labor earnings	5,074	27,787	37,307

[a]The heifers and calves were included in the livestock inventory even though they were being raised under contract.

[b]This was the fee paid to the contractor for raising the replacements based on $200 per animal.

[c]This was for depreciation on machinery only on the Present Farm Plan whereas in the other plans it included depreciation on buildings and fences as well as machinery.

[d]Interest on operating loans was included in other cost in Revision I and Revision II.

[e]Since all concentrates were purchased, no cost for this item was incurred under the Present Farm Plan.

Revision I. Assuming all dairy replacements are raised, this farm could accommodate an average of 120 milk cows, 30 replacement heifers and 34 calves. With a 90 per cent calf crop, 108 calves would be born, allowing for approximately three per cent death loss. Thirty-four heifers were selected as replacements each year while the remaining 71 calves were sold immediately. The difference in the number of dairy heifers kept and replacements needed was accounted for by death losses and culling. Revision I includes the two brood sows that were referred to in Present Farm Plan.

The Present Farm Plan for Case Farm III differed from Revision I in that in Revision I an annual production per cow of 10,000 pounds was assumed whereas in the Present Farm Plan the actual production per cow was 7,430 pounds. The grain requirements for the rations in the Present Farm Plan were purchased from off-the-farm sources and were assumed to be raised on the farm in Revision I.

The revised farm plans for this case farm involved considerable shifts in land use. The major change involved an expansion of acreage of permanent pasture and alfalfa. Permanent pasture acreage was increased from 15 to 128 acres and acreage used for alfalfa was increased from 60 to 169 acres. Acreage in sericea lespedeza was reduced from 107 to 5 acres. Winter pasture was provided with crimson clover and oats rather than crimson clover and rye. Acreage of sudan and millet was reduced from 45 to 30 acres. With the additional acreage of alfalfa and permanent pasture, the summer grazing needs could be met adequately

with less summer supplementary pasture than was provided in the Present Farm Plan (Table XV).

One of the major items of expense in the present operation was purchased feed for the milk cows ($11,594 in 1960). Since considerable acreage of the farm was suitable for corn production, in the revised plans acreage of corn for silage and grain was increased from 60 to 224. This enabled the operator to reduce substantially the cost of purchased feed (Table XVI).

Total expenses for Revision I amounted to $40,445. The largest items of expense were: fertilizer, hired labor and milk hauling which were $9,268, $5,970 and $4,179, respectively.

The milk hauling expense was increased in the two revisions because the cows were assumed producing at higher levels than they were presently producing.

The total investment needed for this revision was $262,272. The plan would produce an estimated net farm income of $40,900. With a five per cent charge to capital, this revision would yield an operator's labor earning of $27,787.

Revision II. With all replacement animals being raised on contract the farmer could handle 152 cows with 39 cows being replaced each year. With a 90 per cent calf crop assumed, 137 cows would calve each year, assuming five per cent death loss. Forty-five heifers were transferred to a contractor to be raised on contract and the remaining

87 calves were sold immediately. The dairyman assumed all death losses and breeding fees of the replacements that were contracted to another farmer.

This plan like Revision I held constant the feed requirements and income from the swine enterprise.

The capital investment in this budget required $275,647 which included the same equipment in Revision I plus the investment in the extra number of cows and replacements. Even though the replacements were grown on contract, the owner still had his capital invested in the replacement animals.

The fertilizer expenditure for this plan was the same for this budget as in Revision I since the same cropping system was used. The only difference was that more corn was used for silage instead of grain as in Revision I.

The expense for hired labor was $6,210 and the milk hauling fee was $5,293 since there was a larger number of animals in production in this revision. The total of all expenses was $49,408, with a net farm income of $51,089. Deducting a five per cent charge to capital, operator labor earnings were estimated to be $37,307 in Revision II.

Comparison of Revision I and Revision II. As was the case in other budgets, the amount of money for feed purchases was less in Revision II than was in Revision I. In fact, the difference amounted to $419 as a result of not having to purchase feeds for the replacement animals.

Since there was more labor required with the addition of 32 more milk cows in Revision II, the amount of hired labor increased from $5,970 in Revision I to $6,210 in Revision II.

Net farm income was $40,900 for Revision I as compared to $51,089 in Revision II, or a net increase of $10,189. After the charge to capital was deducted from both plans, there was a difference of $9,320 in favor of Revision II which made the operator's labor earnings $37,307 in Revision II.

The added income produced in Revision II was attributed to the dairy replacements being raised under contract. In terms of opportunity cost in Revision I the cost of the replacement animals was $540 per animal. This opportunity cost per animal represents the combined cost of hiring the replacements produced under contract for Revision II ($200 per animal) and the increase in net income as a result of the change in replacement method allocated on the basis of the number of replacement animals raised in Revision I ($340 per animal).

CHAPTER IV

SUMMARY AND CONCLUSIONS

This study of Grade A dairy farms in the Tennessee Valley Area of Alabama was undertaken: (1) to determine the present dairy herd replacement methods used and attitudes toward purchasing replacements in the study area, (2) to determine the extent by which factors such as labor supply, bulk tank capacity, barn space, feed supply and capital availability would limit expansion of the dairy herd if replacement animals were purchased, (3) to estimate the effect on net farm income if replacement animals were produced on a contract basis rather than being raised by the dairyman.

The study was based on information obtained from 28 Grade A Test Demonstration farms.[1] In addition to the information available from the annual records of each of the Test Demonstration farms, additional information was obtained from each farm by survey technique to determine such things as factors that limit expansion, numbers of dairy animals sold and purchased, present livestock inventories, dairy replacement methods used on the farm and the farmers' attitudes toward the raising or purchasing of replacement animals.

The dairy farms were classified into three groups depending upon the size of the milking herd. Group I consisted of 10 farms which had

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[1]Since one of the original farms went out of the dairying business in 1961, most of the analysis is based on data from 27 farms.

an average of less than 40 cows in production. Group II consisted of 13 farms that had an average of 40 to 60 cows while Group III consisted of five farms with an average of more than 60 cows in production in 1960.

A case farm was selected for each of the three groups for more detailed study. Two revised plans, called Revision I and Revision II, were developed for each of the case farms. Each of the revisions were contrasted to the present organization, called the Present Farm Plan.

Revision I differed from the Present Farm Plan mainly in livestock and crop production practices and in cropping system. Revision I was designed to make as efficient use of the land, capital and labor resources as possible assuming reasonably good management levels. Dairy replacement animals were assumed to be raised on the farm in Revision I, as was the case on most of the farms included in the study. Dairy cow numbers were increased in Revision I over Present Farm Plan in accordance with increased production of grains and forages and the availability of other input factors such as labor, barn space and bulk tank capacity.

Revision II for each case farm assumed essentially the same cropping system and crop and livestock practices as was used in Revision I except for some changes in the methods of utilizing forages produced on the farm. It was further assumed in Revision II that all replacement animals were grown under contract by another farmer with the dairyman

retaining title to the animal being grown on contract and assuming death losses and breeding fees. It was assumed that the cost of replacement animals raised on contract was $200 each.

Two of the case farms were located in the Limestone Valley region and one case farm was located in the Upper Coastal Plains region of the Tennessee Valley Area in North Alabama.

I. REPLACEMENT METHODS

It was found in the study that 91 per cent of the farmers in the study raise their own replacement animals. The farmers estimated that animals were kept in the herd for an average of 4.4 years, indicating an average annual replacement rate of 22.7 per cent. The actual replacement rate in 1961 for the entire group of farms was 18.9 per cent.

The major reason given by the farmers for raising their own dairy replacements rather than obtaining them from off-the-farm sources was knowledge of ancestors of replacement animals. Other reasons given for raising replacements were: cheaper to raise replacements, scarcity of good replacements to purchase in the area, diseases may be transmitted to the farm through purchased animals and difficulties of financing purchase of replacement animals.

Twelve of the dairymen in the study indicated that they would be interested in purchasing the replacements if they could be assured of obtaining quality replacements, while 15 farmers indicated that they

would not consider purchase of replacement animals. Estimates given by the farmers indicated that, on the average herd, size could be expanded by 16.5 cows or 32.7 per cent of present herd size if all their dairy replacements were purchased or raised under contract on another farm. Thus a change in replacement methods used would seem to provide a means for a significant expansion in herd size.

Table XVII gives a summary which compares the net farm income, capital investment, and labor requirements of the Present Farm Plan and each of the revised plans for the three case farms. The increase of net income in Revision I as compared to Present Farm Plan for each case farm was largely the result of greater efficiency in crop and livestock production. Yields and production rates for crop and livestock were generally considerably higher in Revision I but are considered reasonable and attainable under good management levels. Net farm income under Present Farm Plan was $3,827 for Case Farm I, $14,276 for Case Farm II and $17,272 for Case Farm III. Under the management level assumed in Revision I, net farm income was estimated to be $11,531, $20,895 and $40,900 respectively for the three case farms.

As indicated earlier, Revision II differs from Revision I mainly in terms of method of acquiring replacement animals. Since replacements were produced on another farm in Revision II, the number of milk cows was expanded (as compared to Revision I) to make use of the forage previously used for raising herd replacements. This change in

TABLE XVII

SUMMARY OF STUDY ON CASE FARMS

Item compared	Case farm I	Case farm II	Case farm III
Net farm income:			
Present plan	$3,827	$14,276	$17,272
Revision I	11,531	20,895	40,900
Revision II	13,157	24,245	51,089
Total capital invested:			
Present plan	37,743	99,987	243,962
Revision I	41,080	106,927	262,272
Revision II	43,935	113,152	275,674
Total labor used (days*):			
Present plan	330	1,550	1,200
Revision I	466	862	1,342
Revision II	481	908	1,381

*Nine hours was considered as one work day.

replacement policy was estimated to result in an $1,626 increase in net farm income on Case Farm I, an increase of $3,350 on Case Farm II and an increase of $10,189 on Case Farm III. This would represent an increase in net farm income of 14 per cent, 16 per cent and 24 per cent respectively for the three case farms.

More labor was required in both revised plans for Case Farm I and Case Farm III than was used in the Present Farm Plan since more milk cows were added and some idle land was brought into production. One Case Farm I, Revision I required an estimated 466 man days of labor or an increase of 45 per cent over the amount of labor used in the present system. On Case Farm III total labor requirements were increased from 1200 man days for the Present Farm Plan to 1342 man days in Revision I or an increase of 15 per cent. On Case Farm II labor requirements were substantially less in Revision I than for the present system. This was due to the fact that both plans included 41 acres of cotton and this cotton was assumed to be harvested mechanically in Revision I while hand picking was used under the present system. In Revision II, which differed from Revision I only in terms of method of acquiring replacements, labor requirements were only slightly greater than for Revision I on each of the case farms.

Total capital invested under the present system was $37,743 for Case Farm I, $99,987 for Case Farm II and $243,962 for Case Farm III. Each of the revised plans were estimated to require more capital than the Present Farm Plan. Investment requirements for Revision II were

greater than for Revision I since on each case farm more cows were kept in the system which involved having replacements produced under contract. In Revision II, capital requirements were $6,192 greater than for the present organization on Case Farm I, $13,165 greater for Case Farm II and $31,712 greater for Case Farm III.

A significant increase in net farm income was estimated for each case farm in the study when the cropping system was changed to allow farm resources to be more fully utilized. The net farm income was further increased when herd replacements were grown on contract. This practice provided for more milk cows to be in production in the milking herd. Perhaps the contracting of the dairy replacements could increase the net farm income of the farmers in the study area considerably since in many instances the dairy farmers are farming in areas where land values are high and the replacements could be raised in another area where land values are not as expensive. This practice could permit expansion of herd size of existing dairy farms and provide for fuller utilization of some of the high capital requiring inputs used in milk production. On some farm limitations of labor supply, barn space, or bulk tank might prevent any expansion of herd even if replacements were raised on contract.

In past years dairy farmers have been apprehensive toward the purchasing of dairy replacements because of lack of knowledge of the background of the animals. Contracting for replacements in the manner assumed in this study would alleviate this difficulty since the quality

of the replacement animals would be based on the farmers own breeding program as it is if he raises his own replacements.

Additional study is needed to determine the economic feasibility of outright purchase of replacement animals. In some dairy regions a large proportion of replacement animals are purchased while in others such as the area on which this study is based, practically all the replacements are produced on the farms where they are used.

Additional study is also needed to evaluate the possibility of specialization in dairy replacement stock production. Such specialized operations currently exist in some areas. Such production specialization may offer certain economic advantages particularly to farmers now engaged in beef cattle production or in the production of milk for manufacturing plants. The feasibility of hiring dairy replacements produced on contract is contingent, of course, upon the individual dairyman being able to work out mutually satisfactory arrangements with other farmers to produce these animals.

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APPENDIX

APPENDIX

TEST DEMONSTRATION DAIRY FARM SURVEY---1962
TENNESSEE VALLEY COUNTIES OF ALABAMA

1. Name of farmer _____ County _____

2. Average number of dairy cows, 1960 _____ 1961 _____

3. Livestock summary

	1961 Purchases No.	1961 Purchases Cost	1961 Sales No.	1961 Sales Value	On Hand Now
Dairy cows					
Dairy heifers (1 yrs. & over)					
Dairy calves (less than 1 yr.)					
Dairy bulls	xx	xx	xx	xx	
Beef cows	xx	xx	xx	xx	
Other beef animals	xx	xx	xx	xx	
Sows	xx	xx	xx	xx	
Fattening hogs	xx	xx	xx	xx	
Sheep	xx	xx	xx	xx	
Layers	xx	xx	xx	xx	
Other	xx	xx	xx	xx	

4. Approximately on the average, how long do you keep a dairy cow in your herd _____ years.

5. What proportion of your cow replacements do you:

   a. raise _____ per cent

   b. buy _____ per cent

   c. produced on contractual arrangement _____ per cent

6. If produced on contractual arrangement, briefly describe the contractual arrangement _____

7. If raise most of own replacements:
   (a) What reasons do you have for raising your own replacements rather than buying them? _____

(b) Would you prefer to buy your own replacements if you could be assured of being able to get good quality dairy heifers or cows?

____yes____no

Comment:_____

_____

If not, why not?_____

_____

8. If buy most of replacements:

(a) What reasons do you have for buying most of your replacements rather than raising them on your farm?_____

_____

(b) Are you able to buy good quality replacement animals for your herd? ____yes____no

Comment:_____

(c) What proportion of the dairy replacement animals that you buy were produced
locally ____per cent shipped in from out of state____per cent
other_____

Comment:_____

_____

9. If you purchased all your replacements, could you carry more dairy cows? ____yes____no
If yes, how many more cows could you carry?____ If no, why couldn't you carry more?_____

_____

10. Which of the following factors is most limiting in terms of expanding the number of milk cows you carry?
Labor supply____ Barn space____ Bulk tank_____
Feed supply____ Finances_____

Why does this factor limit your dairy herd?_____

_____