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September 10, 1971

To the Graduate Council:

I am submitting herewith a thesis written by Ingram Bass Howard, Jr., entitled "Factors Affecting the Economic Growth of Grade A Dairy Farms." 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.

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FACTORS AFFECTING THE ECONOMIC GROWTH OF GRADE A DAIRY FARMS

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

Ingram Bass Howard, Jr.

December 1971

ACKNOWLEDGMENTS

The author wishes to express his gratitude to all persons who have made this study possible. The author is especially grateful to Dr. Benny Ray McManus, under whose direction the study was conducted, for his ideas, counsel, and guidance during the entire program of graduate study. To other members of the author's graduate committee, Dr. Charles M. Cuskaden and Dr. James G. Snell, sincere appreciation is expressed for their helpful suggestions and advice.

To the Tennessee Production Credit Associations, gratitude is extended for helping finance the author's graduate studies. The author is also grateful to those dairy farmers in West Tennessee who provided information needed for the study.

The author wishes to thank Dr. Ray Daniel for his computer programming assistance and Dr. Charles L. Cleland for helping in the design of the questionnaire.

Special thanks are extended to: Mrs. Jeanne Sharpe and Mrs. Judy Boring for assistance in preparing the data for analysis, Mrs. Marcia DeWitt for drawing the sample map, Mrs. Anne Norwood, Miss Melitta Stoutt, and Miss Linda Howard for typing drafts of the thesis, and Mrs. Ann Lacava for typing the final draft.

Finally, the author expresses his deepest appreciation to his wife, Chris, for her patience, understanding, and encouragement throughout the study.

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ABSTRACT

Additional knowledge is needed of the process of farm firm growth used by dairy operators to accumulate owned capital. The objectives of this study were: (1) to ascertain characteristics, goals, and attitudes of Grade A dairy farmers to provide a framework for farm size and financial growth analysis, (2) to determine sources and characteristics of farm credit used by Grade A dairy farmers to acquire capital for selected loan purposes and operating expenses, and (3) to relate goals and attitudes of Grade A dairy farmers to farm size and financial growth and determine those factors which are associated with farm size and financial growth.

The data were obtained from a survey of 178 Grade A dairy farmers in West Tennessee and were collected by means of a structured questionnaire.

Capital investment and net worth of the farm operator, at the time of the survey, were used as a proxy for farm size. Changes in capital investment and net worth, from the time the farmer began Grade A dairying until the survey, were used as a proxy for financial growth.

Linear regression equations were estimated to relate goals and attitudes to farm size and financial growth. Four models were theorized and estimated by regression analyses to determine those factors which are associated with farm size and financial growth. Goals and attitudes indexes were developed by means of subjective scaling to be used in the size and growth models.

Contrary to economic theory of the firm, "profit maximization" was not the most important financial goal among farmers. Farmers in this study placed more emphasis on "standard of living" as a financial goal than on "making the highest possible income."

Clarity of goal verbalization by farm operators was positively related to capital investment and net worth. Farmers who had goals "clearly verbalized" had a significantly higher capital investment and net worth than those farmers who had goals "not clearly verbalized."

There was a strong tendency for farmers to use credit. In most all cases, farmers experienced no difficulties in locating lenders who provided loans requested. Limitations to borrowed funds appeared to be from internal capital rationing rather than external capital rationing. Farmers who were "in favor" of using credit had a significantly higher capital investment and net worth than farmers who were "not in favor" of using credit.

Variables which were positively and significantly related to both capital investment and net worth were: (1) number of years Grade A dairying, (2) initial net worth, and (3) average production per cow. Number of credit sources was significantly related to capital investment but was not significantly related to net worth. Education was positively related to capital investment and net worth but was not significantly related to either one.

Variables which were positively and significantly related to change in capital investment per year and change in net worth per year were: (1) change in herd size per year, (2) change in farm size per

year, and (3) education. Change in farm debt was significantly related to change in capital investment per year but was not significantly related to change in net worth per year. Average production per cow and goal index score were positively related to change in capital investment per year and change in net worth per year but were not significantly related to either of the above.

The results obtained from this study should: (1) provide educational information to dairy farmers as well as lenders, (2) enable lenders to make better evaluations of prospective borrowers, and (3) provide guidelines for future research on capital acquisition and accumulation problems of dairy farmers.

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CHAPTER I

INTRODUCTION AND PROBLEM ORIENTATION

The Grade A dairy industry in Tennessee has undergone tremendous changes in the past decade. During this time the total number of herds has decreased while herd size and production herd per cow have increased. Increased herd size and higher production per cow represents not only technological advance in quality and organization of inputs but a vast increase in operating and investment capital for the individual Grade A milk producer.

Several factors have contributed to the increased capital requirements for Grade A dairy farmers. From 1960 to 1969, the average size farm in Tennessee increased 22 percent, while the value of farm real estate per acre increased 66 percent.[1] During this same period, the value of cows and heifers kept for milk purposes increased nearly 25 percent.[2] Also, more labor saving buildings and feeding equipment are being used which requires more capital than in earlier years. Changes in the composition of capital inputs and the substitution of capital for labor have increased total capital requirements for Grade A dairying.

In the past many farmers have been unable to accumulate capital as fast as the need for it has arisen while other farmers have been

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[1] Tennessee Agricultural Statistics, Annual Bulletin T-6 (Nashville: Tennessee Crop Reporting Service, August 1969), p. 4.

[2] Agricultural Statistics, United States Department of Agriculture (Washington: Government Printing Office, 1970), p. 363.

unable to acquire adequate capital for economical and efficient beginning operations. Capital acquisition and accumulation problems will continue to confront dairy farmers of the future. In order to have a viable milk production industry, information is needed on the capital acquisition and accumulation processes used by Grade A farmers in meeting the increased capital requirements for dairy farming.

I. JUSTIFICATION OF STUDY

Researchers in agricultural economics have become increasingly concerned with the effects of various economic and technical changes in agriculture upon the growth of farm firms. These researchers not only want to understand growth of the firm in order to make suggestions for necessary changes in agricultural production but also to provide information for the managers of farm firms.

Various strategies and methods of obtaining and accumulating capital used by established dairymen should provide important financial guidelines for getting established in dairying or expanding present operations. This information should also provide a better understanding of those factors which influence size and growth of Grade A operations and aid in future research and extension work within the dairy industry.

II. OBJECTIVES

This study was concerned primarily with providing more information on those factors which influence farm size and financial growth of Grade A dairy farmers. Other factors were studied to gain more knowledge about the producers, operational methods, and changes in the industry.

Specific objectives of this study were:

1. To ascertain characteristics, goals, and attitudes of Grade A dairy farmers to provide a framework for farm size and financial growth analyses.
2. To determine sources and characteristics of farm credit Grade A dairy farmers used to acquire capital for selected loan purposes and operating expenses.
3. To relate goals and attitudes of Grade A dairy farmers to farm size and financial growth and determine those factors which are associated with farm size and financial growth.

III. CONCEPTUAL FRAMEWORK

The basic assumption underlying this study was that size and growth of the farm firm is a function of personal and economic characteristics of the farm operator. The relevant characteristics were identified, isolated, and associated with farm size and financial growth.

A farm firm was defined as being a Grade A dairy operation controlled and operated by the farm operator. Total farm capital assets, at the time of the survey, were used as a proxy for farm size. Changes in net worth, from the time that the farmer began Grade A dairying until the survey, were used as a proxy for financial growth.

The conceptual framework of analysis involved ascertaining the characteristics of the subjects for the size and growth models. Goals and attitudes were combined into a scale index to be used in the farm size and financial growth models. Models were theorized

and estimated in isolating factors which are associated with farm size and financial growth.

IV. METHODOLOGY

Collection of Data

Data for this study were obtained by personal interview of Grade A dairy farmers in 16 of the 21 counties in West Tennessee. The number of farmers interviewed and total number of Grade A producers in each county are shown in Figure 1. The data were collected by means of a structured questionnaire enumerated during September and October of 1970.

To ascertain the population of dairy farmers to be surveyed, a list of Grade A producers was compiled from office records of milk producers' associations and county agents in the study area. In September, 1970, there were approximately 250 Grade A producers in West Tennessee. All those producers who had herds of 15 or more cows were included in the survey. Because of dairy shows, health inspections, and recent tax reevaluations being held at the time of the survey, the enumerator was unable to obtain useable questionnaires from some producers. A total of 178 useable questionnaires were obtained. This number was considered sufficient to represent Grade A dairy farmers in West Tennessee.

Analytical Procedure

Linear regression equations were used to relate growth and attitudes to size and growth of the operator. Subjective scaling

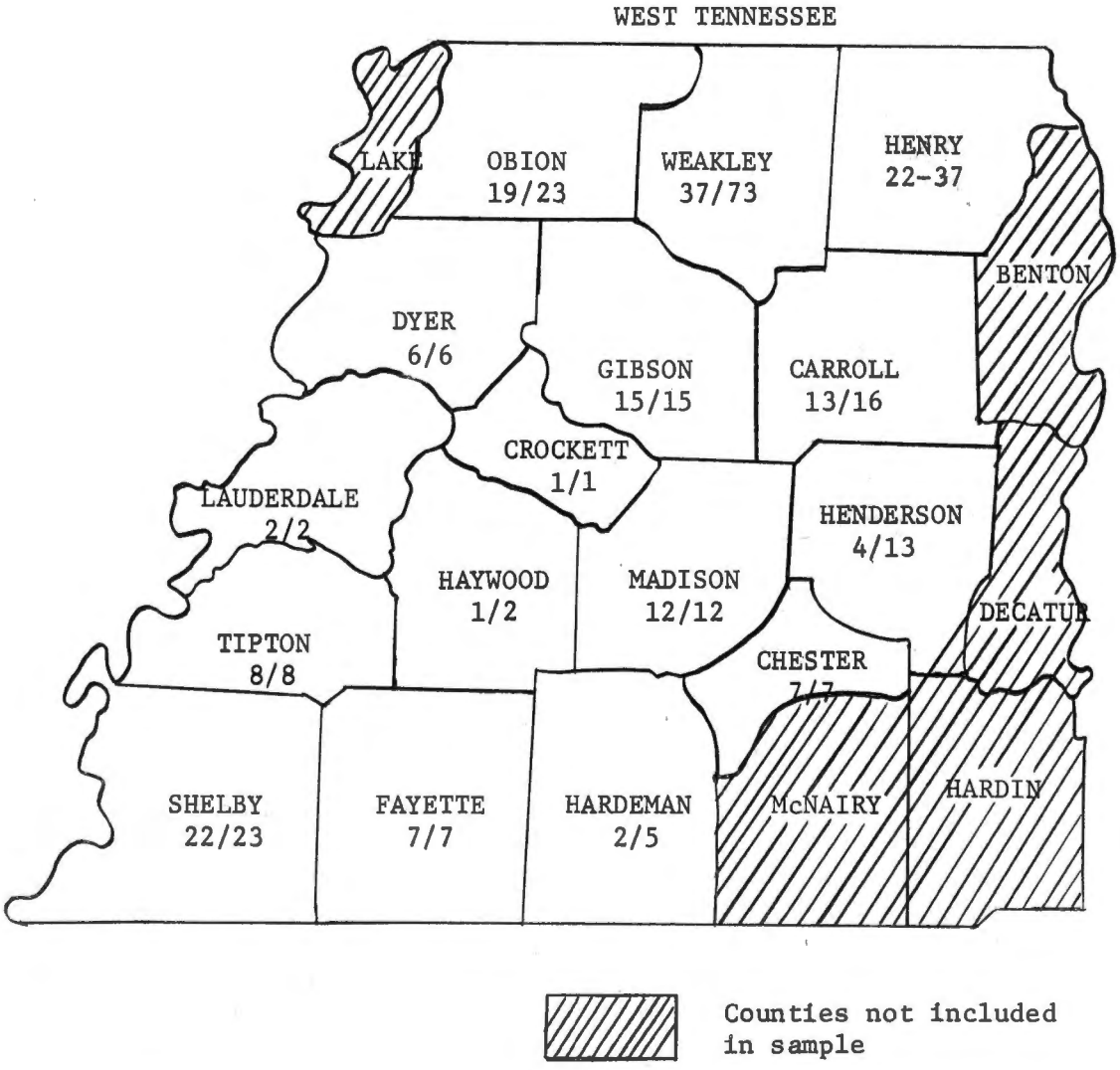

Figure 1. Number of schedules taken and number of Grade A producers by county, West Tennessee, 1970.

Source: Associated Milk Producers' Incorporated and County Agent's Office Records, 1970.

was the basis for developing the goal and attitude indexes. Regression analysis was used in estimating farm size and financial growth models.

V. REVIEW OF LITERATURE

Martin and Plaxico[3] used linear programming techniques to analyze the capital accumulation and growth problems of farm firms in Oklahoma and Texas over a 30 year period. Analyses were made to determine the effect of different tenure situations, consumption levels, increasing land values, growth objectives, and other variables upon capital accumulation and growth rates.

The most relevant variable with respect to minimum starting farm equity requirements was tenure situation. When all farmland was rented, there was very little difference in starting equities for different growth situations. However, renting land in addition to land owned as an operating base resulted in maximum capital accumulation. When all farmland was purchased, minimum starting farm equities increased substantially. Purchasing all farmland operated restricted capital accumulation with respect to both size of operation and level of net returns. Increased land values tended to raise minimum starting equity and decrease growth, in terms of additional acreage.

Capital accumulation and growth decreased as family consumption levels increased. Also, higher propensities to consume in the early stages of the firm were associated with reduced growth rates. Of the

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[3] J. R. Martin and James S. Plaxico, Polyperiod Analysis of Growth and Capital Accumulation of Firms in the Rolling Plains of Oklahoma and Texas, Economic Research Service, Technical Bulletin 1381 (Washington: United States Department of Agriculture, 1967).

growth objectives studied, maximizing the present value of net returns produced highest capital accumulation and growth. When maximizing the asset value of land, maximum firm size could best be achieved by renting land during the first half of the planning period and buying at the end of the period.

Hessler and Janssen[4] sought to determine the extent of external and internal capital rationing among farmers in central Indiana and to determine what proportion of the farmers had reached their subjective optimum investment.

Of the farmers studied by Hessler and Janssen, 10 percent were restricted by external capital rationing while nearly two-thirds operated by internal capital rationing. Approximately 11 percent of the farmers in the latter group were also faced with external capital rationing. Fourteen percent of the farmers had reached their subjective optimum investment. The average optimum investment, given their values and goals, was $102,700. Younger farmers, age 20-29, had higher mean optimum investments although there was no significant difference in mean optimum investments until the 50-59 age group was reached. With living expenses relatively constant, larger net returns were associated with higher mean optimum investments, resulting in an increasing rate of capital accumulation.

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[4]Leon F. Hessler and Melvin R. Janssen, Captial Rationing Among Farmers, Research Bulletin 703 (Lafayette: Purdue University, November 1960).

[5]Subjective optimum investment was defined as the amount that the farmer would invest in the total farm business if he had "plenty of money," assuming he were to continue to farm.

Patrick and Eisgruber[6] studied the effect of managerial ability of the farm operator and capital structure on growth of the firm. A hypothetical firm, representative of farms operated by young Central Indiana farmers was used as the initial position of the study. Capital structure was divided into three types: interest rate, long-term loan limits, and intermediate-term loan limits. For each of these controlled variables, three levels were stimulated over a 20-year period.

Managerial ability of farmers significantly affected growth. Farmers of above average managerial ability increased net worth almost $2,000 per year faster than those farmers with average managerial ability.

In general, an increase in interest rate reduced net worth accumulated, reduced income available for family consumption, and tended to force farmers of low managerial ability out of farming earlier. Long-term loan limits were important in determining the rate of land acquisition and expansion. Farmers who acquired land earlier usually achieved a higher net worth. In most instances varying limits on intermediate-term loans had little effect on net worth of the firm.

Patrick and Eisgruber concluded that managerial ability was the major factor determining the rate of firm growth. They further concluded that farmers with average or low managerial ability and assets could remain in farming during the early years of farm operation only by reducing consumption expenditures below normally desired levels.

A study was conducted by Van Hoozer[7] to determine the effect of

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[6]George F. Patrick and Ludwig M. Eisgruber, "The Impact of Managerial Ability and Capital Structure on Growth of the Farm Firm," American Journal of Agricultural Economics, 50:491-506, August 1968.

[7]Gary M. Van Hoozer, "The Relationship of Agricultural Credit

agricultural credit, land and other assets, non-farm income, and other variables upon firm growth and capital accumulation. Analysis was conducted with the use of a statistical model using least squares multiple regression.

Factors which had a significant positive relationship to growth[8] were initial total asset and net worth position of the operator, non-farm income earned by the operator's wife, and age of the operator. Factors which had a significant negative relationship to growth were financial leverage ratio (total annual normalized short-term credit divided by total assets) and family non-farm income. No significant relationship was found regarding financial liquidity (current assets divided by annual normalized short-term credit), although short-term credit in dollar terms was positively related to growth of owners and part-owners and negatively related to growth of tenants.

Hall[9] studied the effects of selected variables and conditions on growth of dairy farms using growth simulation techniques. Herd milk production levels affected growth of the firm more than any other factor considered. In Hall's study, firms starting at the 13,000 pound level of production increased net worth about three and one-half times faster in a ten-year period than firms starting at a 9,000 pound level and firms starting at a 11,000 pound level increased net worth

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and Other Selected Factors to Growth and Capital Accumulation" (unpublished Master's thesis, Purdue University, January 1970).

[8]Growth was defined as a positive change in operators' net worth over a specified time interval.

[9]Hollis D. Hall, "An Economic Analysis of the Growth of Oklahoma Grade A Dairy Farms Using the Growth Simulation Technique" (unpublished Ph.D. dissertation, Oklahoma State University, 1969).

about twice as fast over the same period as firms starting at a 9,000 pound level.

The percentage of milk marketed as Class I also had an important effect on growth. Firms with herds producing 11,000 pounds of milk per cow increased net worth approximately 5 percent for each 1 percent increase in Class I marketings. The growth response was approximately 10 percent for each 1 percent increase in Class I marketings for firms with herds producing 13,000 pounds of milk per cow.

Hall's study revealed that firms generally experience a period of dormancy in net worth growth during the first five years of operation and that deferment of large capital withdrawals for family consumption until later years enhanced growth during the early stages.

Burkett[10] studied representative dairy farms in New Hampshire to determine the effect of farm size on the ability of farmers to build equity in farm capital. Results of the study showed that total capital investment at each herd size was positively related to herd size, but was not greatly affected by size of labor force. As herd size increased, total capital per animal unit decreased sharply at first and then increased slowly upward until about 70 animal units (a 56 cow herd with replacement animals) was reached. Equipment capital, through most of the herd size range, was higher on two-man farms than on one-man farms. There was no evidence of capital labor substitution in the study, as most farmers tended to equip men rather than substitute capital for labor.

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[10] W. K. Burkett, Farm Size and the Capital Acquisition Problem on New Hampshire Dairy Farms, Agricultural Experimental Station Bulletin 457 (Durham: University of New Hampshire, February 1959).

Burkett concluded that larger size farms had the greater capital accumulation potential and were better able to meet repayments on either 100 percent or modest conservative credit. He further concluded that if farmers were to progress toward full ownership from earnings, they needed the use of large farms which required rental agreements and/or increased use of credit.

A study concerning the extent to which goals entered into the decision-making process of dairy farmers in Wisconsin to adopt farm practices was reported by Wilkening and Johnson.[11] The study was based on considerations by the farmers of five specificed goals in making 14 farm decisions. The five goals considered were "profit," "ease and convenience," "quality or standard," "keeping up with best farmers," and"good relations with other farmers."

Dairy herd management decisions pertaining to adoption of buildings and feeding equipment were influenced most frequently by "profit" considerations and to a lesser extent by a concern for maintenance of "quality" animals and by the desire to "keep up with best farmers." For most farmers economic considerations determined general management decisions. However, many farmers considered elimination of trouble and work and conflicting operations important in reaching management decisions.

"Profit"was the predominant goal for the 14 decisions studied. Other goals in order of importance in decisions were "ease and

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[11]E. A. Wilkening and Donald E. Johnson, Goals in Farm Decision-Making as Related to Practice Adoption, Research Bulletin 225 (Madison: University of Wisconsin, February 1961).

convenience," "quality or standard," "keeping up with best farmers," and "good relations with others."

CHAPTER II

CHARACTERISTICS AND OPERATIONAL METHODS OF WEST TENNESSEE GRADE A PRODUCERS

The changes experienced by the Grade A dairy industry in West Tennessee are the result of many and varied decisions made by individual producers. The structure of the industry today will provide the basis from which future changes will occur. Consequently, a look at the present characteristics of the Grade A producers and their operations which were surveyed in this study should provide a base for more accurate predictions to be made about how future changes in the industry will take place. These characteristics will also acquaint the reader with the areas from which the sample was taken and provide a foundation for the analysis that appears in succeeding chapters.

I. AGE AND FORMAL EDUCATION OF PRODUCER

The average[1] age of the West Tennessee Grade A producers was 48.7 years. Three percent of the producers were under age 30, while at the other end of the scale 17 percent were 60 years of age or older (Table I). Twenty-three percent of the producers were between the ages of 30 and 39 and 57 percent were 40 to 59 years of age. The most common age group was 50 to 59 years.

The average number of years of formal education for all producers was 11.3 years. Twenty-one percent of the producers had eight or less

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[1]Average as used here and in other parts of the thesis refers to arithmetic mean.

TABLE I

NUMBER AND PERCENT OF GRADE A PRODUCERS ACCORDING TO AGE OF PRODUCER, WEST TENNESSEE, 1970

Age of Producer	Number	Percent
29 or less	5	3
30-39	41	23
40-49	49	28
50-59	52	29
60 and over	30	17
Total	177[a]	100

[a]Age of one producer was not ascertained.

years of formal education, 36 percent had 12 years of formal education, 10 percent had 1 to 3 years of college, and 14 percent had 4 years of college and over (Table II). Sixty percent of the producers had 12 or more years of formal education.

II. SIZE OF FARM AND TENURE OF PRODUCER

The average size farm operated by West Tennessee Grade A producers consisted of 258.3 acres of owned land and 238.5 acres of rented land for a total of 496.8 acres. Each producer, on the average, had 208.9 acres in row crops, 177.5 acres in permanent and temporary pastures, 31.8 acres in small grains, and 78.6 acres in noncultivatable land.

To ascertain tenure of producer, all farmers were grouped into one of three categories: owners, part-owners, and tenants. If a farmer owned all of the land which he operated, he was classified as an owner. If a farmer owned and rented the land which he operated, he was classified as a part-owner. Farmers who rented all of the land for their operations were designated as tenants. As shown in Table III, 23 percent of the farmers were owners, 69 percent were part-owners, and 8 percent were tenants.

III. MILK PRODUCTION AND HERD SIZE

Average milk production per cow for 177 Grade A dairy herds in West Tennessee was 10,350 pounds annually. Seventeen percent of the herds had a 5,000-8,499 pound average, about 60 percent had a 8,500-11,499 pound average, nearly 18 percent had a 11,500-13,499 pound average, and about 7 percent had a 13,500 pound or higher average (Table IV).

TABLE II

NUMBER AND PERCENT OF GRADE A PRODUCERS ACCORDING TO FORMAL EDUCATION OF PRODUCER, WEST TENNESSEE, 1970

Formal Education of Producer	Number	Percent
Less than eighth grade	11	6
Eighth grade	27	15
Ninth through eleventh grade	34	19
Twelfth grade	63	36
1-3 years college	18	10
4 years college and over	24	14
Total	177[a]	100

[a]Formal education of one producer was not ascertained.

TABLE III

NUMBER AND PERCENT OF GRADE A PRODUCERS ACCORDING TO TENURE OF PRODUCER, WEST TENNESSEE, 1970

Tenure of Producer	Number	Percent
Owner	41	23
Part-owner	122	69
Tenant	15	8
Total	178	100

TABLE IV

AVERAGE YEARLY PRODUCTION PER COW ACCORDING TO HERD SIZE OF GRADE A PRODUCERS, WEST TENNESSEE, 1970

Average Yearly Production Per Cow (Pounds of Milk)	Herd Size (Number of Cows Milked)											
	15-25		26-50		51-75		76-100		101 and Over		Totals	
	Herds	Percent	Herds	Percent	Herds	Percent	Herds	Percent	Herds	Percent	Herds	Percent
5,000-8,499	4	2.3	19	10.7	5	2.8	1	0.6	1	0.6	30	17.0
8,500-10,499	3	1.7	23	13.0	17	9.6	2	1.1	6	3.4	51	28.8
10,500-11,499	3	1.7	16	9.0	17	9.6	12	6.8	5	2.8	53	29.9
11,500-13,499	3	1.7	14	7.9	8	4.5	2	1.1	4	2.3	31	17.5
13,500 and over	0	0.0	6	3.4	3	1.7	1	0.6	2	1.1	12	6.8
Total	13	7.4	78	44.0	50	28.2	18	10.2	18	10.2	177[a]	100.0

[a]Herd size and average production per cow of one producer was not available.

Herd size for all producers in the study ranged from 15 to 325 milking cows. The majority of producers operated small to medium size herds. Approximately 7 percent of the producers milked 15-25 cows, 44 percent milked 26-50 cows, 28 percent milked 51-75 cows, 10 percent milked 76-100 cows, and another 10 percent milked over 100 cows (Table V). The average size milking herd on the Grade A dairy farms surveyed in West Tennessee was 61.4 cows, excluding dry cows and heifers which had not freshened. Producers in Lauderdale County had the highest average number of cows (182.5) per herd while producers in Henderson County had the lowest average number of cows (36.3) per herd (Table V).

IV. DOMINANT TYPE OF BREED

Each herd in the study was classified according to dominant type of breed. The number of cattle in each breed was ascertained and one breed was declared dominant if it composed at least 75 percent of that herd. If no one breed composed 75 percent, the herd was classified as being mixed.

The Holstein breed was dominant in about 60 percent of all herds, with the herds with more than 75 cows having a higher than average percent of this breed. The Jersey breed was dominant in 14 percent of all herds, and was rather equally distributed over all herd size groups. Twenty-six percent of the herds had no dominant breed and were classified as mixed.

TABLE V

NUMBER OF GRADE A PRODUCERS, NUMBER OF MILK COWS, AND AVERAGE HERD SIZE, BY COUNTY, WEST TENNESSEE, 1970

County	Number of Grade A Producers[a]	Number of Milk Cows[b]	Average Herd Size[c]
Carroll	13	593	45.6
Chester	7	330	47.1
Crockett	1	50	50.0
Dyer	6	281	46.8
Fayette	7	759	103.4
Gibson	15	1,531	102.6
Hardeman	2	93	46.5
Haywood	1	100	100.0
Henderson	4	145	36.3
Henry	22	861	39.1
Lauderdale	2	365	182.5
Madison	12	660	55.0
Obion	19	1,035	54.5
Shelby	22	1,784	81.1
Tipton	8	585	73.1
Weakley	37	1,759	47.5
All counties	178	10,931	61.4

[a]Includes only those producers surveyed in each county.

[b]Total number of cows milked by those producers surveyed in each county.

[c]Average herd size for those producers surveyed in each county.

V. TYPE OF CENTRAL MILKING UNIT AND MILKING LABOR

The kind of central milking unit used by Grade A producers was divided into two types: milking parlors and stanchion barns. Slightly over two-thirds of the producers used milking parlors while almost one-third used stanchion barns (Table VI). Milking parlors were used in both small and large size herds, but were found most frequently in the larger size herds.

The type of milking labor on Grade A dairy farms was classified according to the person(s) who did the actual milking. All herds were designated as being milked by the farm operator and his family, by the farm operator and his family with hired labor, or by all hired labor.

Forty-six percent of the herds were milked by the farm operator and his family, 29 percent were milked by the farm operator and his family with hired labor, and 25 percent were milked by all hired labor (Table VI). The farm operator and his family did the milking more often than the other two types of labor in both types of milking units. All hired labor was used most frequently in herds with over 100 cows.

VI. TYPE OF SILAGE STORAGE AND DEGREE OF MECHANIZATION OF SILAGE FEEDING SYSTEMS

The feeding of silage to dairy animals is advocated by many dairy specialists.[2] Information on whether or not silage was fed and methods of storing and feeding silage was obtained from each dairy producer.

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[2]Lynn Copeland, Good Feeding Makes More Milk (Knoxville: Agricultural Extension Service, University of Tennessee, November 1961), pp. 9-10.

TABLE VI

TYPE OF MILKING UNIT AND MILKING LABOR ON GRADE A DAIRY FARMS, WEST TENNESSEE, 1970

Type of Milking Unit	Type of Milking Labor			Total	Percent
	Operator and Family	Operator and Family with Hired Labor	All Hired Labor		
Milking parlors	48	38	36	122	68
Stanchion barns	35	13	8	56	32
Total	83	51	44	178	100
Percent	46	29	25	100	

About 95 percent of the producers fed silage. Seventeen percent of the producers who fed silage had upright silos only, 25 percent had trench silos only, and 53 percent had both types of silos. One-third of the producers had silage feeding systems which were fully mechanized while one half had partly mechanized feeding systems (Table VII). Only 12 percent of the producers feeding silage fed by hand. Approximately 87 percent of the silage feeding systems were either fully or partly mechanized.

VII. SOURCE OF REPLACEMENT CATTLE

The ability of dairy farmers to raise and/or acquire good replacement animals has been a major factor affecting the quality and future production of herds. Nearly 80 percent of the producers purchased less than 25 percent of their replacement cattle. Forty-seven percent of the producers raised all their replacements, while only 3 percent purchased all of their replacements. Producers with small herds had a greater tendency to raise all replacements, while the owners of larger-than-average size herds bought a higher percentage of their replacements.

VIII. USE OF MILK PRODUCTION RECORDS

For several years, dairy farmers have increased production efficiency of herds by measuring and recording the milk production of each cow. Production records have enabled dairy farmers to cull unprofitable cows, select high producing animals for breeding stock, and make wiser decisions for greater profit.

TABLE VII

DEGREE OF MECHANIZATION OF SILAGE FEEDING SYSTEMS USED BY GRADE A PRODUCERS, WEST TENNESSEE, 1970

Type of Silage Feeding System	Number of Producers	Percent
Fully mechanized	59	33
Partly mechanized	89	50
Fed by hand	21	12
No silage fed	9	5
Total	178	100

At the time of this survey, nearly 40 percent of all producers recorded milk production of each cow. Twenty-six percent of the producers used either the Dairy Herd Improvement Association (DHIA) or the Dairy Herd Improvement Registry (DHIR) programs, 9 percent used the Owner-Sampler Program, and 3 percent used the Weight-a-Day-a-Month (WADAM) program as shown in Table VIII.[3] About two-thirds of the producers did not keep records on milk production.

[3]For more detailed information on these programs, see Bernard J. Conlin, "DHI Records Help Make Your Decisions and Profit," Hoard's Dairyman, May 25, 1971, pp. 238-239.

TABLE VIII

TYPE OF MILK PRODUCTION RECORDS USED BY GRADE A PRODUCERS, WEST TENNESSEE, 1970

Type of Milk Production Records	Number of Producers	Percent
DHIA or DHIR	47	26
Owner-sampler	16	9
WADAM	6	3
Did not keep production records	109	62
Total	178	100

CHAPTER III

ACQUISITION AND USE OF FARM CREDIT

Decisions relating to the acquisition and use of farm credit have been a major factor affecting the financial success of the individual farmer. Inadequate use of credit has often restricted progress for some farmers while excessive borrowing has often lead to unfortunate circumstances for other farmers. Although borrowing may be profitable, adequate returns must be obtained and at the appropriate time to insure repayment of the loan and a financially strong position with the lender. One method which dairy farmers have used to acquire internal capital has been through borrowing or the use of credit.

I. USERS AND NONUSERS OF FARM CREDIT

A user of farm credit was defined as any Grade A dairy farmer who had one or more loan(s) outstanding as of September 1, 1970. A nonuser of farm credit was one who had no farm loan(s) outstanding as of September 1, 1970.

Eighty-six percent of the West Tennessee Grade A dairy farmers were classified as users of farm credit and 14 percent were classed as nonusers (Table IX). Twenty-one percent of the farmers using credit were owners, 71 percent were part-owners, and 8 percent were tenants (Table X). The percentage of farmers using farm credit in each tenure group was relatively high. Approximately 87 percent of all part-owners and tenants used farm credit and slightly over 75 percent of all owners were users of farm credit.

TABLE IX

USE OF FARM CREDIT BY GRADE A DAIRY FARMERS,
WEST TENNESSEE, 1970

Farm Credit	Number of Farmers	Percent
Users of farm credit		
Had one or more farm loan(s) outstanding as of September 1, 1970	153	86
Nonusers of farm credit		
Had no farm loan(s) outstanding as of September 1, 1970	25	14
Total	178	100

TABLE X

USERS OF FARM CREDIT ACCORDING TO TENURE OF OPERATOR, WEST TENNESSEE, 1970

Tenure of Operator	Users of Farm Credit	
	Number	Percent
Owner	32	21
Part-owner	108	71
Tenant	13	8
Total	153	100

II. RATING OF CREDIT FACTORS

Each farmer was asked to rate five specified credit factors in order to determine which of these factors farmers considered to be most important when selecting a source of credit. Of the five credit factors rated, purpose of the loan was rated most important by all farmers. Interest rate was chosen as the second most important factor with repayment terms and relationship with the lending personnel chosen as third and fourth, respectively. Availability of funds was chosen as the least important of the five factors. Other factors which farmers considered important were term of loan, location of the credit facility, and amount of collateral required. There was considerable variation in the ratings depending upon the terms and location of the lenders.

III. NUMBER OF CREDIT SOURCES AND LOANS

In general, the farmers who used credit borrowed from one or two sources. Thirty-eight percent of the farmers borrowed from one source, 36 percent from two sources, 20 percent from three sources, and 4 percent from four to five sources (Table XI). Only 2 percent of the farmers had no credit sources. Credit sources which provided loans to farmers and the number of loans obtained from each source are shown in Table XII. Farmers in this study had a total of 434 loans outstanding as of September 1, 1970.

Production Credit Associations and commercial banks provided 37 percent and 28 percent, respectively, of all loans. More loans were obtained from those two sources than all other sources combined.

TABLE XI

NUMBER OF FARM CREDIT SOURCES USED BY GRADE A DAIRY FARMERS, WEST TENNESSEE, 1970

Number of Credit Sources	Number of Farmers	Percent
0	4	2
1	68	38
2	64	36
3	35	20
4	5	3
5	2	1
Total	178	100

TABLE XII

SOURCE AND NUMBER OF LOANS OBTAINED BY GRADE A DAIRY FARMERS, WEST TENNESSEE, 1970

Source of Loan	Number of Loans	Percent
Production Credit Associations	162	37
Commercial banks	123	28
Farmers Home Administration	60	14
Federal Land Bank Association	57	13
Individuals or dealers	20	5
Insurance companies	9	2
Other	3	1
Total	434[a]	100

[a]A total of 434 loans were obtained by 153 farmers.

Fourteen percent of the loans were obtained from Farmers Home Administration, 13 percent from Federal Land Bank Associations, 5 percent from individuals or dealers, and 2 percent from insurance companies. The remaining 1 percent of the loans were made by other lenders.

All loans were classified into five categories according to the purpose for which each loan was made. Thirty-eight percent of the loans were for real estate purchases or improvements, 26 percent were for farm equipment purchases, 19 percent were for operating expenses, and 15 percent were for livestock purchases (Table XIII). The remaining 2 percent of the loans were for other farm purchases. The number of loans rather than the dollar volume is emphasized to show that farmers borrowed for various purposes to meet peak capital requirements.

IV. CREDIT PREFERENCES

Information was obtained in the survey to determine which credit sources farmers preferred to use to purchase real estate, livestock, and equipment and to handle operating expenses. Each farmer was asked the credit source and type of loan he preferred for each of the above items.

The percentage of farmers responding and the source of credit they preferred for each specified item are shown in Table XIV. The credit source most often preferred for real estate purchases was the Federal Land Bank Association followed by commercial banks and the Farmers Home Administration. For real estate purposes, farmers preferred long-term loans with a 20 or more year repayment schedule.

For livestock and equipment purchases, farmers favored the use

TABLE XIII

PURPOSE OF LOANS OBTAINED BY GRADE A DAIRY FARMERS, WEST TENNESSEE, 1970

Purpose of Loan	Number of Loans	Percent
Real estate purchase or improvements	164	38
Farm equipment purchases	112	26
Operating expense	84	19
Livestock purchases	66	15
Other	8	2
Total	434[a]	100

[a]A total of 434 loans were obtained by 153 farmers.

TABLE XIV

SOURCES OF CREDIT PREFERRED BY GRADE A DAIRY FARMERS FOR SPECIFIED LOAN PURPOSES

Credit Source	Purpose of Loan			
	Real Estate Purchase or Improvements	Livestock Purchases	Equipment Purchases	Operating Expenses
	Percentages of Farmers Responding[a]			
Commercial banks	23	42	40	53
Production Credit Associations	5	46	46	39
Farmers Home Administration	19	6	7	4
Federal Land Bank Associations	41	1	1	1
Individuals or dealers	5	15	12	7
Insurance companies	13	--	--	--
Other	7	6	2	2

[a]Many farmers preferred to use one or more credit sources for each category on loan purpose.

of Production Credit Associations in both cases with commercial banks as the second most liked source. The majority of the farmers preferred to purchase the above items with intermediate-term loans with a 3 to 5 year repayment plan depending upon the amount and size of the equipment and the age of the livestock purchased.

The most frequent sources listed for operating expenses were banks, followed by Production Credit Associations and individuals or dealers. Most farmers preferred a six month or one year loan for operating expenses.

CHAPTER IV

GOALS AND ATTITUDES

The level of financial success that a farmer achieves is influenced by the goals toward which he works. Goals may be defined as objectives of levels of aspirations which an individual has attained or is trying to attain.[1] According to Neilson, the goals of an individual are influenced largely by his values and by his cultural environment--his association with others, the ideals of the community or social groups to which he belongs, etc.[2]

An attitude may be defined as "a belief which is normative, evaluative, and is a predisposition for action."[3] An individual's attitudes affect the manner in which he responds to objects and situations. They are formed by the joint interaction of a person with his environment and, like goals, are influenced partly by the individual's value system and partly by his experiences.

In this research, data were obtained on the initial as well as future financial goals of each farm operator and on attitudes of farmers toward credit and dairy farming. Open-end and structured

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[1] James Neilson, The Farm Families . . . Their Attitudes, Goals, and Goal Achievement, Technical Bulletin 287 (East Lansing: Michigan State University, 1962), p. 12.

[2] Ibid.

[3] J. Thomas Romans, "Knowledge and Attitudes of Tennessee Farmers Concerning Credit Practices and Some Effects on Credit Management and Credit Cost" (unpublished Master's thesis, The University of Tennessee, Knoxville, August 1957), p. 38.

questions were used to elicit information on the goals and attitudes. The data obtained on goals and attitudes were used to study the relationship between goals and attitudes and farm size.

I. INITIAL FINANCIAL GOALS

Each farmer was asked an open-end question to get insights into his initial financial goals. The question was asked as follows: "When you started Grade A dairying, what financial goals or accomplishments did you want to achieve?" Twenty-five different goals were identified by farmers in response to the above question. The 10 goals listed most frequently are shown in Appendix Table XX. "Making a good or comfortable living" was the goal mentioned most frequently by all farmers. "Increasing the level of milk production" and "increasing herd size" were second and third, respectively, in frequency mentioned. Other initial goals which farmers considered important were "having less debt or being out of debt" and "making the highest possible income from the farm."

II. VERBAL RANKING OF SPECIFIED GOALS

After farmers had responded to the open-end question, they were handed a list containing 10 specified goals. The farmers were asked to check the three goals which were most important to them in decisions they made about farming. They were then asked to rank these three items in order of importance to them.

The percentages of farmers in the sample ranking each of the 10 goals first are shown in Appendix Table XXI. "Purchase additional

land" was ranked first by more farmers than any other goal. "Increase size of herd" was second and "increase gross farm income and/or net farm income" was third in the frequency of first place rankings.

Some farmers could select and rank the goals with little difficulty while some expressed considerable difficulty; a few could not rank the goals at all. Several farmers indicated that two or more of the goals which they were asked to rank were of equal importance to them.

III. FUTURE FINANCIAL GOALS

In order to determine the future financial goals of each farm operator, respondents were asked the following question: "What financial goals do you plan to achieve or accomplish in the next 10 to 15 years?" Several of the younger operators indicated that they were still in the process of accomplishing many of the initial goals that they had established. On the other hand, the older operators indicated that the goals they initially had in mind had changed considerably since they first began dairying. There was a strong tendency for the younger operators to be growth oriented while the older operators tended to desire consolidation and preservation.

The goal mentioned most frequently by the younger operators was "increasing the production of the herd." "Building new milking and/or feeding facilities" was the second most often mentioned goal among the younger operators. The third most important goal of the younger group was "operating a more profitable and efficient farm business."

"Reduce or get out of debt" was the goal mentioned most frequently by the older operators. "Build up security for later years" and "retirement" were the second and third, respectively, in frequency mentioned.

IV. CLARITY OF INITIAL GOAL VERBALIZATION

At the end of the interview each farmer was given a rating on the clearness with which he verbalized initial goals in response to the open-end question. While clarity in goal formulation may be considered a continuum, each farmer was subjectively classified by the enumerator as having goals clearly verbalized, fairly clearly verbalized, or not clearly verbalized.

Twenty-five percent of the farmers in the sample were rated as having goals clearly verbalized, 42 percent as having goals fairly clearly verbalized, and 33 percent as having goals not clearly verbalized (Table XV). Farmers in the first category expressed a set of goals clearly and specifically. Farmers in the second category did not have well defined goals and usually expressed difficulty in verbalizing goals. Farmers in the last category could verbalize no goals at all, or at best, mentioned only a vague or general farming goal.

Relationship Between Initial Goal Verbalization and Farm Size

Clarity of initial goal verbalization by farm operators was hypothesized to be positively related to present capital investment and net worth. Two linear regression equations were estimated to test the above hypothesis. The estimated regression coefficients for the two

TABLE XV

CLARITY OF INITIAL GOAL VERBALIZATION BY GRADE A DAIRY FARMERS, WEST TENNESSEE, 1970

Clarity of Initial Goal Verbalization	Number of Farmers	Percent in Each Class
Goals clearly verbalized	44	25
Goals fairly clearly verbalized	75	42
Goals not clearly verbalized	59	33
Total	178	100

equations along with the standard error of the coefficients are presented below.

$$(1)\quad Y_1 = 124.54 + \underset{(28.864)}{37.426X_1} + \underset{(25.455)}{25.135X_2}$$

and

$$(2)\quad Y_2 = 107.04 + \underset{(24.821)}{25.854X_1} + \underset{(21.890)}{16.135X_2}$$

where:

Y_1 = capital investment

Y_2 = net worth

X_1 = 1 if goals clearly verbalized, 0 if otherwise

X_2 = 1 if goals fairly clearly verbalized, 0 if otherwise

X_3 = 1 if goals not clearly verbalized, 0 if otherwise.[1]

The signs and the relative magnitude of the estimated regression coefficients in equations 1 and 2 indicated that clarity of initial goal verbalization was positively related to capital investment and net worth. Based on a one-tailed test of the estimated regression coefficients, those farmers who had goals clearly verbalized had a significantly higher capital investment and net worth than those farmers who had goals not clearly verbalized at the .10 level. The average capital investment and net worth of the farmers based on clearness of initial goal verbalization are shown in Table XVI.

V. ATTITUDE TOWARD THE USE OF CREDIT

In order to determine the attitudes of farmers toward credit,

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[1] Variable X_3 was omitted from the solution for regression coefficients to prevent singularity.

TABLE XVI

AVERAGE CAPITAL INVESTMENT AND AVERAGE NET WORTH OF GRADE A DAIRY FARMERS ACCORDING TO CLARITY OF INITIAL GOAL VERBALIZATION

Clarity of Initial Goal Verbalization	Average Capital Investment Per Farmer	Average Net Worth Per Farmer
	Dollars	
Goals clearly verbalized	162,000	133,000
Goals fairly clearly verbalized	150,000	123,000
Goals not clearly verbalized	125,000	107,000
All farmers[a]	147,000	125,000

[a]The figures shown in the above table were based on 106 farmers. Seventy-two farmers were excluded from the analysis because of lack of data pertaining to capital investment and net worth.

each farmer was asked a series of open-end questions concerning the use of farm credit in his operation. Some of the questions asked were: (1) What is your overall feeling toward farm credit? (2) Do you prefer to borrow from one or more than one source? and (3) How important do you think farm credit is as far as dairy farming is concerned?

Based on the responses of the farmers to the open-end questions, each farmer was subjectively classified by the enumerator into one of four groups on the basis of how strongly he favored using credit. As shown in Table XVII, 53 percent of the farmers were classified as being strongly in favor of using credit, 20 percent as being in favor of using credit, 16 percent as being somewhat in favor of using credit, and 11 percent as being not in favor of using credit.

Most of the farmers who were classified as being strongly in favor of credit were either young farmers who had used a considerable amount of credit to get started or established dairymen who had made expansions in milking or feeding facilities. Nearly all of the above farmers indicated that credit was one of the most important sources of farm capital for dairy farmers.

Farmers in the second category indicated that they would borrow only under certain conditions. The "in favor" group who attached reservations to their willingness to borrow most often mentioned the following qualifications: (1) they preferred to borrow, but the decision to borrow depended on the amount of debt they had and how profitable the "buy" was, and (2) the amount they would borrow depended upon the weather, crop, and price outlook.

Farmers in the third category were generally in favor of credit

TABLE XVII

ATTITUDES OF GRADE A DAIRY FARMERS TOWARD THE USE OF CREDIT

Attitude Toward Credit	Number of Farmers	Percent
Strongly in favor of using credit	95	53
In favor of using credit	36	20
Somewhat in favor of using credit	28	16
Not in favor of using credit	19	11
Total	178	100

but were somewhat hesitant about going into debt. Many of these farmers used credit for certain purposes only. For example, some farmers would borrow for real estate or equipment purchases but not for livestock purchases or operating expenses.

Farmers in the last category preferred not to borrow or use credit for farming purposes. The majority of farmers in the "not in favor" group operated smaller farms and few had expanded operations since starting in dairying. In most cases, farmers in the latter group used personal savings instead of credit to finance their operations.

Relationship Between Attitude Toward Credit and Farm Size

Farmers who had a more favorable attitude toward credit were hypothesized to have higher capital investment and net worth than farmers who had a less favorable attitude toward credit. The above hypothesis was tested by means of two linear regression equations. The two equations along with the estimated regression coefficients and the standard error of the coefficients are presented below.

$$(1)\quad Y_1 = 107.78 + \underset{(37.598)}{31.551}X_1 + \underset{(41.525)}{79.269}X_2 + \underset{(43.262)}{32.812}X_3$$

and

$$(2)\quad Y_2 = 106.78 + \underset{(32.370)}{4.723}X_1 + \underset{(35.751)}{47.950}X_2 + \underset{(37.245)}{15.399}X_3$$

where:

Y_1 = capital investment

Y_2 = net worth

X_1 = 1 if strongly in favor of using credit, 0 if otherwise,

X_2 = 1 if in favor of using credit, 0 if otherwise,

X_3 = 1 if somewhat in favor of using credit, 0 if otherwise,

X_4 = 1 if not in favor of using credit, 0 if otherwise.[2]

The estimated regression coefficients in the above equations indicated that those farmers who had a more favorable attitude toward credit had higher capital investment and net worth than those farmers who had a less favorable attitude toward credit with the exception of those farmers who were strongly in favor of using credit. The latter group had lower capital investment and net worth than either the group "in favor of using credit" or the group "somewhat in favor of using credit."

Farmers who were in favor of using credit had a significantly higher capital investment than those farmers who were not in favor of using credit at the .05 level based on a one-tailed test. Neither the group "strongly in favor of using credit" nor the group "somewhat in favor of using credit" had a significantly higher capital investment and net worth than the group "not in favor," even at the .10 level.

Farmers who were in favor of using credit also had a significantly higher net worth than farmers who were not in favor of using credit based on a one-tailed test, but only at the .10 level. The average capital investment and net worth of the farmers based on attitude toward credit are shown in Table XVIII.

Those farmers who were classified as being strongly in favor of using credit did not have the highest capital investment and net worth as might have been expected. Several factors may have accounted

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[2]Variable X_4 was omitted from the solution for regression coefficients to prevent singularity.

TABLE XVIII

AVERAGE CAPITAL INVESTMENT AND AVERAGE NET WORTH OF GRADE A DAIRY FARMERS ACCORDING TO ATTITUDE TOWARD CREDIT

Attitude Toward Credit	Average Capital Investment Per Farmer	Average Net Worth Per Farmer
	Dollars	
Strongly in favor of using credit	140,000	112,000
In favor of using credit	187,000	155,000
Somewhat in favor of using credit	141,000	122,000
Not in favor of using credit	108,000	107,000
All farmers[a]	147,000	125,000

[a]The figures shown in the above table were based on 106 farmers. Seventy-two farmers were excluded from the analysis because of lack of data pertaining to capital investment and net worth.

for this result. First, proper utilization of credit may have had more influence on the ability of the farm operator to acquire and accumulate capital in his operation than attitude toward using credit. Secondly, the above group may have had an unusually high proportion of younger operators who had not had time to accumulate a high capital investment or net worth. Finally, the technique used to classify the attitude of farmers toward credit may not have properly distinguished between different credit attitudes.

VI. ATTITUDES TOWARD DAIRY FARMING

To determine attitudes of farmers toward dairy farming, each farmer was asked the following open-end question: "How do you feel about dairy farming as an occupation as compared to other occupations?" Based on the responses of the farmers to the above question, all farmers were subjectively classified by the enumerator into five groups according to the degree of satisfaction each farmer expressed toward dairy farming.

Sixty-seven percent of the farmers were classified as being very well satisfied with dairy farming, 25 percent as being fairly well satisfied, and 5 percent as being not satisfied. Three percent of the farmers were undecided as to how they felt.

Nearly all farmers mentioned one or more things they liked and disliked about dairy farming. The positive aspect of dairying that farmers mentioned most frequently was that they could have a regular monthly income which offered more security than other types of farming. Other things farmers liked about dairying were: (1) they were assured

of steady employment, (2) they could be their "own boss" in dairying, and (3) the farm was a good place to rear a family.

The aspect of dairying that farmers liked least was that the work was too confining and kept a person "tied down" the year round. Other things farmers disliked about dairying were: (1) the large capital investment required, (2) the high operating costs involved, (3) the shortage of good dairy labor, and (4) interference and controls by the government.

CHAPTER V

FARM SIZE AND FINANCIAL GROWTH MODELS

In the present chapter, regression analyses were made to ascertain those factors which are associated with farm size and financial growth of dairy operators. The variables which were utilized in the analyses are described in the first section of this chapter. The variables were analyzed by means of four models which were designated as Models I, II, III, and IV. Models I and II were used to ascertain variables related to farm size. Models III and IV were used to ascertain variables related to financial growth. Estimating equations were derived from the analyses and are shown in the text with each respective model. A comparison of Models I and II and Models III and IV is presented later in the chapter.

For purposes of this study, farm size was measured in terms of capital investment and net worth of the farm operator. Financial growth was measured in terms of change in capital investment per year and change in net worth per year.

I. VARIABLES IN THE MODELS

Dependent Variables

Dependent variables utilized in the regression models were:

Capital investment. The value of this variable was the present value of all farm assets, which included real estate and buildings, farm machinery and equipment, all dairy livestock, and other farm assets

owned by the farm operator and used for farming purposes. Capital investment of the farm operator was measured in $1,000 units.

Net worth. The value of this variable equaled present capital investment minus present farm debt. Net worth of the farm operator was measured in $1,000 units.

Change in capital investment per year. The value for this variable equaled present capital investment minus initial capital investment (the total value of farm assets at the time the farm operator started Grade A dairying) divided by the number of years that the farm operator had been in Grade A dairying. Change in capital investment was measured in $1,000 units.

Change in net worth per year. The value for this variable equaled present net worth minus initial net worth divided by the number of years that the farm operator had been in Grade A dairying. Change in net worth was measured in $1,000 units.

Independent Variables

Independent variables utilized in the regression models were:

Education. The value for this variable was the actual number of years of formal education that the farm operator had attained.

Number of years Grade A dairying. The actual number of years that the farm operator had been engaged in Grade A dairy farming was the value for this variable.

Average production per cow. The value for this variable equaled the average yearly production per cow in 1,000 pounds of milk.

Initial net worth. The value for this variable equaled initial

capital investment minus initial farm debt. Initial net worth of the farm operator was measured in $1,000 units.

Number of credit sources. The actual number of credit sources that the farm operator was using at the time of the survey was the value assigned this variable.

Change in farm debt per year. The value for this variable equaled present farm debt minus initial farm debt divided by the number of years Grade A dairying. Change in farm debt was measured in $1,000 units.

Change in herd size per year. Change in herd size per year equaled present herd size (the number of cows milked) minus initial herd size divided by the number of years Grade A dairying.

Change in farm size per year. Change in farm size per year equaled present farm size (the number of acres owned) minus initial farm size divided by the number of years Grade A dairying.

Goal index score. The goal index score was a subjectively scaled index score based on three goal categories: formulation of goals, ranking of specified goals, and clarity of initial goal verbalization. Minimum and maximum goal index scores which a farmer could receive ranged from 0 to 150, respectively. For a more detailed discussion on the construction of the goal index, see Appendix.

II. MODEL FORMULATION

Five independent variables were theorized to be positively associated with capital investment, the dependent variable in Model I, and net worth, the dependent variable in Model II. These variables

were: education, number of years Grade A dairying, average production per cow, initial net worth, and number of credit sources used. All five variables were included in Model I and Model II.

Six independent variables were theorized to be positively associated with change in capital investment per year, the dependent variable in Model III, and change in net worth per year, the dependent variable in Model IV. These variables were: education, average production per cow, change in farm debt per year, change in herd size per year, change in farm size per year, and goal index score. All six variables were included in Model III and Model IV. The dependent variables in Model III and Model IV were divided by the number of years Grade A dairying so that individual farmers would be on a comparative basis from an economic growth standpoint.

III. RESULTS

Model I

Model I was used to ascertain those variables which are associated with capital investment of the farm operator. The estimating equation derived from the regression analysis was:[1]

$$Y_1 = -191.10 + \underset{(10.580)}{34.822}X_1 + \underset{(0.372)}{1.625}X_2 + \underset{(1.178)}{5.048}X_3 + \underset{(4.208)}{11.440}X_4 + \underset{(3.189)}{3.735}X_5$$

$R^2 = .312$ $\qquad$ $Se = 89.954$

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[1]Standard errors of the regression coefficients are shown in parentheses below each coefficient. R^2 equals the total amount of variation in the dependent variable explained by the independent variables. Se equals the standard error of estimate of the estimating equation. The regression coefficients were tested for significance at the .05 level using a one-tailed test.

where:

Y_1 = capital investment

X_1 = number of credit sources used

X_2 = initial net worth

X_3 = number of years Grade A dairying

X_4 = average production per cow

X_5 = educational level.

All five variables had positive regression coefficients. Variables which were significantly associated, at the .05 level, with capital investment were: number of credit sources, initial net worth, number of years Grade A dairying, and average production per cow. The regression coefficient for education was positive but not significant at the .05 level. The five independent variables in Model I explained approximately 31 percent of the variation in the dependent variable.

Based on the estimating equation in Model I, a one unit change in number of credit sources used would increase capital investment more than a one unit change in any other independent variable. An increase in number of credit sources from one to two, ceteris paribus, would result in an estimated increase of almost $35,000 in capital investment per farm. The above coefficient would be useful primarily to a farmer with five or less credit sources. Based on the above observation, as the number of credit sources used by the farmer increased the level of capital investment attained increased.

The next variable which had the most influence on capital investment was average production per cow. Holding all other factors constant,

an increase of 1,000 pounds in average production per cow would result in an estimated increase of over $11,000 in capital investment per farm. These results indicate that as average production per cow increased, the level of capital investment attained by the farm operator increased. Similar estimated changes in capital investment could be obtained for number of years Grade A dairying and initial net worth.

Education, the only variable in Model I not significant at .05 level, had a larger regression coefficient than initial net worth. However, the standard error of the regression coefficient for education was much higher than for initial net worth relative to the size of the regression coefficient. This result implied that there was a wide distribution in capital investment between farmers with high levels of formal education and between farmers with low levels of formal education.

Model II

Model II was used to ascertain those variables which are associated with net worth of the farm operator. The resulting equation derived from the regression analysis was:

$$Y_2 = -157.74 + \underset{(1.018)}{5.055}X_3 + \underset{(0.321)}{1.405}X_2 + \underset{(3.636)}{10.133}X_4 + \underset{(9.143)}{18.119}X_1 + \underset{(3.927)}{2.907}X_5$$

$$R^2 = 0.301 \qquad Se = 77.732$$

where:

Y_1 = net worth

X_3 = number of years Grade A dairying

X_2 = initial net worth

X_4 = average production per cow

X_1 = number of credit sources

X_5 = education

The regression coefficients of all five variables were positive. Number of years Grade A dairying, initial net worth, and average production per cow were significantly associated with net worth at the .05 level. Number of credit sources and education were not significant at the .05 level. The five independent variables in Model II explained approximately 30 percent of the variation in the dependent variable.

Based on the estimating equation in Model II, average production per cow significantly increased net worth. Net worth per operator would be increased by an estimated $10,000 for every 1,000 pound increase in average production per cow, ceteris paribus.

Number of years Grade A dairying increased net worth more than any other variable with the exception of average production per cow. For each additional year the farm operator would be engaged in Grade A dairying, his net worth would be increased by an estimated $5,000, ceteris paribus. Similarly, an increase of $1,000 in initial net worth, ceteris paribus, would increase net worth of the operator by almost $1,500.

Number of credit sources had a higher regression coefficient than any other variable in Model II. However, the standard error for number of credit sources was high relative to the size of the regression coefficient which indicated that there was a wide distribution in net worth between farmers based on numbers of credit sources used. Education had a higher regression coefficient than initial net worth

but the standard error of education was higher than that of initial net worth relative to the size of the regression coefficient.

Model III

Model III was used to ascertain those variables which are associated with change in capital investment per year. The resulting estimating equation was:

$$Y_3 = \underset{}{-3.722} + \underset{(0.195)}{0.017X_1} + \underset{(0.158)}{0.652X_2} + \underset{(0.064)}{0.220X_3} + \underset{(0.171)}{0.492X_4} + \underset{(0.228)}{0.182X_5} + \underset{(0.019)}{0.005X_6}$$

$$R^2 = .535 \qquad Se = 4.72$$

where:

Y_3 = change in capital investment

X_1 = change in farm debt per year

X_2 = change in herd size per year

X_3 = change in farm size per year

X_4 = education

X_5 = average production per cow

X_6 = goal index score

All six independent variables were positively related to the dependent variable. Variables which were significantly associated, at .05 level, with change in capital investment per year were: change in farm debt per year, change in herd size per year, change in farm size per year, and education. Two of the six variables, average production per cow and goal index score, were not significant at .05 level. The independent variables explained approximately 53 percent of the variation in the dependent variables.

Based on the estimating equation in Model III, an increase of

$1,000 in farm debt per year, ceteris paribus, would increase total capital investment per farm by an estimated $1,017 per year. Similarly, capital investment per farm could be estimated to increase by $652 per year for each additional cow milked and by approximately $500 per year for each additional year of formal education attained, ceteris paribus. For each additional acre of land owned capital investment per farm would increase by an estimated $220 per year, ceteris paribus. Based on the above observations, as farm debt, herd size, and farm size increased each year, and as the level of formal education increased, capital investment per farm increased.

Model IV

Model IV was used to ascertain those variables which are associated with change in net worth per year. The estimating equation derived from regression was:

$$Y_4 = -3.764 + \underset{(0.158)}{0.658}X_4 + \underset{(0.064)}{0.220}X_3 + \underset{(0.171)}{0.499}X_1 + \underset{(0.228)}{0.177}X_2 + \underset{(0.019)}{0.005}X_6 + \underset{(0.194)}{0.013}X_5$$

$R^2 = .354$ $\quad$ $Se = 4.718$

where:

Y_4 = change in net worth per year

X_4 = change in herd size per year

X_3 = change in farm size per year

X_1 = education

X_2 = average production per cow

X_6 = goal index score

X_5 = change in farm debt per year

All independent variables in Model IV had positive regression coefficients. Change in herd size, change in farm size, and education were significantly associated, at .05 level,with change in net worth per year. Change in farm debt per year, average production per cow, and goal index score were not significantly associated with the dependent variable at .05 level. The independent variables explained approximately 35 percent of the variation in change in net worth per year.

Based on the estimating equation in Model IV, a one unit increase in herd size would change net worth per year more than a one unit increase in any other variable. For each additional cow milked, net worth per operator would increase by an estimated $658 per year, ceteris paribus. Net worth of the operator would increase by nearly $500 per year, ceteris paribus, for each additional acre of land owned and by $220 per year, ceteris paribus, for each additional year of formal education attained. Based on the results obtained in Model IV, as herd size and farm size increased each year, and as the level of formal education increased, net worth of the operator increased each year.

IV. COMPARISON OF MODELS

Models I and II

Number of years Grade A dairying, initial net worth, and average production per cow were significantly related to both capital investment and net worth. Number of credit sources was significantly related to total capital investment but was not significantly related to net

worth. Education was positively related to both dependent variables but was not significantly related to either one in the two models. The five independent variables explained approximately the same proportion of variation, 31 and 30 percent, respectively, in capital investment and net worth.

Models III and IV

Variables which were significantly related to change in capital investment per year and change in net worth per year were change in herd size per year, change in farm size per year, and education. Change in farm debt per year was significantly related to change in capital investment per year but was not significantly related to change in net worth per year. Average production per cow and goal index score were positively related to both dependent variables, but were not significantly associated with either dependent variable. The six independent variables explained 53 percent of the variation in change in total capital investment per year and 35 percent of the variation in change in net worth per year.

CHAPTER VII

SUMMARY, CONCLUSIONS, AND IMPLICATIONS

I. SUMMARY

The broad objective of this study was to provide more information on those factors which influence farm size and financial growth of Grade A dairy farmers. Specific objectives of the study were: (1) to ascertain characteristics, goals, and attitudes of Grade A dairy farmers to provide a framework for farm size and financial growth analyses, (2) to determine sources and characteristics of farm credit Grade A dairy farmers used to acquire capital for selected loan purposes and operating expenses, and (3) to relate goals and attitudes of Grade A dairy farmers to farm size and financial growth and determine those factors which are associated with farm size and financial growth.

The study was based on a survey of 178 Grade A dairy farmers in West Tennessee. The data were collected through personal interviews of the farmers by means of a structured questionnaire.

Capital investment and net worth of the farm operator, at the time of the survey, were used as a proxy for farm size. Changes in capital investment and net worth, from the time that the farmer began Grade A dairying until the survey, were used as a proxy for financial growth.

Linear regression equations were estimated to relate goals and attitudes to farm size and financial growth. Four models were theorized and estimated by means of regression analysis to determine those variables

which are associated with farm size and financial growth. Models I and II contained variables which were theorized to be positively related to size of the dairy operation. Models III and IV contained variables which were theorized to be positively related to financial growth of the farm operator. Goal and attitude indexes were developed by means of subjective scaling to be used in the size and growth models.

The average age of the West Tennessee Grade A producer was 48.7 years. The average number of years of formal education for all producers was 11.3 years. Each producer, on the average, owned 258.3 acres. Twenty-three percent of the producers were owners, 69 percent were part-owners, and 8 percent were tenants.

The average size Grade A milking herd surveyed consisted of 61.4 cows, with each cow producing an average of 10,350 pounds annually. The most common herd size was 26 to 50 milking cows. The Holstein breed was dominant in about 60 percent of all herds and was the dominant breed in all herds with 75 or more cows. The Jersey breed was predominant in 14 percent of the herds. Milking parlors were used by almost two-thirds of all producers with the proportion using parlors in the larger herds greater than in smaller herds. About one-third of the producers milked in stanchion barns. Forty-six percent of the herds were milked by the farm operator and his family, 29 percent by the farm operator and his family with hired labor, and 25 percent by all hired labor. About 50 percent of the producers raised all herd replacements while only 3 percent purchased all herd replacements. Almost all producers fed silage. Of those producers feeding silage, nearly 87 percent had partially or fully mechanized equipment.

Fifty-three percent of the farmers were classified as being strongly in favor of using credit, 20 percent as being in favor of using credit, 16 percent as being somewhat in favor of using credit, and 11 percent as being not in favor of using credit. Farmers who were more in favor of using credit had higher capital investment and net worth than farmers who were less in favor of credit with the exception of those farmers classified as being strongly in favor of using credit. The group "strongly in favor of using credit" had lower capital investment and net worth than either the group "in favor" or the group "somewhat in favor" of using credit.

Variables which were positively and significantly related to both capital investment and net worth were: (1) initial net worth, (2) number of years Grade A dairying, and (3) average production per cow. Number of credit sources was significantly related to net worth. Education was positively related to both capital investment and net worth but was not significantly related to either one.

Variables which were positively and significantly related to change in capital investment per year and change in net worth per year were: (1) change in herd size per year, (2) change in farm size per year, and (3) education. Change in farm debt per year was significnatly related to change in capital investment per year but was not significantly related to change in net worth per year. Average production per cow and goal index score was positively related to change in capital investment per year and change in net worth per year but were not significantly to either of the above.

II. CONCLUSIONS

Gaining control of land by purchase was a realistic basis for increasing capital assets and net worth of the farm operator. Renting land in addition to that owned appeared to be a feasible alternative to gain access to the use of capital when cash flows and internal capital was restricted.

In most all cases, farmers experienced no difficulties in locating leaders who were willing to provide funds requested. Limitations in the use of borrowed funds appeared to be from internal capital rationing rather than external capital rationing.

Results obtained from the regression analysis showed that the clarity of goal verbalization by the farm operator was positively related to the level of capital investment and net worth. Farmers should be able to improve financial progress by formulating well conceived and definite financial goals.

Based on the variables analyzed in this study, number of credit sources used by the farm operator was the most significant variable affecting capital investment. The variable which had the most influence on net worth was the number of years that the farmer had been in Grade A dairying.

This study showed that increases in farm debt each year increased capital investment per year more than any other variable considered. Increases in herd size per year resulted in the largest increase in net worth per year. Increasing the number of acres owned also significantly increased net worth level each year.

Formal education of the farm operator was not significantly related to capital investment or net worth. While educational level may be considered an important criteria for managerial ability, there must be other factors which influence the ability of the farm operator to acquire and accumulate capital that were not included in this study. Also, many of the younger farm operators who had high levels of formal education may have had insufficient time to accumulate a high capital investment and net worth. However, when capital investment and net worth were divided by the number of years Grade A dairying so that all farmers would be on an equal basis from an economic standpoint, education was significantly related to change in capital investment per year and change in net worth per year. Even though a farmer may have limited formal education, based on the findings in this study, he should be able to improve his financial situation by gaining more knowledge from informal sources.

If past trends in capital investment continue, the capital requirements for dairying will increase approximately 50 to 60 percent every 10 years.

Although the analysis was based on a sample of Grade A dairy farmers in West Tennessee, the findings in this study may well have considerable application to family operated and commercial dairy farms throughout Tennessee and the United States.

III. IMPLICATIONS

Findings in the study pertaining to goals imply that, contrary to economic theory of the firm, "profit maximization" was not the most

important financial goal among farmers. Farmers in this study placed more emphasis on "standard of living" as a financial goal than on "making the highest possible income."

Farmers who were more in favor of using credit had a higher capital investment and net worth than farmers who were less in favor of using credit with the exception of those farmers who were classified as being strongly in favor of using credit. An attitude too liberal toward the use of credit may be detrimental or as detrimental to financial progress as an attitude too conservative.

Based on the relatively small percentage of farmers who kept milk production records, more farmers might improve herd production and level of income if they measured and recorded milk production. Production records are probably one of the best references dairy farmers have to cull unprofitable cows.

If the past trends in capital requirements per dairy farm continue, the amount of credit to be supplied by lenders to the dairy sector and to each farmer will approximately double in the next ten years. Implied herein is that lenders to dairy farmers will need to seek new ways to supply funds for increased capital requirements in dairying.

While this study showed various factors to be associated with size and growth of the farm firm, more research is needed to enable dairy farmers to acquire capital to go with a complement of labor and entrepreneurship for an economically strong productive unit. Additional studies would be beneficial concerning growth of the farm firm by methods other than capital acquisition such as intergeneration of

capital transfers in dairy farming. Analyses concerning the marginal rate of return to labor and capital at various herd sizes are important areas for further study.

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APPENDIX

CONSTRUCTION OF GOAL INDEX

The goal index was based on three general goal categories covered by the questionnaire. In the first goal category, each farmer was asked to state his initial financial goals when he began Grade A dairying. Later, each farmer was to state his future financial goals. Each farmer was given points on the index scale if he had formulated initial and future financial goals. Future goals were given greater weight since they were considered the more reliable of the two responses.

In the second category, each farmer was given a list of 10 specified goals which appear in Table XXI in this appendix. Each respondent was then asked to check those goals which were most important to him in decisions he made about farming. Those farmers who checked "build net worth," "increase herd size," and "purchase additional land" were given higher points since these goals reflected some degree of progressiveness on their part and could be considered a means or source or increasing their capital accumulation and net worth.

At the conclusion of each interview, the enumerator made an appraisal of the farmer's ability to verbalize his initial financial goals. The numerical values for each verbalization category were subjectively assigned. Values on each goal category may understate or overstate the comparative differences between the individuals.

A sample of the goal index is presented on the following page.

The minimum and maximum number of points an individual could have received was 0 and 150. Goal index scores for the farmers ranged from a low of 26 to a high of 141. For the distribution of goal index scores and average index score, see Table XIX in this appendix.

Goal Category		Points
I. Formulation of Financial Goals		
1. If farmer formulated initial goals		15
2. If farmer formulated future goals		20
	Total	35
II. Verbal Ranking of Specified Goals		
1. If build net worth was checked		30
2. If increase in herd size was checked		20
3. If purchase additional land was checked		15
4. All other goals checked (7 possible)		5 ea.
	Total	100
III. Clarity of Initial Goal Verbalization		
1. If goals were clearly verbalized		10
2. If goals were fairly clearly verbalized		5
3. If goals not clearly verbalized		0
	Total	15

TABLE XIX

DISTRIBUTION OF GOAL INDEX SCORES FOR GRADE A DAIRY FARMERS, WEST TENNESSEE, 1970

Goal Index Score	Number of Farmers	Percent	Cumulative Percent
21-30	1	0.9	.9
31-40	1	0.9	1.8
41-50	8	7.5	9.3
51-60	8	7.5	16.8
61-70	11	10.4	27.2
71-80	6	5.7	32.9
81-90	12	11.3	44.2
91-100	23	21.7	65.9
101-110	10	9.5	75.4
111-120	11	10.4	85.8
121-130	7	6.6	92.4
131-140	6	5.7	98.1
141-150	2	1.9	100.0
Total[a]	106	100.0	
Average index score = 95.59			

[a]Goal index scores apply to only those farmers who had complete data pertaining to capital investment and net worth.

TABLE XX

TEN FINANCIAL GOALS LISTED MOST FREQUENTLY BY GRADE A DAIRY FARMERS IN RESPONSE TO OPEN-END QUESTION

Financial Goal	Percent of Farmers Listing Each Goal
Making a good or comfortable living	32
Growing high producing livestock	30
Being able to increase herd size	19
Having less debt or being out of debt	15
Making the highest possible income from the farm	10
Owning a farm and/or more land	9
Building net worth for later years	8
Providing children with college education	8
Obtaining more efficient buildings and/or equipment	6
Being a successful farmer	3

TABLE XXI

PERCENTAGES OF FARMERS RANKING SPECIFIED GOALS FIRST ON VERBAL RANKINGS

Specified Goal	Percent of Farmers Ranking Each Goal First
Purchase additional land	23
Increase size of herd	19
Increase gross farm income	10
Increase net farm income	10
Reduce debt	8
Own farm free of debt	7
Build net worth	6
Build or remodel dairy buildings	3
Become full owner of farm	2
Purchase farm equipment	1
Not responding	14

VITA

Ingram Bass Howard, Jr., was born in Memphis, Tennessee, on April 25, 1947. He attended Germantown and Arlington elementary schools, and was graduated from Bolton High School in Arlington, Tennessee, in May, 1965. In September of that year, he entered the University of Tennessee at Martin and was graduated as a Distinguished Military Graduate with a Bachelor of Science degree in Agriculture in June, 1969. At that time he was commissioned as a Second Lieutenant in the United States Army. As an undergraduate, he was an active member of the Agriculture Club, Alpha Gamma Rho, and Scabbard and Blade Society.

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