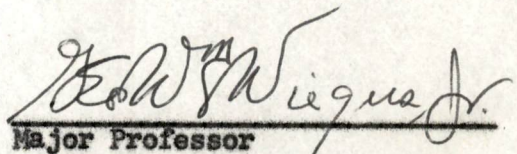


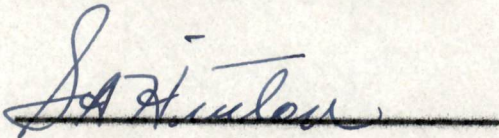
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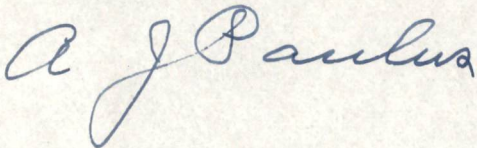
I am submitting herewith a thesis written by Ralph B. Mitchell entitled "A Study for Improving Dairy Feeding Practices in Greene County, Tennessee." I recommend that it be accepted for nine quarter hours of credit in partial fulfillment of the requirements for the degree of Master of Science, with a major in Agricultural Education.


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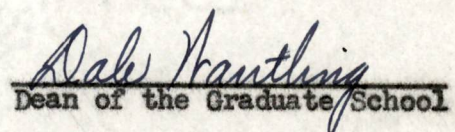
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and recommend its acceptance:







Accepted for the Council:


Dean of the Graduate School

A STUDY FOR IMPROVING DAIRY FEEDING PRACTICES
IN GREENE COUNTY, TENNESSEE

A THESIS

Submitted to
The Graduate Council
of
The University of Tennessee
in
Partial Fulfillment of the Requirements
for the degree of
Master of Science

by
Ralph B. Mitchell
March 1959

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CHAPTER I

THE PROBLEM

Statement of the Problem

The problem was analyzed into the following objectives: (1) to determine the feeding practices of selected Greene County, Tennessee, dairy farmers, (2) to develop a set of standards or goals, and (3) to develop condensed teaching plans and procedures to aid in instructing these or other farmers in improving those practices which are substandard.

Need for the Study

Dairying provides a major source of income in Greene County. The county ranks first in Tennessee in pounds of milk sold and in number of dairy cows.¹ In 1954, the number of farmers reported selling milk was 3,108.² There are at present 145 "Grade A" dairy farms³ and about 3,000 farmers selling "manufacturing grade" milk to the local milk plants⁴ for the production of evaporated milk and cheese.

¹U. S. Bureau of the Census, United States Department of Commerce, 1954 Census of Agriculture, Preliminary, Greene County, Tennessee, (Washington: Government Printing Office, Sept. 1955), p. 2.

²Ibid.

³Greene County Department of Public Health, Office Records, December 2, 1958.

⁴Clayton David, Head Fieldman, Pet Milk Company, Greeneville, Tennessee; and D. E. Sprayberry, Manager, Kraft Foods Company, Greeneville, Tennessee, personal interview, July 3, 1958.

In an interview with the management of two companies buying "manufacturing grade" milk, the writer asked if they were in a position to handle increased production. Both answered in the affirmative. The "Grade A" market is rather stable with only a very few farmers starting or quitting each year.

In a study by Henderson⁵ of Greene County farms located in the Dunmore soil series areas in 1950, he summarizes:

The findings of this study indicate that most large and medium-sized farms can profitably increase their monetary returns by expanding their livestock (primarily dairy) operations. This calls for more labor, most of which would be available on farms. Labor will be utilized rather than being absorbed in inefficiency or leisure as at present. Livestock and crops used together in the right proportion will provide year-round employment. Livestock also furnish manure for crops. Quality of land on most farms does not permit continuous cultivation for crops, but indicates that a roughage program should be used, for beef or dairy cattle; dairy for farms with surplus labor; and beef for those with limited labor.

Census figures⁶ for 1954 show that 75 per cent of Greene County farms had a gross farm income of \$2,500 or less and 23 per cent had a gross of between \$2,500 and \$5,000. On the other hand, Test Demonstration farm records for 1956 and 1957 on a few family operated farms showed a gross income of \$10,000 to \$15,000 and a net income of \$5,000 to \$8,000. This indicates what can be done on these small family farms. The sale of milk accounted for a major portion of the income on these demonstration farms.

⁵Harold A. Henderson, "Adjustments in Dairy Farm Organization, Greeneville, Tennessee Area" (Unpublished M. S. thesis, Department of Agricultural Economics, The University of Tennessee, 1951), p. 46.

⁶U. S. Bureau of the Census, op. cit., p. 2.

Of the 5,250 Greene County farms operated in 1954,⁷ 1,507 of the operators worked one hundred or more days off the farm. This leaves 3,713 families which must produce most of their income on the farm. The above figures indicate a need for improved incomes. Since burley tobacco acreage is restricted and the farms are small, with an average of 55.9 acres per farm,⁸ and family operated for the most part, increased income from milk seems desirable as well as attainable. The soil resources and climate are well adapted to dairying.

Why was the feeding phase of dairy farm management selected for study? The cost of feed is of prime importance in the production of milk. Records of various experiment stations set the feed cost at from 50 to 65 per cent of the total cost of producing milk. On 113 dairy farms in West Central New York in 1953-54⁹ the average feed cost per cow per year was \$207, or 53 per cent of the total cost. According to Morrison¹⁰ the cost of feed and bedding make up two-thirds of the total cost of raising heifers up to the time of calving. At the University of Tennessee in 1958,¹¹ Dairy Specialists and Agricultural Economics Specialists set up costs and returns

⁷ Ibid.

⁸ Ibid.

⁹ Frank B. Morrison, Feeds and Feeding, (twenty-second edition; Ithaca, New York: The Morrison Publishing Company, 1956), p. 648.

¹⁰ Ibid., p. 681

¹¹ Estimated Annual Costs and Returns of a Typical Twenty-Cow Grade "A" Dairy in Tennessee, Unpublished data presented to Agricultural Agents and Milk Plant Fieldmen at Greeneville, Tennessee, Summer 1958. Prepared by U. T. Agricultural Economics Department, 1958.

for a typical twenty-five-cow "Grade A" dairy. The total feed cost, including pasture, was estimated to be \$2,784 on a farm production cost basis or \$4,538 if calculated at market value of the feed at the farm. The total cash and non-cash cost of operation was \$5,152 per year. At farm cost the feed amounted to 54 per cent of the total; and, if figured at market value of the feed, it would amount to 88 per cent of the total cost. At the University of Tennessee in 1956, Ranney¹² made a study of returns on ninety-three selected dairy farms in the Nashville, Tennessee, area and found that the cost of feed (other than pasture) amounted to 54 per cent of the total operating cost. Another reason for selecting the feeding phase is that dairy farmers in Greene County often hear the expression, "Dairy cows are better bred than fed."

Scope of the Study

This study is limited to the feeding practices of selected Greene County dairy farmers. It is evident that there are other management factors which affect the dairy operation. The survey was made with forty-two dairymen for the year 1957. The particular selection was made due to their frequent contacts with the agricultural extension service and vocational agriculture teachers for help with their dairy problems and for known leadership in their respective communities. It is hoped that any help from educational agencies working with these dairy farmers will be reflected to

¹²W. P. Ranney, "Returns from Selected Dairy Herds in the Nashville Milkshed," The University of Tennessee, Agricultural Experiment Station, Bulletin 281, January 1958, p. 10.

similar farms in the county.

In the analysis of this study most of the feeding practices were related to their effect on the production of milk. This relationship was used because of the high percentage of costs being for feed and the evidence of return above feed costs going higher as production per cow increases. A study of the records of 50,005 cows selected at random from dairy herd improvement association records for the year 1952¹³ showed that the return above feed cost went from \$111 per cow in the lowest producing group to \$585 per cow in the highest producing group. The fourteen groups of cows between the lowest and highest in production showed an increase in returns above feed cost in each group as the production increased.

Procedure

This study began with a review of literature on the feeding of dairy cattle. The problem was then discussed with the staff members of the Department of Agricultural Education and the Department of Dairying at the University of Tennessee. It was evident that a study of the local practices would be desirable as a prerequisite to setting up feeding standards and teaching procedures. A tentative list of dairy farmers was made. This list included the forty-two finally selected as described in the "Scope of Study." Several survey forms were studied and a preliminary list of relationship tables was outlined. A survey form was then developed to cover the factors which apparently needed attention on the feeding of dairy cattle in the

¹³Frank B. Morrison, op. cit., p. 575.

locality. Several other management factors or practices were included on the survey form and all of this information will be filed for use in future contacts with these dairymen on problems which may arise.

The data were secured by personal contact with the dairy farm operator on his farm. The writer interviewed thirty-two of the farmers personally. In addition, three vocational agriculture teachers interviewed ten farmers in their respective communities making a total of forty-two farmers interviewed. An average of about two hours was required for each interview. This method of procuring data proved to be an excellent contact with the farmers. They were very cooperative and seemed interested in learning how to improve their practices.

After the surveys were completed, relationship tables (Chapter II) were set up to determine the effect of the different feeding practices on the production of milk, growth of the young animals, and other measures of efficiency. Eleven standards or goals were developed to serve as guides for farmers in planning their feeding programs. Abbreviated teaching plans and procedures were developed to aid in the teaching of better feeding practices to the dairy farmers interviewed and possibly to other dairymen in the area. All of the data on feeding were tabulated, for farmers interviewed, on two large tables for use in instruction. One of the tables ranked the practices according to compliance with the standards so that each farmer can see how he stands with respect to each feeding practice, see Table XVI.

Definition of Terms

1. Four per cent fat corrected milk: (abbreviated 4% FCM)

This method of showing the production of milk was used in order to make accurate comparison of the herds in the study. A formula was developed by Gaines of Illinois^{14,15} and serves to equalize milk production records where there is a variation of butterfat test between cows or herds. The formula is as follows: 4 per cent fat corrected milk equals 0.4 times pounds of milk, plus fifteen times pounds of fat. Unless otherwise stated, the figures on milk production given in this study are expressed in pounds of 4 per cent FCM per cow per year.

2. Quality of hay: Standards have been developed by the Department of Agriculture, USDA. In this study, number I grade is considered as excellent, number II as good, number III as fair, and sample grade as poor.

3. Silage quality: Standards for silage have not been as widely accepted as for hay. In this study, a score chart for silage developed by Purdue University has been used; see Appendix, Table 4.

4. "Grade A" milk: This milk is sold from farms which have passed certain health department regulations for bottling and sale as fluid milk.

5. Manufacturing grade milk: This is a term used in this locality to describe milk for sale to processors of canned condensed milk and cheese.

6. Mixed herds: These are herds having more than one breed of dairy cattle.

¹⁴O. R. Overman and W. L. Gaines, The Journal of Animal Science, 7:55-59, 1948.

¹⁵Frank B. Morrison, op. cit., p. 576.

7. Test demonstration farm family: This is a farm and family selected by their community members with the approval of the Tennessee Agricultural Extension Service and the Tennessee Valley Authority to carry out a farm and home management demonstration of approved fertilization and other recommended farm practices, including the keeping of accurate farm records.

8. Total digestible nutrients (abbreviated TDN): This is the sum of the digestible protein, nitrogen-free extract, and fat in a given feed. It is determined by analysis and extensive feeding trials.

9. Digestible protein: This is that portion of the protein in a feed which can be used by the animal for building body tissue, for milk, or for energy.

10. Net energy: This is the amount of energy left in a feed after there is deducted from its total energy value the amounts lost in the feces, combustible gases, urine, and heat increments or "work of digestion." For examples of net energy comparisons see Morrison.¹⁶ Net energy values are considered along with TDN and digestible protein in making feeding recommendations in this study.

11. Growth index of calves and heifers: Heart girth measurement is a widely accepted method of checking growth rates of cattle. In all except ten of the herds surveyed for this study, measurements were made of all the calves and heifers with a tape calibrated to show the weight of the animal. From this record of the weight, comparison was made to the normal (Chapter III, Table XI) and a growth index averaged for each herd,

¹⁶Ibid., pp. 48, 1073.

using 100 per cent as normal growth.¹⁷

12. Tennessee Valley Authority (abbreviated TVA): This agency was authorized by the United States government to supply electric power, control floods, and aid in developing resources in the Tennessee River watershed.

13. Prepartum period: This is the period just prior to calving time of a cow or heifer.

14. Range: As used in the tables of this study, range means the low and the high figure for the cases in the group from which the average was calculated.

15. Job: As used in this study, job refers to the dairy farmer's job as he operates his farm. It may mean a mental exercise, the use of physical skill, or a combination of the two.

16. Objective: This is the goal or outcome which the teacher hopes to reach when teaching a job or practice to farmers.

17. Factors: These are the various aspects or important parts of a job as anticipated by the teacher regarding the job.

18. Evidence: This is local data, experimental data, references, samples, and experiences of members of class or the farmer.

19. Procedure: This is the steps or methods used by the teacher and students to reach the objective.

20. Follow-up: Further contact with the farmer or pupil to help clarify any question he may have and to deal with new problems which may have arisen on a particular job should help get the practices taught into actual operation.

¹⁷Frank B. Morrison, op. cit., p. 680.

CHAPTER II

ANALYSIS OF THE STUDY

In order to determine how different feeding practices affected the production of milk and growth of calves and heifers, simple relationship tables were developed.

Table I compares the ten highest producing herds with the ten lowest producing herds on fifteen of the factors studied. The most striking revelation in this comparison was the similarity of practices in the high and low producing herds. Exceptions noted were in the components of the concentrate ration, the feeding of silage (low producers were fed more silage), improved permanent pasture, and use of temporary pasture. Three of the low producing herds were below standard on components of the concentrate ration. The low producing herds averaged below standard on the use of improved permanent pasture and temporary pasture. These data indicate that all of the practices are important and that one practice in itself does not necessarily control rate of milk production or heifer growth.

Of the forty-two farms surveyed, weights of the calves and heifers were determined by measurement in thirty-two herds. A growth index was calculated for each herd by using 100 as normal weight for age as shown in Standards, Table XI, Chapter III. Table II relates the feeding practices to the growth index of calves and heifers. Twenty-five of the farmers fed acceptable rations to their calves using either milk or commercial milk replacer, commercial calf starter and hay. Seven farms fed calves rations which are considered substandard. Six farmers in the substandard group fed a farm-mixed grain ration which was not satisfactory

TABLE I

COMPARING HIGH TEN WITH LOW TEN HERDS

Factors Considered	High Ten		Low Ten	
	Average	Range	Average	Range
1. Production of 4% FCM (pounds)	9680	8503 - 10522	5614	5084 - 5936
2. Cows dry; avg. for year (%)	17	8 - 24	18	12 - 25
3. Conception rate 1st service (%)	76	50 - 90	74	50 - 85
4. Growth index of heifers (% of avg.)	100	88 - 127	101	87 - 106
5. Grain-milk ratio	1:3.5	1:3-1:5	1:3.5	1:3-1:4
6. Components of concentrate ration	All had 70% or more TDN and less than 10% fiber		Seven met standard; three were below standard	
7. Concentrates to dry cows and bred heifers (lbs. daily)	Seven fed an avg. of 4 lbs. for 2 mos., three fed none		Seven fed an avg. of 4 lbs. for 2 mos., three fed none	
8. Concentrates to heifers 6-15 mos. old (lbs. per day)	All were fed some, from "as needed" to 6 lbs; the majority fed 4 lbs.		All but one fed some, from "as needed" to 8 lbs.	
9. Feeding calves	Average	Range	Average	Range
a. Milk or replacer	2½ mos.	2-3 mos.	2 mos.	1-4 mos.
b. Calf starter	3 mos.	2-4 mos.	2 mos.	1-6 mos.
c. Grain mixtures and hay to 6 mos.	According to standard		According to standard	
10. Hay equivalent, tons per cow per year	2.6	1.8-4.0	2.8	1.5-4.0
11. Alfalfa hay, tons per cow	1.3 ^a	0.3-2.2	1.3 ^a	0.2-3.0

^aSeven herds only

TABLE I (continued)

COMPARING HIGH TEN WITH LOW TEN HERDS

Factors Considered	High Ten		Low Ten	
	Average	Range	Average	Range
12. Silage, tons per cow	1.9 ^b	0.9-3.2	4.4 ^b	3.0-5.5
13. Improved permanent pasture, acres/cow	2.0	1.0-3.0	1.4	0.3-3.0
14. Temporary pasture, acres per cow	1.3 ^a	0.2-2.0	0.9 ^c	0.2-1.5
15. Water supply				
a. Winter	In barn or close by		In barn or close by	
b. Summer, from pasture	Range from 200 yards to one-half mile		Range from "water in each field" to one-half mile	

^bFour herds only^cSix herds only

Note: The average production of all herds was 7341 lbs. 4% FCM for the year, and the median was 7157 lbs. 4% FCM.

TABLE II

FEEDING PRACTICES WITH DAIRY CALVES AS RELATED TO GROWTH
EFFICIENCY OF CALVES AND HEIFERS

Feeds Used During First Four Months	Number of Cases	Growth Index ^a	
		Average	Range
Commercial milk replacer and starter plus hay	13	99	86 - 127
Cows milk and commercial calf starter plus hay	12 ^b	102	90 - 116
Cows milk and farm mixed starter and hay	6	92	70 - 106
Nurse cow and hay	1	113	-

^aSee Definition of Terms, Chapter I.

^bSix of these allowed calves to nurse the cow; the others gave the calves milk in buckets.

due to vitamin deficiency, and one farmer fed cows milk and hay.

From this study we see that the dairymen were generally getting adequate growth on their calves with the exception of those feeding farm-mixed "starter" (grain ration). A growth index of 113 per cent on the one farm feeding only cows' milk and hay would indicate that the calves may be getting too fat to develop into good producers as mature animals.

Since the growth index of all heifers was not too far from normal, one may conclude from the study that all of the dairymen did a good job of feeding heifers six to fifteen months old as shown in Table III. There was a wide variation in the amount and quality of pasture and hay available for the heifers. This influenced the amount of grain needed to maintain normal growth. Herd averages for growth were for the most part satisfactory. The table does not show variations within the individual herds, but in checking the calves the writer found considerable deviation from the standard weights.

In order to determine the effect of feeding grain to dry cows and bred heifers, a relationship table was set up, Table IV. Of the forty-two herds studied, twenty-six farmers fed grain to dry cows and heifers at rates ranging from two pounds per day for two months, up to more than six pounds per day for two months. Strangely there was no significant difference in production per cow at different levels of feeding, but the herds fed grain averaged slightly more milk than the sixteen herds fed no grain during the dry period. Both the highest and lowest producing herds were in the "no grain" group.

The feeding of high quality forage is often stressed by agricultural

TABLE III

FEEDING GRAIN TO HEIFERS SIX TO FIFTEEN MONTHS OF AGE
AS RELATED TO GROWTH

Pounds Concentrate Fed Per Heifer Per Day	Number of Cases	Growth Index of Calves ^a	
		Average	Range
None	4	97	86 - 113
"As needed to keep them growing"	4	93	88 - 102
2 lbs.	8	101	90 - 116
3 lbs.	4	97	94 - 127
4 lbs.	8	105	94 - 115

^aSee Definition of Terms, Chapter I.

Note: (One dairyman fed one pound and another six pounds. Six of the dairymen surveyed did not raise calves in 1957. The growth index was not determined on six other herds).

TABLE IV

FEEDING OF GRAIN TO DRY COWS AND BRED HEIFERS RELATED
TO MILK PRODUCTION

Pounds Grain Per Cow Per Day	Number of Cases	Pounds Per Cow (4% FCM)	
		Average	Range
None	16	7183	5084 - 10522
2 to 3 lbs. for 2 mos.	10	7554	5477 - 9954
4 to 5 lbs. for 2 mos.	11	7335	5475 - 9801
6 or more lbs. for 2 mos.	5	7646	5525 - 10301

workers as being a very important factor in the production of milk. Table V shows the effect of the quality of forage and of the grain-milk ratio on production in this study. Only six herds were fed number I quality hay and silage; these showed a slightly higher production than herds fed lower quality forage. The groups with the most cases, fourteen in number, fed number II quality forage and a grain-milk ratio of 1:3.5. This included the highest and lowest producing herds. The grain-milk ratio showed little relationship to production. One herd receiving number II forage and no grain produced 8,741 pounds, 4 per cent FCM per cow.

To provide an adequate supply of good forage for winter feeding and to supplement pasture during the summer, when needed, is of prime importance according to dairy authorities. Table VI relates milk production to supply of hay or its equivalent per cow. This study shows no positive relation between farm forage supply and production.

Alfalfa has long been used by dairy farmers as a source of good forage for dairy cows. A survey of seed sales in Greene County indicated that farmers seeded 5,400 acres of this crop in 1957, a record to date.¹ In order to determine the effect of alfalfa hay on milk production on the farms studied, the herds were grouped according to the amount of alfalfa hay fed as indicated in Table VII. All but five of the farms fed some alfalfa. Cows in the highest producing group in this table, six in number, were fed from 2.0 to 2.9 tons per cow. The lowest group, five in number, were fed no alfalfa.

¹Dealers supplying seed to farmers of Greene County, Tennessee, for the year 1957, personal interviews, December 1957.

TABLE V

QUALITY OF HAY^a AND SILAGE^b AND GRAIN MILK RATIO^c RELATED TO MILK PRODUCTION^d

Ratio of grain to milk	Total No. of Cases	Production when fed different quality of hay and silage					
		No. I quality		No. II quality		No. III quality	
		Cases	Average Range	Cases	Average Range	Cases	Average Range
No grain	1			1	8,741		
1:3	9	1	7,713	8	5,853	5,477-6,375	
1:3.5	17	3	7,917	14	7,505	5,084-10,522	
1:4	3	1	7,275	2	7,714	5,457-9,954	
1:4.5	3	1	8,503	1	7,517		1 5,974
1:5 or more	9			8	7,720	5,217-10,354	1 9,828

^aUSDA grades of hay.

^bSilage rated by Purdue silage score card; see Appendix, Table 4.

^cPounds of grain fed in proportion to the pounds of milk produced.

^dPounds of 4% FCM produced per cow per year.

TABLE VI

SUPPLY OF HAY EQUIVALENT^a RELATED TO MILK PRODUCTION

Tons Per Cow For the Year	Number of Cases	Production (4% FCM) Per Cow Per Year	
		Average	Range
1.5 to 2.4	12	7797	5475 - 9958
2.5 to 3.4	15	6802	5084 - 10301
3.5 to 4.4	9	7587	5936 - 10522
4.5 or more	6	7438	5875 - 8503

^aSilage was converted to hay equivalent (three tons silage equals one ton of hay).

TABLE VII

FEEDING OF ALFALFA HAY RELATED TO MILK PRODUCTION

Tons Alfalfa Hay ^a Per Cow Per Year	Number of Cases	Pounds 4% FCM Per Cow Per Year	
		Average	Range
None	5	6230	5475 - 7458
0.1 to 0.9	8	6914	5084 - 9431
1.0 to 1.9	15	7634	5217 - 10354
2.0 to 2.9	6	8427	5962 - 10522
3 or more	8	7090	5525 - 8503

^aMost of the herds had a supply of other hay in varying amounts in addition to alfalfa.

CRANES & CREST

The production of silage, to increase the total productive capacity of farms and to supply a type of forage which is more nearly like pasture than is dry forage, has long been advocated by many agricultural workers. In order to determine the effect of the feeding of silage in the herds studied, a comparison was made to show its effect on milk production. Only fifteen of the herds received silage as indicated in Table VIII. These herds produced slightly more milk per cow than the twenty-seven herds receiving no silage.

No significant difference is noted in comparing the acres of improved permanent pasture per cow with milk production as indicated in Table IX. No record was made as to the amount of fertilizer used on pastures or whether pastures were irrigated. The highest and lowest producing herds are in the group with 1.0 to 1.9 acres of improved pasture.

In comparing herds on the basis of the use of temporary summer and winter pasture, higher milk production was noted in herds which had access to summer supplemental pasture, as shown in Table X. Only twenty-one of the forty-two herds surveyed provided any supplemental pasture. Average production for the group without supplemental pasture was 7,139 pounds, compared to an average of 7,553 for those which had supplemental pasture. The survey did not provide information on the cost of producing feed nutrients with or without supplemental pasture, but experimentally as shown in Table XIII, pasture generally supplies the lowest cost feed.

TABLE VIII

FEEDING OF SILAGE AND MILK PRODUCTION

Tons Per Cow Per Year	Number of Cases	Pounds 4% FCM, Per Cow Per Year Average	Range
None	27	7296	5217-10522
1.0 to 4.9	6	7311	5084-9431
5.0 or more	9	7465	5475-9554

TABLE IX

THE USE OF IMPROVED^a PERMANENT PASTURE AS RELATED TO MILK PRODUCTION

Acres Per Cow	Number of Cases	Pounds 4% FCM Per Cow Per Year	
		Average	Range
0.1 to 0.9	5	7228	5815 - 9954
1.0 to 1.9	19	7432	5084 - 10522
2.0 to 2.9	11	7306	5477 - 10354
3.0 to 3.9	7	7180	5878 - 8227

^aPasture on land prepared, fertilized, and seeded to permanent type grasses and/or clovers.

TABLE X

THE USE OF TEMPORARY^a PASTURE AS RELATED TO MILK PRODUCTION

Season and Acres Per Cow	Number of Cases	Pounds 4% FCM Per Cow Per Year Average	Range
None	21	7139	5525 - 10301
Winter only 0.1 to 1.0 acres	3	6364	5475 - 7681
Summer only 0.1 to 1.0 acres	7	8337	5820 - 10354
1.1 or more acres	1	9954	-
Both winter and summer 0.1 to 1.0 acres	6	6786	5084 - 9328
1.1 or more acres	4	7612	5217 - 10522

^aBoth winter and summer supplemental pasture; includes the grazing of alfalfa fields for varying periods of time for temporary summer pasture.

CHAPTER III

SUGGESTED STANDARDS OR GOALS FOR GREENE COUNTY DAIRY FARMERS

In order to evaluate feeding practices and to help the dairy farmer to evaluate his own feeding practices, a set of standards or goals was needed. Such standards were prepared and are offered as guides. They are not intended to represent the last word in recommendations for feeding dairy cattle but should help the dairy farmer to set his own goals for his farm. These standards were determined with the help of data collected in the surveys made in this study, the analysis made of the surveys, research and literature on the subject, and consultation with staff members of the Department of Dairying of the University of Tennessee.

Standards were set for the following:

1. Milk production per cow per year
2. Length of the dry period
3. Feeding calves to six months of age
4. Feeding of heifers six to fifteen months of age
5. Growth rate of calves and heifers
6. Level of concentrate feeding to milk cows
7. Components of the concentrate ration
8. Feeding of concentrates to dry cows and bred heifers
9. Quality and quantity of forages—pasture, hay, silage
10. Water supply
11. Mineral requirements
12. Vitamin requirements

STANDARD I--Milk Production Per Cow Per Year

The goal is 10,000 pounds of 4 per cent FCM¹ per cow per year for the farms studied. For culling low producers Table XI may be used as a guide. The table was prepared from records of 263 herds in Tennessee which were participating in the Dairy Herd Improvements Association. These records showed that a cow which did not produce more than 250 pounds of butterfat per year was not making a profit. In deciding whether or not to cull a cow, the dairyman should also consider such factors as:^{2,3}

(1) the stage of lactation of the cow, (2) the need for milk to hold the marketing "base," (3) the prices of milk and feed, (4) the availability of replacements to fully use facilities, equipment, and labor, (5) the age of the cow; the production goal for individual cows and for the herd should be set by each farmer and adjustments made as changing conditions justify.

STANDARD II--Length of the Dry Period

A dry period of forty-five to sixty days is accepted as standard. The most desirable length of time will be governed by the condition of the cow and the amount of milk she normally produces. From a study of

¹O. R. Overman and W. L. Gaines, The Journal of Animal Science, 7:55-59, 1948.

²J. F. Kendrick, "The Dairy Herd Improvement Association Program," Agricultural Research Administration, USDA, Farmers' Bulletin 1974, April, 1953, pp. 7-8.

³"Cull the Cow that Culls Your Profit," USDA, Federal Extension Service, PA-250, June 1954, pp. 6-7.

TABLE XI

MILK REQUIRED FOR PROFITABLE PRODUCTION
AT VARIOUS BUTTERFAT LEVELS IN TENNESSEE^a

Comparable amounts of milk when butterfat test is:				
*b 3.6% Lbs.	** 4.1% Lbs.	*** 4.8% Lbs.	**** 5.2% Lbs.	Levels of Butterfat Lbs.
11111	9756	8333	7692	400
10417	9146	7813	7212	375
9722	8537	7292	6731	350
9028	7927	6771	6250	325
8333	7317	6250	5767	300
7639	6707	5729	5093	275
CULL IF BELOW THIS LINE				
6944	6098	5208	4808	250
6250	5488	4688	4327	225
5556	4878	4167	3846	200

^aFrom a chart prepared by the Dairy Department of the University of Tennessee as a guide in deciding when to cull a cow from the milking herd. The recommendations were made after a study of DHIA records in Tennessee.

^bThe U. S. average DHIA test for each breed is: *Holsteins, **Ayrshire and Brown Swiss, ***Guernseys, and ****Jersey.

Instructions for using table:

1. Determine the test for each cow by butterfat test or use the average test for the breed as indicated above.
2. Under test selected read down the column to nearest pounds of milk for the lactation.

the records of cows on DHIA in twelve states, Klein and Woodward⁴ of the United States Department of Agriculture concluded that a dry period of about eight weeks gave the best annual yields for cows producing 10,000 pounds of 4-per-cent milk per year and calving at twelve-month intervals. Either a longer or shorter dry period reduced the annual milk yield. For lower producing cows the dry period may be shortened with the possibility of increasing their production.

STANDARD III--Feeding of Calves

Be sure the calf gets colostrum immediately after birth and during the first three or four days; then feed whole milk or commercial milk replacer at the following rates in pounds per calf per day with commercial calf starter and hay free choice: (Divide into 2 or 3 feedings daily)

Breed	Age in Weeks									
	1	2	3	4	5	6	7	8	9	10
Holstein or Ayrshire	Pounds Per Calf Per Day									
	7	8	9	8	7	6	4	3		
Jersey or Guernsey	5	6	7	7	6	6	5	4	3	3

Limit the commercial calf starter to about four pounds per day with allowances for the condition and growth rate or size of the calf. Provide good quality grass or grass-legume hay fresh every day. Straight legume hay sometimes causes scours. Provide clean water and salt free choice after two weeks. Avoid over-consumption of water at first.

⁴John W. Klein and T. E. Woodward, Journal of Dairy Science, 26:705-13, 1943.

The above is a guide. Check growth frequently by comparing with normal.⁵ These recommendations are based on reports from Tennessee,⁶ Arkansas,⁷ Illinois,⁸ and California.⁹ These references also give mixtures of calf starters which may be prepared on the farm if the number of calves justifies the practice.

Apparently rumen inoculation of young calves is not necessary. Hinton¹⁰ of Tennessee, in a study of the use of rumen inoculation of twenty-six Jersey and twenty-two Holstein calves, found that the rumen inoculation did not produce a significant difference in the growth or the pounds of TDN required per pound gain on the calves.

STANDARD IV—The Feeding of Heifers Six to Fifteen Months of Age

Without pasture: Heifers six to twelve months of age will need eight to twelve pounds of good quality legume or legume-grass hay and four pounds of grain per head daily. Adjust the grain feeding according

⁵Frank B. Morrison, Feeds and Feeding, (twenty-second edition; Ithaca, New York, The Morrison Publishing Company, 1956), p. 680.

⁶Lynn Copeland, "Raising Dairy Calves," U. T. Agricultural Extension Leaflet 100, 1957, pp. 3-5.

⁷A. Leon Holley and T. P. Head, "Raising Dairy Calves," University of Arkansas, Agricultural Extension Circular 454, Rev. 1951, pp. 3-7.

⁸K. E. Harshbarger and K. E. Gardner, "Raising Dairy Calves," University of Illinois, Department of Dairy Science, Circular D-675, 1954, pp. 2-6.

⁹S. W. Mean, "Raising Dairy Calves," University of California, Berkeley, Circular 107, 1951, pp. 10-18.

¹⁰Frank D. Hinton, "Rumen Inoculation of Dairy Calves, Its Relation to the Feeding of Roughage and Growth of Calves," (Unpublished M. S. thesis, Dairy Department, The University of Tennessee, 1951), pp. 21-22.

to growth rate as compared to desirable normal weight for age. Refer to Standard V, Measuring Growth of Heifers.

With pasture: Plenty of good quality pasture and two to four pounds of grain are needed in summer until the heifers are twelve months of age. When pasture is in short supply it should be supplemented with hay as above.

After they reach twelve months of age and are making normal growth, heifers will need only a plentiful supply of pasture, hay, or hay and silage. Free choice salt and plenty of fresh water should be supplied during the six- to fifteen-month period.

STANDARD V--Growth Rate of Calves and Heifers

In order to keep check on the growth of calves and heifers to determine whether or not they are growing normally, Table XIII is included. It gives the normal weights for age of the four breeds commonly found in Tennessee. These figures taken from a similar table in Morrison's Feeds and Feeding¹¹ summarize weight records from Iowa, Kansas, Missouri, Nebraska, South Carolina, and West Virginia experiment stations, and the USDA. These data and other research indicate that calves should be kept within an index range of from 90 to 110 per cent of normal. Overfeeding of milk or concentrates to calves or heifers results in fat or overfed heifers. Swanson of Tennessee¹² in an experiment with several sets of

¹¹Morrison, op. cit., p. 680.

¹²R. W. Swanson, "The Effect of Fattening Dairy Heifers Upon Their Growth and Lactation," Report presented at the fifty-second annual meeting of the American Dairy Science Association, June 27, 1957. (Mimeographed)

TABLE XII

NORMAL WEIGHTS OF DAIRY HEIFERS

Age (Months)	Jersey (Pounds)	Guernsey (Pounds)	Holstein (Pounds)	Ayrshire (Pounds)
Birth	50	65	93	71
1	70	79	115	86
2	96	105	155	114
3	130	141	193	152
4	176	177	260	190
5	220	222	320	236
6	268	267	379	281
8	357	350	491	371
10	432	427	589	451
12	495	490	685	518
14	549	556	752	576
16	597	605	820	635
18	644	663	890	690
20	694	712	961	743
22	742	763	1038	790
24	785	818	1104	845

twin heifer calves found that too heavy concentrate feeding of heifer calves resulted in "fatty" udders and less milk production in the mature animals compared to those fed normal rations as calves. In measuring heart girth to determine weight, Misner¹³ at Cornell found a 0.97 coefficient of correlation with actual body weight and heart girth measurement.

STANDARD VI--The Level of Concentrate Feeding for Milk Cows

The Morrison standards¹⁴ are widely used as reliable guides in deciding how much concentrate to feed dairy cattle for optimum performance in milk production, maintenance, and growth. Easy-to-follow tables are included to show the recommended amount of concentrate to feed per day to a given cow when one has a record of her production and knows the quality of hay, pasture, or silage, and the butterfat test. Feeding at levels above Morrison and other standards have sometimes proved economically sound. At the University of Tennessee¹⁵ dairy cows are fed 10 per cent above Morrison standards, and the returns have more than compensated for the extra feed cost. Another standard which was at one time rather widely used is called the Haecker standard of feeding dairy cows. Baker

¹³E. G. Misner, "Measurements and Weights of One Hundred Cows in the Cornell Dairy Herd," (Ithaca, N. Y.) Cornell Bulletin 771, 1941.

¹⁴Morrison, op. cit., Tables VIIIA and VIIIB, pp. 1134-35.

¹⁵S. A. Hinton, Dairy Department, University of Tennessee, personal interview, October, 1958.

and Tomhave¹⁶ of Maryland fed five groups of Holstein cows maintenance rations plus allowances of TDN for milk production equal to 82.2, 105.3, 122.4, and 131.0 per cent of the Haecker¹⁷ standard, respectively. Though the amount of milk produced for each pound of TDN was greatest at the lowest feeding level, the results showed that the amount of concentrate feed could be profitably increased up to 20 per cent above the Haecker standard, unless the cost of each added pound of TDN is as great as the net cash return from 1.46 pounds of 4-per-cent milk. To make allowances for different milk prices, Klein and Jennings, USDA,¹⁸ have prepared a guide which will be of further help in determining the level of grain feeding in light of local prices of feed and milk; Table XIII.

Since Morrison's standards have been kept up to date, they are accepted by dairy authorities and should serve as a reliable guide for the dairy farmer. The farmer should also take into consideration the price of milk, the price of feed, the age of the cow, the stage of lactation, and perhaps other factors when setting the level of concentrate feeding for his herd.

¹⁶T. A. Baker and A. E. Mohave, "The Intensity of Feeding as Related to Milk Production," University of Maryland, Agricultural Experiment Station, Bulletin 208, 1944.

¹⁷T. L. Haecker, Feeding Standards Developed by Intensive Research from 1900 to 1910, Minnesota Agricultural Experiment Station.

¹⁸J. W. Klein and R. D. Jennings, The Agricultural Situation, Bureau of Agricultural Economics, USDA, Vol. 33, No. 2, February 1949.

TABLE XIII

MILKING COWS — MOST PROFITABLE LEVEL OF GRAIN FEEDING^a

Pounds of milk equal in value to 100 pounds of grain or mixed feed ^c	Feeding one pound of grain to the pounds of milk given below ^b		
	For large cows testing 3½ per cent fat	For medium cows testing 4 per cent fat	For small cows testing 5 per cent fat
	(pounds)	(pounds)	(pounds)
175	4.1	4.0	3.9
160	3.7	3.5	3.4
145	3.4	3.2	3.1
130	3.2	3.0	2.8
115	3.0	2.8	2.6
100	2.9	2.7	2.4
85	2.7	2.5	2.2
70	2.4	2.3	2.1
55	2.1	2.0	— ^d

^a"More Grain for Your Dairy Cows?" J. W. Klein and R. D. Jennings, *The Agricultural Situation*, Bureau of Agricultural Economics, U.S.D.A., Vol. 33, No. 2 (2/49).

^bFor cows of different size and butterfat test where roughage is limited to 18.5 pounds of good hay or its equivalent per 1,000 pound cow daily with different relative price of grain to milk.

^cThe figures in this column are also the pounds of additional milk obtained from feeding 100 pounds additional grain at the specified rates of feeding.

^dAll they will eat without injury to the cow.

Directions for Using Table

1. Divide the local price of 100 pounds of grain by the price at the farm of one pound of milk.
2. In the first column of the table find the number most closely approximating this ratio.
3. Follow this number across the table until the appropriate column is reached for a particular cow in the herd.
4. This number represents the pounds of milk for which a pound of grain should be fed.

Example

The price of grain is \$4.25 per hundredweight and the price of milk \$.05 per pound; therefore, the grain price-milk price ratio equals 85. The cow in question is large and tests 3½ per cent milk. The resulting feeding ratio is one pound of grain to every 2.7 pounds of milk.

STANDARD VII--Components of the Concentrate Ration

Use Morrison's standards¹⁹ and/or sample rations²⁰ as guides.

Since feeds vary in energy required for digestion, the net energy values of feeds should not be overlooked. For an illustration refer to "net energy from 100 pounds TDN in typical feeding stuffs."²¹ In a ration with TDN of 70 per cent or above, and with less than 10-per-cent fiber, the standard for net energy will usually be met. High fiber feeds such as ground hay, straw, and screenings used in the concentrate ration lower the net energy value. Table 2, Appendix, will serve as a guide in deciding on the most economical components of the ration.

STANDARD VIII--The Feeding of Concentrates to Dry Cows and Bred Heifers

None is necessary provided that heifers are of normal size and condition, that cows were fed adequate rations during the previous lactation so as to maintain body weight, and that good or better quality forage or pasture is supplied in amounts equal to the capacity of the animals. These recommendations are based on work by Greenhalgh and Gardner,²² and by Wylie and Hinton.²³ Concerning the Illinois experi-

¹⁹Morrison, op. cit., pp. 1000-69.

²⁰Morrison, op. cit., pp. 1115-19.

²¹Morrison, op. cit., p. 48.

²²J. F. D. Greenhalgh and K. E. Gardner, "The Effect of Heavy Grain Feeding Before Calving Upon Lactation and Udder Edema," Journal of Dairy Science, 41:822-29, June 1958.

²³C. E. Wylie and S. A. Hinton, "Feeding the Dry Cow," Tennessee Agricultural Experiment Station, Report 57, 1944, p. 47.

ment, the following may be noted:

Heavy grain feeding before calving resulted in no increase in the yield of fat-corrected milk during the first eighty-four days of lactation. Nine cows and nine heifers received, in addition to the basal roughage ration, a supplement of 378 pounds and 373 pounds of concentrates, respectively, during a six weeks' prepartum period. A similar number of controls received no grain. During lactation all animals were fed roughage and grain according to maintenance and production requirements.

Wylie and Hinton²⁴ observed that switching from a plan of normal grain feeding during the dry period to heavy grain feeding in the late lactation and no grain feeding in the dry period reduced udder edema and increased production.

STANDARD IX--The Quality and Quantity of Forages: Pasture, Hay, Silage

Pasture. From an economic standpoint²⁵ maximum use should be made of pastures. Under recommended fertilization and management practices in Greene County, this would require about one and one-half acres of permanent pasture, one-half acre of temporary winter pasture, add one-half acre temporary summer pasture per cow.²⁶ Fertilizing according to soil test will be necessary to establish and maintain a satisfactory pasture program.

Hay and/or silage. A minimum of 200 days' supply should be pro-

²⁴Ibid.

²⁵"Pasture Production," University of Tennessee Agricultural Education Mimeo 27, 1957, p. 36.

²⁶Webster Pendergrass, "Pasture Production in Tennessee," University of Tennessee Agricultural Extension Leaflet 102, 1956.

vided. This will supply the forage needs in winter and during dry periods in summer when pastures are in short supply. For a thousand-pound cow this would require two and one-half tons' hay equivalent. She would consume about twenty-five pounds of number II hay per day. The quality of hay and/or silage should be number II or better. Hay and/or silage would be fed free choice, allowing the cows all they will consume.

The above forage program will supply the maintenance requirements plus requirements for at least ten pounds of milk production per day for light breeds and for twelve to fifteen pounds of milk per day for heavy breeds. These recommendations are in line with Morrison's feeding standards. On farms which have soils adapted to alfalfa productions, the standard should be to produce alfalfa hay in preference to other hays for milk cows. The value of alfalfa hay for producing milk is indicated in Table VIII, Chapter II.

Table XIV gives the cost of producing TDN with different grains and forage. These figures from three state experiment stations and the USDA show that pastures produce feed at least cost; next is hay and silage crops, and grain is the most costly.

STANDARD X—The Water Supply

An adequate supply of fresh water should be accessible to cows and young stock at all times. The supply should be protected from freezing in winter. As a minimum requirement, water should be readily available near the milking herd just after milking both at night and morning. Growing heifers and dry cows should have access to plenty of fresh water at

TABLE XIV

COMPARATIVE COSTS OF PRODUCING TDN

Feeds	Cost of Producing 100 Pounds of TDN			
	New Jersey ^a 1951	North Carolina ^a 1950	Iowa ^b 1951	USDA ^a 1940
Pasture	\$1.57	\$0.58	\$0.64	\$0.29
Hay Crop				
Silage (EST)	2.20	1.07		
Corn Silage	2.40	1.30	1.54	.91
Alfalfa Hay		1.35	.83	
Corn		1.77	1.38	
Oats		2.07	2.02	1.29
Average Hay	2.90			.40
Grain Concentrate	5.00			

^a Agricultural Education Mimeo No. 27, p. 36

^b Forages, Iowa State College Press, 1951, p. 643

least twice daily, and young calves should have water free choice after the first two weeks. The amount of water cows will drink depends upon their size, the yield of milk, the air temperature and humidity, and the amount of water in the feed they eat.²⁷ From twelve to fifteen gallons daily is an average amount consumed per head for a herd. This includes both cows in milk and dry cows. Experiments have shown that providing water by means of automatic drinking bowls, so the cows can drink whenever they wish, increased the milk yield of good cows 3.5 to 4.0 per cent over watering twice daily, and 6 to 11 per cent over watering once daily.²⁸

STANDARD XI--Mineral Requirements

Provide loose salt free choice in container protected from rain in addition to one pound of salt mixed with each one hundred pounds of concentrate. With the possible exception of phosphorus, there is not likely to be a mineral deficiency if cows and heifers in this locality are fed the standard rations outlined above. For cows fed roughage alone, or roughage and farm grains alone, the addition of twenty to forty pounds of bone meal to a ton of concentrates would make up for any possible deficiencies. For those being fed a concentrate ration consisting of at least 25 per cent of such high-phosphorus supplements as wheat bran, cottonseed meal, or linseed meal, the requirement would be met without the

²⁷Morrison, op. cit., p. 609.

²⁸Loc. cit.

addition of bone meal.²⁹

STANDARD XII--Vitamin Requirements

Where dairy cows are fed the recommended rations outlined above, they will in all probability receive an adequate supply of the necessary vitamins. The B-complex vitamins are synthesized by bacteria in the fermentations which normally occur in the rumen of cattle. Vitamins A and D are supplied in good quality pasture and hay. Sunshine also supplies vitamin D. In feeding young calves, vitamins are supplied by cows' milk, milk replacer, or calf starter.

²⁹Morrison, loc. cit., pp. 600-03.

CHAPTER IV

CONDENSED TEACHING PLANS ON THE FEEDING OF DAIRY CATTLE

Introduction

Since one of the objectives of this study was to teach dairy farmers to improve their feeding practices in those areas which were found to be below standard, condensed teaching plans were developed for nine feeding jobs. The objective, factors involved, the evidence or references, the teaching procedure, and the follow-up or evaluation were outlined for each of the nine jobs. These plans will be used for group and individual instruction with the forty-two farmers interviewed and with other dairy farmers in Greene County. These plans and other information will be made available to all agricultural workers of the county who wish to use them.

So far, we have merely assembled information by herds. Now we will turn to a comparison of the practices on individual farms to the standards set up in Chapter III in order to determine what changes the farmer would need to make.

In Table XV is shown a tabulation sheet which served to bring together information on each herd. Each line represents a herd. The table is, therefore, read from left to right. The content was used to set up Table XVI. In this Table an analysis of the factors for each of the forty-two farms was set up on a single sheet. In Table XVI all factors except numbers 2, 5, 6, 7, 8, and 11 are ranked from the top of the column down, according to the standard. In these exceptions, the

optimum does not appear at the top of the column—as in production, for example. The standard for each factor is shown at the foot of the column. Table XVI was duplicated and copies were given to each of the forty-two farmers participating in the survey. Each farmer's practices were marked by circling to show how he stood with respect to the standard. Table XVII is a duplicate of Table XVI marked for farm number one for illustrative purposes. The farmer's position on each factor would indicate the extent of his deviation from the standard, if any, and would quite likely show the urgency of need for improvement in the practice.

TABLE XV

TABULATION OF FACTORS INCLUDED IN THE ANALYSIS--BY HERDS

Grade sold	Rank	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18																
		Milk produced		Conception 1st serv. (%)	Heifer growth (index)	Grain-milk ratio		Concentrate ration		Calves		Tons hay and silage per cow		Hay Alfalfa		Acres pasture per cow		Water supply (rating)
		Pounds per cow	4% FCM			ratio	Protein (%)	Quality rating	Fed dry cows, lbs.	ration, quality	Total hay	Silage fed equiv.	Hay equiv.	hay	Improved	Total and suppl.	Temporary	
A	1	10522	19	65	94	1:3.5	14	Good	0	Good	4.0	0	4.0	2.0	1.8	1.8	1.7	Good
M	2	10354	24	75	--	1:5.0	13	Good	0	Good	3.1	0	3.1	1.5	3.0	3.0	0.8	Good
A	3	10301	16	85	94	1:3.5	16	Good	240	Good	3.0	0	3.0	2.0	1.8	1.8	0.0	Good
A	4	9954	8	75	127	1:4.0	17	Good	60	Excellent	2.0	6.0	4.0	2.0	1.7	1.7	1.4	Good
A	5	9872	17	80	94	1:5.0	16	Good	120	Good	1.8	0	1.8	1.3	2.8	2.8	0.3	Good
M	6	9801	18	75	108	1:5.0	16	Good	240	Good	2.0	0	2.0	0.5	1.5	3.2	0.0	Good
A	7	9431	16	80	--	1:3.5	16	Good	240	Good	2.0	2.3	2.8	0.3	1.6	1.6	0.2	Good
A	8	9328	14	90	88	1:3.5	16	Good	120	Excellent	1.5	0.9	1.8	1.0	1.0	1.0	0.8	Good
M	9	8741	14	86	95	No grain fed	--	--	--	Good	2.4	0.0	2.0	1.0	1.8	1.8	2.0	Good
A	10	8503	24	50	104	Morrison	16	Good	60	Good	2.7	3.0	3.7	2.2	2.0	2.0	0.0	Good
M	11	8227	18	80	98	1:10	16	Good	120	Good+	2.0	0.0	2.0	2.0	2.5	2.5	1.0	Good
A	12	8048	11	80	--	1:3.5	14	Fair+	240	Good+	4.4	6.7	6.6	4.4	1.5	2.5	0.0	Good
A	13	7962	12	40	106	1:3.5	16	Good	120	Fair+	3.4	0.0	3.4	1.4	1.8	3.2	0.0	Good
M	14	7939	16	70	90	1:5.5	14	Good-	100	Good	3.3	0.0	3.3	3.3	1.5	3.5	0.5	Good
A	15	7713	17	60	--	1:3	14	Good	0	Good	0.9	8.0	3.8	0.7	1.8	1.8	1.0	Good
M	16	7681	27	90	70	1:3.5	12	Fair+	0	Fair+	2.7	0.0	2.7	1.5	2.0	2.0	0.5	Good
A	17	7522	14	89	95	1:3.5	16	Good	35	Good	2.0	7.0	4.4	0.7	0.5	1.0	1.0	Good
M	18	7458	19	93	97	1:3.5	14	Fair	300	Good+	2.0	0.0	2.0	0.0	2.0	3.0	0.0	Good
A	19	7343	18	75	100	1:3.5	16	Good	0	Good	0.5	12.0	4.5	0.1	1.3	1.3	0.7	Good
A	20	7275	13	70	105	1:4.5	16	Good	300	Good	3.2	2.8	4.1	3.0	2.0	2.0	0.5	Good
A	21	7157	16	50	115	1:4.5	16	Good+	200	Good+	0.6	5.9	2.8	0.6	0.8	0.8	0.5	Good
A	22	6930	12	80	91	Morrison	14	Good	90	Good	1.7	3.2	2.7	1.5	1.2	1.2	0.0	Good
M	23	6900	19	50	113	1:3.5	15	Fair	200	Fair	5.0	0.0	5.0	4.0	3.0	3.0	0.0	Good
M	24	6868	33	80	--	1:7.0	13	Good	100	---	2.3	0.0	2.3	0.7	2.0	2.0	0.0	Good
M	25	6805	11	80	106	1:5.5	14	Good	120	Good	3.4	0.0	3.4	1.0	2.0	4.0	0.0	Good
M	26	6555	17	80	--	1:5.0	10	Fair+	0	Good+	3.5	0.0	3.5	2.0	2.0	3.0	0.0	Good
M	27	6486	20	90	106	1:3.5	13	Good-	135	Good	2.2	0.0	2.2	0.0	1.8	2.7	0.0	Good
M	28	6448	14	87	98	1:3.5	18	Poor	0	Good	4.2	0.0	4.2	1.8	1.5	3.9	0.0	Good
A	29	6375	17	65	86	1:3.0	16	Good	140	Good	3.0	0.0	3.0	2.0	1.3	2.1	0.0	Good
M	30	5974	21	70	116	1:4.5	16	Good	0	Good+	3.3	0.0	3.3	3.0	1.1	1.0	0.0	Good
M	31	5970	18	90	--	1:3.5	16	Good	240	Good	3.0	0.0	3.0	1.5	2.0	2.0	1.0	Good
A	32	5962	17	60	92	1:3.0	13	Good	0	Good	3.5	0.0	3.5	2.0	2.0	3.0	0.4	Good
M	33	5936	20	80	105	1:3.0	12	Good-	200	Good+	4.0	0.0	4.0	2.0	1.5	1.5	0.8	Good
M	34	5915	13	84	--	1:3.0	12	Fair	120	Fair+	1.5	0.0	1.5	0.0	0.6	3.6	0.0	Good
A	35	5878	17	85	--	1:3.5	18	Good+	210	---	3.0	5.5	4.8	0.6	2.0	4.0	0.0	Good
A	36	5820	22	70	87	1:3.0	16	Good	240	Good+	1.5	4.0	2.8	0.0	1.1	1.9	1.0	Good
M	37	5815	15	84	105	1:3.0	16	Poor	0	Good-	2.5	0.0	2.5	1.0	0.5	3.4	0.0	Good
M	38	5525	19	75	106	1:3.0	16	Good	180	Good	3.0	0.0	3.0	3.0	1.6	1.6	0.0	Good
M	39	5477	14	50	102	1:3.0	16	Fair	90	Fair+	2.4	0.0	2.4	1.0	2.1	2.1	1.0	Good
A	40	5475	25	70	--	1:4.0	15	Good	120	Good+	0.5	5.0	2.4	0.0	3.2	3.2	0.2	Good
M	41	5217	20	90	--	1:7.0	16	Good	0	Good	3.0	0.0	3.0	1.5	1.0	1.0	1.0	Good
A	42	5084	20	50	--	1:3.5	15	Good-	0	Good	2.4	3.0	3.4	0.2	1.0	1.0	1.0	Good

Note: The practices of each farmer are listed on same line as his production average per cow. Letters "A" and "M" refer to the grade of milk sold.

TABLE XVI

RANKING OF FACTORS SHOWN IN TABLE XV ACCORDING TO THE STANDARDS^a

1		2		3		4		5		6		7		8		9		10		11		12		13		14		15		16		17		18	
Milk produced		Dry cows		Conception		Heifer growth		Grain-milk ratio		Concentrate ration		Calf ration		Tons hay and silage		Hay equiv.		Alfalfa		Permanent pasture		Temporary		Water supply											
Grade sold	Rank	Pounds per cow	4% FCM	Dry cows	1st serv.	(%)	(index)	Quality rating	Protein (%)	Fed dry cows	lbs. quality	Excellent	(11)	Total hay	Silage fed	Hay equiv.	hay	Improved	Total and suppl.	Winter	Summer	Excellent													
A	1	10522	33(1)	93(1)	127(1)	Morrison(2)	Excellent	18(2)	300(2)	Excellent	5.1(1)	12.0(1)	6.6(1)	4.4(1)	3.2(1)	4.0(2)	2.0(1)	3.2(1)	4.0(2)	2.0(1)	Excellent														
M	2	10354			125					(11)	4.5	6.0	4.0(1)	3.1	3.9(1)			3.1	3.9(1)		Excell.														
A	3	10301			123						4.4(1)	11.0	5.0(1)	3.5	3.1	3.8	1.9	3.1	3.8																
A	4	9954	27(1)	90(5)	122	1:10(1)					4.3	4.3(1)	3.3(1)	3.0	3.7			3.0	3.7																
A	5	9872			121						4.2(1)	10.0	4.5	3.0(3)	3.0(2)	3.6	1.8	3.0(2)	3.6																
M	6	9801	26		120	1:7 (1)	Good+	17(1)	240(6)	Good+	4.1	4.5(1)	2.9	2.9	2.9	3.6		2.9	3.6		Good+														
A	7	9431		89(1)	119						4.0(2)	9.0	4.4(1)	2.8	2.8	3.5(1)	1.7(1)	2.8	3.5(1)	1.7(1)	Good+														
A	8	9328	25(1)		118						3.9	4.3	2.7	2.7	2.8(1)	3.4(1)		2.8(1)	3.4(1)																
M	9	8741			117						3.8	8.0(1)	4.2(1)	2.6	2.7	3.3	1.6	2.7	3.3	1.6															
A	10	8503	24(2)	87(1)	116(1)						3.7	4.1	2.5	2.5	2.7	3.2		2.7	3.2																
M	11	8227			115(1)	1:5.5(2)	Good(24)	16(21)	210(1)	Good(24)	3.6	7.0(1)	4.1(1)	2.4	2.6	3.2(3)	1.5	2.6	3.2(3)	1.5	Good(17) Good(42)														
A	12	8048	23		114						3.5(2)	4.0(3)	2.3	2.5	3.1			2.5	3.1																
A	13	7962		86(1)	113						3.4(2)	6.7(1)	3.9(1)	2.2(1)	2.5(1)	3.0(5)	1.4(1)	2.5(1)	3.0(5)	1.4(1)															
M	14	7939	22(1)		112						3.3(2)	3.8(1)	2.1	2.4	2.9			2.4	2.9																
A	15	7713			111					200(3)	3.2(1)	6.0(1)	3.7	2.0(8)	2.4	2.8	1.3	2.4	2.8																
M	16	7681	21(1)	85(2)	110	1:5.0(4)	Good-	15(2)			3.1(1)	3.7(1)	1.9	2.3	2.8(1)			2.3	2.8(1)		Good-(3) Good-														
A	17	7522			109						3.0(6)	5.9(1)	3.6	1.8(1)	2.2	2.7(1)	1.2	2.2	2.7(1)	1.2															
M	18	7458	20(4)		108(1)						2.9	3.5(2)	1.7	2.2	2.6(1)			2.2	2.6(1)																
A	19	7343		84(2)	107					180(1)	2.8	5.5(1)	3.4(3)	1.6	2.1	2.5(2)	1.1	2.1	2.5(2)	1.1															
A	20	7275	19(4)		106(4)						2.7(2)	3.3	1.5(5)	2.1(1)	2.4			2.1(1)	2.4																
A	21	7157			105(3)	1:4.5(3)	Fair+(4)	14(7)			2.6	5.0(1)	3.3(2)	1.4(1)	2.0(10)	2.4	1.0(8)	2.0(10)	2.4		Fair+														
A	22	6930	18(4)	80(9)	104(1)						2.5(1)	3.2	1.3(1)	1.9	2.3			1.9	2.3		Fair+														
M	23	6900			103					140(1)	2.4(3)	4.0(1)	3.1(1)	1.2	1.9	2.2	0.9	1.9	2.2	0.9															
M	24	6868	17(6)		102(1)						2.3(1)	3.0(4)	1.1(6)	1.8	2.1(2)			1.8	2.1(2)																
M	25	6805		75(5)	101					135(1)	2.2(1)	3.2(1)	2.9	1.0	1.8(6)	2.0	0.8(3)	1.8(6)	2.0	0.8(3)															
M	26	6555	16(4)		100(1)	1:4(3)	Fair(1)	13(4)			2.1	2.9	0.9	1.7(1)	2.0(5)			1.7(1)	2.0(5)		Fair(20) Fair														
M	27	6486			99						2.0(6)	3.0(2)	2.8(3)	0.8	1.6	1.9(1)	0.7(1)	1.6	1.9(1)	0.7(1)															
M	28	6448	15(1)	70(5)	98(2)					120(7)	1.9	2.7(2)	0.7(3)	1.6(2)	1.8(4)			1.6(2)	1.8(4)																
A	29	6375			97(1)						1.8	2.8(1)	1.6	0.6(2)	1.5	1.7(1)	0.6	1.5	1.7(1)	0.6															
M	30	5974	14(5)		96					100(2)	1.7(1)	2.5	0.5(1)	1.5(5)	1.6			1.5(5)	1.6																
M	31	5970		65(2)	95(2)	1:3.5(16)	Fair-	12(3)			1.6	2.3(1)	2.5(1)	0.4	1.4	1.6(2)	0.5(4)	1.4	1.6(2)	0.5(4)	Fair-(2) Fair-														
A	32	5962	13(2)		94(3)						1.5(3)	2.4(3)	0.3(1)	1.3	1.5(1)			1.3	1.5(1)																
M	33	5936			93					90(2)	1.4	0.9(1)	2.3	0.2(1)	1.3(2)	1.4	0.4(1)	1.3(2)	1.4	0.4(1)															
M	34	5915	12(2)	60(2)	92(1)						1.3	2.2(1)	0.1	1.2	1.3(1)			1.2	1.3(1)																
A	35	5878			91(1)						1.2	0.8	0.0(5)	1.2(1)	1.2	1.2(1)	0.3(1)	1.2(1)	1.2	0.3(1)															
A	36	5820	11(2)		90(1)	1:3(9)	Poor(2)	11	60(2)	Poor	1.1	2.1		1.1(2)	1.2(1)			1.1(2)	1.2(1)		Poor														
M	37	5815			89						1.0	0.5	2.0(4)	1.0(3)	1.1	0.2(2)		1.0(3)	1.1	0.2(2)															
M	38	5525	10	50(5)	88(1)					35(1)	0.9(1)	1.9	1.8(2)	0.8(1)	1.0(5)			0.8(1)	1.0(5)																
M	39	5477			87(1)						0.8(1)	0.3		0.6(1)	0.9	0.1		0.6(1)	0.9	0.1															
A	40	5475	9		86(1)						0.7	1.6		0.5(2)	0.8			0.5(2)	0.8																
M	41	5217		40(1)	70(1)	No grain(1)	--	10(1)	6(13)	No calves	0.6(1)	0.0(27)	1.5(1)	0.0	0.8(1)	0.0(19)		0.0	0.8(1)	0.0(19)															
A	42	5084	8(1)								0.5(2)																								
Standard		10000	16	100	90-100	Morrison	Excellent					2.5	2.0	1.5							Good+														
Factors 1, 3, 4, 5, 6, 9, 10, 12, 13, 14, 15, 16, 17, and 18 are ranked (top to bottom) according to standards recommended in the study. Other factors are in numerical order. The number of cases is entered in parenthesis with rating.																																			

^a Factors 1, 3, 4, 6, 9, 10, 12, 13, 14, 15, 16, 17, and 18 are ranked (top to bottom) according to standards recommended in the study. Other factors are in numerical order. The number of cases is entered in parenthesis with rating.

TABLE XVI

RANKING OF FACTORS SHOWN IN TABLE XV ACCORDING TO THE STANDARDS^a (with practices of herd No. 1 circled)

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1		2		3		4		5		6		7		8		9		10		11		12		13		14		15		16		17		18	
Milk produced		Dry cows		Conception		Heifer growth		Grain-milk ratio		Concentrate ration		Calf ration		Tons hay and silage		Hay		Alfalfa		Permanent pasture		Temporary		Water supply											
Pounds per cow		1st serv.		1st serv.		(index)		ratio		Quality		Fed dry cows		Protein		Hay		Hay		Improved		Total		Excell. (rating)											
4% FCM		%		%		%		Morrison (2)		Excellent (2)		300(2)		Excellent (11)		5.1(1)		6.6(1)		4.4(1)		4.0(2)		2.0(1)		4.0(2)		3.9(1)		3.8		3.7		3.6	
Rank		Rank		Rank		Rank		Rank		Rank		Rank		Rank		Rank		Rank		Rank		Rank		Rank		Rank		Rank		Rank		Rank		Rank	
A	1	10522	33(1)	93(1)	127(1)	Morrison (2)	Excellent (2)	300(2)	Excellent (11)	5.1(1)	12.0(1)	6.6(1)	4.4(1)	3.2(1)	4.0(2)	2.0(1)	Excell. (17)																		
M	2	10354			125					4.5	4.4(1)	6.0	4.0(1)	3.1	3.9(1)	1.9																			
A	3	10301			123					4.4(1)	11.0	5.0(1)	3.5	3.1	3.8																				
A	4	9954	27(1)	90(5)	122	1:10(1)				4.3	4.3(1)	3.3(1)		3.0	3.7																				
A	5	9872			121					4.2(1)	10.0	4.5	3.0(3)	3.0(2)	3.6	1.8																			
M	6	9801	26		120	1:7 (1)	Good+	240(6)	Good+	4.1	4.5(1)	2.9		2.9	3.6																				
A	7	9431		89(1)	119					4.0(2)	9.0	4.4(1)	2.8	2.8	3.5(1)	1.7(1)																			
A	8	9328	25(1)		118					3.9	8.0(1)	2.7		2.7	3.4(1)																				
M	9	8741			117					3.8	4.2(1)	2.6		2.6	3.3																				
A	10	8503	24(2)	87(1)	116(1)					3.7	4.1	2.5		2.5	3.2																				
M	11	8227			115(1)	1:5.5(2)	Good(24)	210(1)	Good(24)	3.6	7.0(1)	4.1(1)	2.4	2.6	3.2(3)	1.5																			
A	12	8048	23		114					3.5(2)	6.7(1)	3.9(1)	2.3	2.5	3.1																				
A	13	7962		86(1)	113					3.4(2)	3.9(1)	2.2(1)		2.5(1)	3.0(5)	1.4(1)																			
M	14	7939	22(1)		112					3.3(2)	3.8(1)	2.1		2.4	2.9																				
A	15	7713			111			200(3)	Good-	3.2(1)	6.0(1)	3.7	2.0(8)	2.4	2.8	1.3																			
M	16	7681	21(1)	85(2)	110	1:5.0(4)	Good-(4)	15(2)	Good-	3.1(1)	3.7(1)	1.9		2.3	2.8(1)	Good-(3)																			
A	17	7522			109					3.0(6)	5.9(1)	3.6	1.8(1)	2.2	2.7(1)	1.2																			
M	18	7458	20(4)		108(1)					2.9	3.5(2)	1.7		2.2	2.6(1)																				
A	19	7343	84(2)		107			180(1)		2.8	5.5(1)	3.4(3)	1.6	2.1	2.5(2)	1.1																			
A	20	7275	19(4)		106(4)					2.7(2)	3.3	1.5(5)		2.1(1)	2.4																				
A	21	7157			105(3)	1:4.5(3)	Fair+	14(7)	Fair+(4)	2.6	5.0(1)	3.3(2)	1.4(1)	2.0(10)	2.4	1.0(8)																			
A	22	6930	18(4)	80(9)	104(1)					2.5(1)	4.0(1)	3.1(1)	1.3(1)	1.9	2.3																				
M	23	6900			103			140(1)		2.4(3)	3.1(1)	1.2		1.9	2.2	0.9																			
M	24	6868	17(6)		102(1)			135(1)		2.3(1)	3.0(4)	1.1(6)		1.8	2.1(2)																				
M	25	6805		75(5)	101					2.2(1)	3.2(1)	2.9	1.0	1.8	2.0	0.8(3)																			
M	26	6555	16(4)		100(1)	1:4(3)	Fair(1)		Fair(1)	2.1	2.9	0.9		1.7(1)	2.0(5)																				
M	27	6486			99					2.0(6)	3.0(2)	2.8(3)	0.8	1.6	1.9(1)	0.7(1)																			
M	28	6448	15(1)	70(5)	98(2)			120(7)		1.9	2.7(2)	0.7(3)		1.6(2)	1.8(4)																				
A	29	6375			97(1)					1.8	2.8(1)	1.6	0.6(2)	1.5	1.7(1)	0.6																			
M	30	5974	14(5)		96			100(2)		1.7(1)	2.5	0.5(1)		1.5(5)	1.6																				
M	31	5970		65(2)	95(2)	1:3.5(16)	Fair-		Fair-	1.6	2.3(1)	2.5(1)	0.4	1.4	1.6(2)	0.5(4)																			
A	32	5962	13(2)		94(3)					1.5(3)	0.9(1)	2.4(3)	0.3(1)	1.3	1.5(1)																				
M	33	5936			93			90(2)		1.4	0.9(1)	2.3	0.2(1)	1.3(2)	1.4	0.4(1)																			
M	34	5915	12(2)	60(2)	92(1)					1.3	2.2(1)	0.1		1.2	1.3(1)																				
A	35	5878			91(1)					1.2	0.8	2.1	0.0(5)	1.2(1)	1.2	0.3(1)																			
A	36	5820	11(2)		90(1)	1:3(9)	Poor(2)	11	Poor	1.1	2.1			1.1(2)	1.2(1)	Poor																			
M	37	5815			89			60(2)		1.0	0.5	2.0(4)		1.0(3)	1.1	0.2(2)																			
M	38	5525	10	50(5)	88(1)			35(1)		0.9(1)	0.3	1.8(2)		0.8(1)	1.0(5)																				
M	39	5477			87(1)					0.8(1)				0.6(1)	0.9	0.1																			
A	40	5475	9		86(1)					0.7	1.6			0.5(2)	0.8																				
M	41	5217	40(1)		70(1)	No grain(1)	—	10(1)	13	0.6(1)	0.0(27)	1.5(1)		0.0	0.8(1)	0.0(19)																			
A	42	5084	8(1)							0.5(2)																									
Standard		10000	16	100	90-100	Morrison	Excellent		Excellent		2.5	2.0		1.5																					
Factors		1, 3, 4, 5, 9, 10, 12, 13, 14, 15, 16, 17, and 18 are ranked (top to bottom) according to standards recommended in the study. Other factors are in numerical order.																																	

^a Factors 1, 3, 4, 6, 9, 10, 12, 13, 14, 15, 16, 17, and 18 are ranked (top to bottom) according to standards recommended in the study. Other factors are in numerical order. The number of cases is entered in parenthesis with rating.

JOB I

DETERMINING THE NECESSARY NUTRIENTS, THEIR SOURCES AND USE

- Objective:** The dairy farmer learn of the nutrients he will need to supply, and the sources in order to make the best net return from his dairy operation.
- Factors:** Total digestible nutrients; net energy; digestible protein; total protein; fats; palatability; laxativeness; variety; pasture; hay; silage; vitamins; minerals; water; antibiotic feed supplements; urea; pellets; and wafers.
- Evidence:** Morrison, 22nd Edition, pp. 47-48, 586-594, 627-634; Idaho Ag. Ext. Circ. 68, pp. 4-5; Illinois Ag. Ext. Circ. 667, pp. 26-31; Peterson, W. E., Dairy Science, 1950, pp. 455-468.
- Procedure:** List factors with help of farmers; present charts showing nutrients and sources; discuss characteristics of nutrients and how used by dairy cattle; present data on use of antibiotics and urea; help farmers decide how his feed supply can furnish the various nutrients.
- Follow-up:** In later discussions on feeding problems, refer back to what was taught until farmer becomes familiar with the terms listed as factors.

JOB II

FEEDING THE YOUNG CALF TO SIX MONTHS OF AGE

- Objective:** Farmers learn to grow heifers into good milk cows for herd replacements or for sale.
- Factors:** Quality of heifers to grow -- breeding; health; size; measuring growth; raising versus buying; raising versus veal production; effect on milk production of calf nursing cow; colostrum; milk versus milk replacer; quantity to feed; how long to feed milk; commercial starter versus home mix concentrates; when to pasture; feeding hay; providing water and salt.
- Evidence:** Morrison, 22nd Edition, pp. 657-682; Peterson, W. E., Dairy Science, 1950, pp. 286-305; Calif. Ag. Ext. Circ. 435; Arizona Agri. Ext. Circ. 198; U. Tenn. Ag. Ext. Circ. 198; U. Tenn. Ag. Ext. Leaflet 100; Swanson, E. W., The U. of Tenn. Dairy Department, "The effect of fattening heifers upon their growth and lactation," and "Principals and Practices for Successful Calf Raising"; Vermont Agr. Exp. Station Bulletin 564, June 1951; Greene County Survey Data, Standards III and V.
- Procedure:** Review Job I; discuss local practices; ask farmers to state problems; present charts showing costs of raising calves for herd replacement and for veal; compare cost of milk with milk replacers; present information on starter mixtures; compare cost of commercial starter with home mixed concentrate; present recommendations on amounts of feed needed; show how to check on growth of calves and heifers; compare production of well bred cows to those of inferior breeding; discuss make-up of digestive system of calf; help farmers to make plans for feeding their calves.
- Follow-up:** On future contacts with the farmers, discuss their progress on plans set up and help with new problems which may arise.

JOB III

FEEDING THE DAIRY HEIFER FROM SIX MONTHS OF AGE TO
FRESHENING TIME

- Objective:** The farmer learn the most economical way to feed his heifers and grow them into profitable producing cows.
- Factors:** When to start on pasture; kind and amount of pasture; concentrates required; level of feeding; normal growth; cost of raising heifers; kind and quality of hay; use of silage; growth index; age and weight to breed and freshen; water and salt requirements.
- Evidence:** Morrison, pp. 675-1088; 1116; Peterson, pp. 306-311; U. T. Ag. Ext. Leaflet 100; Calif. Ag. Ext. Circ. 107, pp. 19-23; Arizona Ag. Ext. Circ. 198, pp. 30-34; Calif. Ag. Exp. Sta. Circ. 435; "Weight Tape" and "Weight Chart"; Review of Greene County Data, Standards IV and V.
- Procedure:** Review Jobs I and II; discuss local practices; ask farmers to state problems; show how growth index may be determined by tape; show chart of normal weights for ages; present evidence on desirable age and weight for breeding; show nutrient requirements; help farmer decide on a feeding program for his heifers, including concentrates, roughage and pasture.
- Follow-up:** Discuss with individuals their program and aid with problems which may arise.

JOB IV

FEEDING LACTATING COWS DURING THE NO-PASTURE SEASON

- Objective:** The farmer learn to plan the most profitable feeding program for his herd.
- Factors:** Characteristics of a good ration; amount and kind of forage needed; use of silage; feeding the cows individually; the concentrate ration needed; selecting the feeds for the ration; TDN; protein; net energy; balancing rations; where and when to feed forage and concentrates.
- Evidence:** Morrison, pp. 627-632; Peterson, pp. 496-507; Univ. of Wisc. Ag. Econ. Bul. 18; Univ. of Delaware, Ag. Exp. Sta. Bul. 248; Univ. of Ill. Ag. Ext. Circ. 677; Arizona Ag. Ext. Circ. 226; USDA, ARS, 52-35; Greene County Survey Data; Ky. Ag. Exp. Sta. Bul. 648, pp. 5-33.
- Procedure:** Review Jobs I and III; discuss local practices; invite farmers to present problems; present data on the amount and kind of forage needed; review characteristics of a good ration; define TDN, protein, net energy; show how to select the most economical feeds for the ration; work out example rations for given cows; lead farmers to decide on rations for their milking herd.
- Follow-up:** Help farmer evaluate his feeding program and make any adjustments which seem desirable.

JOB V

FEEDING THE LACTATING COW DURING THE PASTURE SEASON

- Objective:** The farmer learn to determine the kind and amount of concentrates he can profitably feed during the pasture season to supplement pasture and other forages available.
- Factors:** Relative cost of concentrates and forage as a source of nutrients; feeding cows individually; supplementing pasture with other forage; when and where to feed the concentrate; water supply; minerals; salt; bloat control.
- Evidence:** Morrison, pp. 632-635; Peterson, pp. 508-518; Univ. of Ill. Ag. Ext. Circ. 667, pp. 14-17; Arizona Ag. Ext. Circ. 226; Wisconsin Ag. Ext. Circ. 446; Journ. Am. Vet. Assoc., Vol. 122, pp. 345-352; Purdue Ag. Ext. Mimeo. D-H 20; Purdue Ag. Ext. Mimeo. A-E-32; Ky. Ag. Exp. Sta. Bul. 648; pp. 5-34; Greene County Data, Standards VI, VII, VIII, IX and X.
- Procedure:** Review Jobs I and III; discuss local practices; invite farmers to present problems; present data on cost of producing nutrients with pasture, forage, and concentrates; present data on nutrient requirements for different levels of production and capacity of cow to utilize pasture and other feeds; balance rations for certain cows; present data on bloat control and water and salt requirements.
- Follow-up:** Help the farmer to evaluate his summer feeding program and to make any needed adjustments.

JOB VI

FEEDING THE DRY COW

- Objective:** Farmers to decide on a feeding program for their dry cows which will net them their highest return.
- Factors:** Condition of the dry cow and rate she should gain; quality of pasture or other forage available; length of dry period; nutrients required during dry period; her milk producing ability; periodic observation.
- Evidence:** Morrison, pp. 635-640; Peterson, pp. 505; Univ. of Ill., Ag. Ext. Circ. 677, pp. 22-23; USDA FB No. 1440, pp. 1-5; Ark. Ag. Ext. Circ. 453, pp. 6; Greene County Survey Data, Standard VIII; Ky. Ag. Exp. Sta. Bul. 648.
- Procedure:** Review Jobs I, IV, and V; discuss local practices; ask farmers to state problems; present data on nutrients required; study experimental data; present recommendations on gains desirable during dry period; help farmer set up plans for feeding during dry period.
- Follow-up:** Review with individual farmer his plans of feeding; help with problems encountered.

JOB VII

FEEDING THE COW AT CALVING TIME

- Objective:** The farmer learn to do the best possible job of feeding his cows and heifers two weeks before and two weeks after calving.
- Factors:** Special feed and care before calving; feeding after calving; preventing milk fever; preventing Ketosis; where to keep cow during this period; providing water; letting the calf nurse; milking after freshening.
- Evidence:** USDA FB 1470, pp. 2-4; Univ. of Ark., Ag. Ext. Serv. Circ. 453; Arizona Ag. Ext. Circ. 226, p. 25; Illinois Agr. Ext. Circ. 677, pp. 22-23; Feeds and Feeding, Morrison, 22nd ed. pp. 637-640; Dairy Science, Peterson, 1950, p. 505.
- Procedure:** Invite farmers to state problems and discuss local practices; present information on the kind and amount of feeds which should be supplied during this period; present data on feeding practices which may help prevent milk fever and Ketosis; help farmer set up feeding plans; recall unfortunate experiences.
- Follow-up:** Help with any problems encountered by the farmer.

CRANESEST CREST

JOB VIII

PROVIDING PASTURE FOR DAIRY COWS

- Objective:** The farmer provide the most profitable pasture program possible on his farm.
- Factors:** Soil types; acreage; permanent, temporary, and supplemental pastures; acres per cow; species of pasture crops; legumes and non-legumes; fertilization; rotational grazing; irrigating; other management factors: seed bed preparation, seeding rates and dates; cost of pasture.
- Evidence:** U. T. Ag. Ed. Subject Matter Mimeo No. 27; U. T. Ag. Exp. Sta. Bul. 272; U. T. Ag. Ext. Pub. 319; USDA F.B. No. 2080; Purdue Ag. Exp. Sta. Circ. 386; U. T. Ag. Exp. Sta. Bul. 249; Purdue Ag. Ext. Mimeo DH-37; U. T. Ag. Exp. Sta. Bul. 248; Purdue Ag. Ext. Mimeo. AE-27a; Greene County Soil Survey; Greene County Dairy Survey, Standards IX, X, and XI; U. T. Rural Research Series Mono. No. 268. pp. 28; U. T. Ag. Ed. Mimeo 25, pp. 2-8, p. 45.
- Procedure:** Discuss local pasture practices; invite farmers to state problems; present data on local soil types; list possible selection of pasture crops; present data on pasture requirements per cow; present cost-returns data on pasture crops; present data on legumes versus non-legumes; fertilizing; irrigating; and rotational grazing. Help farmers set goals on pasture production and management.
- Follow-up:** Work with individual farmers on special problems with his pasture program.

PROVIDING HAY AND SILAGE FOR DAIRY CATTLE

- Objective:** The farmer plan an accepted, economically sound hay and silage program for his farm.
- Factors:** The importance of hay and silage in the dairy operation; local practices; cost of producing hay and silage; amount of TDN expected from different sources; hay versus silage for dairy cattle; selecting species of crops for available land; fertilizing and liming; soil tests; seed bed preparation; seeding rates and dates; managing stands; irrigating; harvesting, amount needed; importance of quality forage; surplus growth from pastures.
- Evidence:** Ky. Ag. Exp. Sta. Bul. 648; USDA FB 2080, pp. 19-21; Greene County Soil Survey; Greene County Dairy Survey Data, Standards IX, X, and XI; U. T. Agr. Educ. Mimeo No. 27, pp. 228-242; Thompson, The Pasture Book, pp. 3-18, 83-95, 159-183; U. T. Ag. Ext. Service Pub. 216; Trimberger and Ward, Milk Production Per Acre, Cornell Univ.; Purdue Univ. Dairy Ext. Serv. Mimeo No. 6; U. T. Ag. Ext. Circ. 459; Calif. Ag. Ext. Circ. 411; U. T. Rural Research Series Mono No. 268, pp. 23-26; U. T. Ag. Ed. Mimeo 25, pp. 2-8 and 45.
- Procedure:** Discuss local practices and list problems of farmers; present data on cost of producing TDN with hay and silage; show how hay and silage fit into the local farming situations--land, climate, etc; present data on the cost of producing different hay and silage crops; make quality comparisons with the various crops; present data on seed bed preparation, fertilization, rates and dates of seeding, irrigation, harvesting, curing, and storing; show the feed requirements of dairy cattle; help farmers decide on the forage production plans for their farms.
- Follow-up:** Help the farmer to evaluate his hay and silage program and make any necessary adjustments.

SUMMARY AND CONCLUSIONS

Summary

The primary aim of this study was to find ways and means of helping Greene County dairy farmers to improve their net income. This study applies only to the feeding practices. Three steps were taken to secure information and materials to aid the agricultural worker in helping with dairy feeding problems:

1. A study of the feeding practices of forty-two dairy farmers of the county was made by personal interview to determine each farmer's present practices.

2. Standards were set up for twelve feeding practices. Information from the survey was used in setting up the standards, along with supporting evidence from experiment stations and dairy department personnel.

3. Lesson plans were developed for nine feeding jobs. These included the objective in teaching the job, the factors involved, the evidence to be used to help solve the problems, the procedure or steps in teaching, and the follow-up with the individual farmer.

In the analysis of the survey data, a correlation was made between the different feeding practices and the production of milk and the growth of young stock. There were surprisingly few indications that any one feeding practice showed any marked effect on the production of milk. Exceptions noted were in the use of alfalfa hay and supplemental summer pasture. Farms using these practices showed considerably more milk

production per cow than the ones not using them. In the case of alfalfa, there was a corresponding increase in production per cow as the amount of alfalfa hay increased, up to 2.9 tons' supply per cow per year.

Conclusions

The interviews with the farmers in collecting the survey data were a rewarding experience. It helped the agricultural workers and the farmer to focus their attention on problems not before recognized as such. Future contacts with the farmer by agricultural workers will be of still more value since they will be armed with tabulations from the survey data, standards for comparing with his present practice, and with a list of teaching materials and plans to help in solving problems.

Since the analysis showed that, with few exceptions, no one feeding practice had a marked effect on the production of milk or the growth of young stock, we can safely conclude that all phases of the feeding program need to be kept up to standard. Since the production and use of alfalfa hay resulted in higher milk production, we recommend that an adequate supply be grown on farms where soil resources permit. If summer supplemental pasture will fit in the farming program, it should be included. In cases where it does not fit, there should be provisions for summer feeding during dry periods through the use of silage or hay. Added fertilization to permanent pastures would add to the pasture supply in many instances. Since most of the farmers interviewed did a creditable job in feeding their calves, we would expect the growth rate to be about normal as shown in the analysis of the data. Much more difference in growth of calves was noted between

individual calves within herds than in averages between herds. This would indicate that perhaps disease and pest control and consistency in the use of accepted feeding practices need to be emphasized on some of the farms.

Even though feeding practices are of major importance in a dairy farm operation, there are many other management factors which need attention. Of these we might call attention to: (1) the breeding program, dealing with such problems as selection of breeding stock, the use of artificial breeding associations or better sires on the farm; (2) breeding records, production records through DHIA, Weigh-a-Day-a-Month, or other; (3) sanitation, disease and pest control. The management of permanent pastures is a problem which also needs considerable attention on most farms. Even though this is a part of the feeding program, it was not covered in the study of the farms surveyed. This and the other management factors listed above leave a wide choice of subjects for further study.

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APPENDIX A

GREENE COUNTY DAIRY SURVEY

62

Farmer _____ Address _____ Year _____

Acres Operated _____ Owned _____ Rented in _____

I. Nature and Size of Business:

1. No. of cows: (average for year) in production _____ Dry cows _____

Replacements: over 1 year _____ under 1 year _____ breed _____

2. Bulls: No. _____ purebred _____ grade _____ breed _____

3. Total yearly milk production _____ Ave. per cow _____

Average test _____ % Milk used at home _____ Fed calves _____

II. Herd Replacement:

4. Method of selection: Pedigree _____ Looks _____ No. replaced _____

5. How obtained: raised _____ bought _____ (show number of each)

6. Breeding of replacements: purebred _____ grade _____

III. Breeding Heifers and Cows:

7. Method: pasture _____ artificial _____ are records kept? _____

8. Per cent conception first service _____ % ave. no. services _____

9. Age of heifer at first breeding _____ weight when bred _____

IV. Care of Cow at Calving Time:

10. Are you on hand at calving time _____ how many calves died _____

11. Place of calving: winter _____ summer _____

12. How soon are cows milked after calving? _____

13. How soon are calves removed from cows? _____

V. Providing shelter and equipment:

14. Where are cows kept: Summer _____ winter _____

15. Source of water: summer _____ winter _____

Distance to water- maximum: summer _____ winter _____

VI. Controlling Diseases:

16. Diseases past year: Traceable to nutrient deficiencies _____

17. Other _____ past ten years _____

18. What practices are followed to prevent diseases? _____

19. Sanitation practices: disinfectant used when washing udders _____

Disinfectant used on teat cups after each cow _____

20. Vaccinations: calves and heifers for: Brucellosis ___ blackleg ___

21. Losses due to diseases _____ causes _____

VII. Controlling parasites:

22. Parasites _____ control measures _____

VIII. Milking and Caring for Milk:

23. Time of milking _____ AM _____ PM _____ how regular? _____

24. Method of preparing cow _____

25. Method of milking: hand _____ machine _____ parlor? _____ pipeline? _____

26. Type of cooler _____ How are cows stripped? _____

IX. Marketing:

27. Milk sold last year _____ lbs. price per lb. _____ ¢ grade _____

28. Month price highest _____ lowest _____ summer daily "base" _____ lbs.

29. Month of highest production _____ lowest _____

X. Keeping and Using Records:

30. Kind of records kept: Breeding _____ calving _____ DHIA _____

WADAM _____ other-production _____ feeding _____

costs _____ butterfat _____ other _____

31. Are records used often? _____ occasionally? _____ seldom? _____

XI. Measuring feeding efficiency of calves and heifers by securing weight:

Age of calf or heifer	Weight (ave.) for this age	Standard for breed	Per cent of standard
At birth	_____	_____	_____
3 months	_____	_____	_____
6 months	_____	_____	_____
9 months	_____	_____	_____
12 months	_____	_____	_____
15 months	_____	_____	_____
18 months	_____	_____	_____

FEEDING PROGRAM

	Concentrate ration	Hay	Pasture	Silage
--	--------------------	-----	---------	--------

Milking cows:

Summer

Winter

Dry cows:

Summer

Winter

Bred Heifers:

Summer

Winter

Heifers - 6 to 15 months

Summer

Winter

Calves to 6 months

Note: List kind and amount of each feed per cow per day; list ingredients and proportions in concentrate mixtures.

FEED PRODUCTION AND USE

62c

	Production			Quality (*)	Amount used for	
	Acres	Per A.	Total		cows	youngstock
<u>Grain:</u>						
1.	Corn					
2.	Oats					
3.	Barley					
4.						
5.						
<u>Hay:</u>						
6.	Alfalfa					
7.	Lespedeza					
8.	Oat					
9.						
10.						
<u>Silage:</u>						
11.	Corn					
12.	Corn and cane					
13.	Alfalfa					
14.	Grass & clover					
15.						
16.						
<u>Pasture:</u>						
17.	Or. grass & clover					
18.	Fescue & clover					
19.	Bluegrass					
20.	Sudan					
21.	Starr millet					
22.	Lespedeza					
23.						
24.						
(*) Excellent, good, fair, or poor						

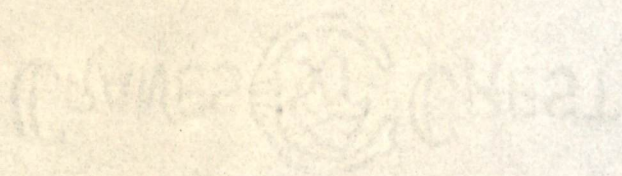
APPENDIX B

Table 2.—List of common dairy feeds, with a code number after each feed that refers to the column of the same code number in table 3

LOW-PROTEIN FEEDS		MEDIUM-PROTEIN FEEDS		HIGH-PROTEIN FEEDS			
Alfalfa-molasses feed-----	(15)	Kafir grain-----	(3)	Beans, field-----	(6)	Corn gluten meal-----	(3)
Barley-----	(4)	Milo head chops-----	(5)	Brewers' grains, dried-----	(11)	Cottonseed meal-----	(6)
Beet pulp, dried-----	(8)	Milo grain-----	(4)	Coconut oil meal, old process-----	(3)	Fish meal-----	(10)
Corn bran-----	(6)	Molasses, beet-----	(14)	Corn gluten feed-----	(5)	Linsed meal, old process-----	(4)
Corn, well-dried-----	(2)	Molasses, cane-----	(15)	Distillers' corn grains, dried-----	(1)	Linsed meal, solvent process-----	(7)
Corn, No. 2 grade-----	(3)	Oats-----	(8)	Distillers' grains, mixed dried-----	(6)	Peanut-oil-meal, old process-----	(2)
Corn-and-cob meal-----	(6)	Oat mill feed-----	(16)	Distillers' grains, mixed dried-----	(4)	Peanut-oil-meal, solvent process-----	(7)
Distillers' rye grains, dried-----	(12)	Orange pulp, dried-----	(4)	Pees and pea feed-----	(9)	Peanut-oil-meal, solvent process-----	(15)
Feterita grain-----	(4)	Potato flour-----	(5)	Peanut skins-----	(5)	Peanuts, whole pressed-----	(1)
Feterita head chops-----	(9)	Potato pomace, dried-----	(9)	Rye middlings-----	(4)	Skim milk, dried-----	(2)
Grapefruit refuse, dried-----	(6)	Rye-----	(3)	Wheat middlings-----	(8)	Soybeans--oil-meal, expeller process-----	(1)
Hegari grain-----	(3)	Sorghum grain-----	(6)	Wheat bran-----	(4)	Soybean--oil-meal, solvent process-----	(2)
Hominy feed-----	(1)	Wheat-----	(2)	Yeast grains, dried-----	(13)	Soybean--oil-meal, solvent process-----	(5)
Rice bran-----	(10)					Yeast, dried-----	(6)

Table 3.—Cost of 100 pounds of total digestible nutrients in various feeds at different prices per ton of feed.

Cost of feed per ton	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
25-----	1.47	1.51	1.54	1.56	1.62	1.67	1.71	1.76	1.81	1.87	1.92	1.98	2.05	2.12	2.19	2.21
30-----	1.76	1.81	1.85	1.90	1.95	2.00	2.05	2.11	2.17	2.24	2.31	2.36	2.46	2.54	2.63	2.69
35-----	2.06	2.11	2.16	2.22	2.27	2.33	2.40	2.46	2.54	2.61	2.69	2.78	2.87	2.97	3.07	3.17
40-----	2.35	2.41	2.47	2.53	2.60	2.67	2.74	2.82	2.90	2.99	3.08	3.17	3.26	3.36	3.46	3.57
45-----	2.65	2.71	2.78	2.85	2.92	3.00	3.08	3.17	3.26	3.36	3.46	3.57	3.69	3.81	3.95	4.10
50-----	2.94	3.01	3.09	3.16	3.25	3.33	3.42	3.52	3.62	3.73	3.85	4.00	4.10	4.24	4.37	4.51
55-----	3.24	3.31	3.40	3.48	3.57	3.67	3.77	3.87	3.99	4.10	4.23	4.37	4.51	4.66	4.82	4.98
60-----	3.53	3.61	3.70	3.80	3.90	4.00	4.11	4.23	4.35	4.48	4.62	4.76	4.92	5.08	5.26	5.43
65-----	3.82	3.92	4.01	4.11	4.22	4.33	4.45	4.58	4.71	4.85	5.00	5.16	5.33	5.51	5.70	5.89
70-----	4.12	4.22	4.32	4.43	4.55	4.67	4.79	4.93	5.07	5.22	5.38	5.56	5.74	5.93	6.14	6.36
75-----	4.41	4.52	4.63	4.75	4.87	5.00	5.14	5.28	5.43	5.60	5.77	5.95	6.15	6.36	6.58	6.82
80-----	4.71	4.82	4.94	5.06	5.19	5.33	5.48	5.63	5.80	5.97	6.15	6.35	6.56	6.78	7.02	7.27
85-----	5.00	5.12	5.25	5.38	5.52	5.67	5.82	5.99	6.16	6.34	6.54	6.75	6.97	7.20	7.45	7.70
90-----	5.29	5.42	5.56	5.70	5.84	6.00	6.16	6.34	6.52	6.72	6.92	7.14	7.38	7.63	7.89	8.17
95-----	5.59	5.72	5.86	6.01	6.17	6.33	6.51	6.69	6.88	7.09	7.31	7.54	7.79	8.05	8.33	8.61
100-----	5.88	6.02	6.17	6.33	6.49	6.67	6.85	7.04	7.25	7.46	7.69	7.94	8.20	8.47	8.77	9.07
105-----	6.18	6.33	6.48	6.65	6.82	7.00	7.19	7.39	7.61	7.84	8.08	8.33	8.59	8.86	9.15	9.45
110-----	6.47	6.63	6.79	6.96	7.14	7.33	7.53	7.75	7.97	8.21	8.46	8.73	9.02	9.32	9.65	10.00
115-----	6.76	6.93	7.10	7.28	7.47	7.67	7.88	8.10	8.33	8.58	8.85	9.13	9.45	9.75	10.09	10.45
120-----	7.06	7.23	7.41	7.59	7.79	8.00	8.22	8.45	8.70	8.96	9.23	9.52	9.84	10.17	10.53	10.90
125-----	7.35	7.53	7.72	7.91	8.12	8.33	8.56	8.80	9.06	9.33	9.62	9.92	10.25	10.59	10.96	11.33
130-----	7.65	7.83	8.02	8.23	8.44	8.67	8.90	9.15	9.42	9.70	10.00	10.32	10.66	11.02	11.40	11.79
135-----	7.94	8.13	8.33	8.54	8.77	9.00	9.25	9.51	9.78	10.07	10.38	10.71	11.07	11.44	11.84	12.24



APPENDIX C

1954 CENSUS OF AGRICULTURE--Preliminary

September 1955

GREENE COUNTY, TENNESSEE

U. S. DEPARTMENT OF COMMERCE

2—GREENE COUNTY, TENNESSEE

FARMS, FARM CHARACTERISTICS, AND FARM PRODUCTS

FARMS, FARM CHARACTERISTICS, AND FARM PRODUCTS

GREENE COUNTY, TENNESSEE--

Item	County total	Item	County total
SPECIFIED FACILITIES AND EQUIPMENT* Continued		FARMS BY TYPE OF FARM* Continued	
Motor trucks.....	farms reporting 1954..... 1,599 1950..... 1,374	Livestock farms other than dairy and poultry.....	1954..... 127 1950..... 299
Tractors.....	farms reporting 1954..... 1,720 1950..... 1,356	General farms.....	1954..... 480 1950..... 810
Wheel tractors other than garden.....	farms reporting 1954..... 1,684 1950..... 2,384	Primarily crop.....	1954..... 55 1950..... 48
Garden tractors.....	farms reporting 1954..... 1,582 1950..... 1,824	Primarily livestock.....	1954..... 134 1950..... 370
Crawler tractors.....	farms reporting 1954..... 1,391 1950..... 3,901	Crop and livestock.....	1954..... 1,775 1950..... 1,931
Automobiles.....	farms reporting 1954..... 1,339 1950..... 2,280	Miscellaneous and unclassified farms.....	1954..... 4,184 1950..... 4,062
Farms by class of work power:		FARMS BY ECONOMIC CLASS*	
No tractor, horses or mules.....	farms reporting 1954..... 1,339 1950..... 2,280	Class I (value of products sold, \$25,000 or more).....	1954..... 18 1950..... 7
No tractor and only 1 horse or mule.....	farms reporting 1954..... 1,339 1950..... 2,280	Class II (value of products sold, \$10,000-\$24,999).....	1954..... 65 1950..... 8
Tractor and 2 or more horses and/or mules.....	farms reporting 1954..... 1,339 1950..... 2,280	Class III (value of products sold, \$5,000-\$9,999).....	1954..... 191 1950..... 110
Tractor and no horses or mules.....	farms reporting 1954..... 1,339 1950..... 2,280	Class IV (value of products sold, \$2,500-\$4,999).....	1954..... 795 1950..... 646
Family and/or hired workers.....	farms reporting 1954..... 5,334 1950..... 5,439	Class V (value of products sold, \$1,200-\$2,499).....	1954..... 1,825 1950..... 1,722
Family workers, including operator.....	farms reporting 1954..... 5,334 1950..... 5,439	Class VI (value of products sold, \$250-\$1,199).....	1954..... 1,290 1950..... 1,569
Operators.....	farms reporting 1954..... 5,334 1950..... 5,439	Other farms.....	1954..... 1,770 1950..... 1,916
Unpaid members of operator's family.....	farms reporting 1954..... 3,311 1950..... 4,454	Part-time ¹	1954..... 1,095 1950..... 969
Hired workers.....	farms reporting 1954..... 1,005 1950..... 5,654	Residential (with less than \$250 value of products sold).....	1954..... 675 1950..... ...
Specified farm expenditures.....	farms reporting 1954..... 5,654 1950..... 5,235	Abnormal (public and private institutional farms, etc.).....	1954..... 1950..... 1950.....
Machine hire and/or hired labor.....	farms reporting 1954..... 4,015 1950..... 3,122	HORSES AND MULES	
Machine hire.....	farms reporting 1954..... 3,208 1950..... 293,920	Horses and/or mules.....	1954..... 2,760 1950..... 3,440
Hired labor.....	farms reporting 1954..... 2,934 1950..... 465,380	Cattle and calves.....	1954..... 5,064 1950..... 5,175
Feed for livestock and poultry.....	farms reporting 1954..... 1,042,970 1950..... 689,517	CATTLE AND DAIRY PRODUCTS	
Gasoline and other petroleum fuel and oil.....	farms reporting 1954..... 2,939 1950..... 2,364	Milk cows.....	1954..... 3,118 1950..... 28,151
Commercial fertilizer.....	farms reporting 1954..... 4,949 1950..... 789,085	Heifers and heifer calves.....	1954..... 2,582 1950..... 2,605
Lime and liming materials.....	farms reporting 1954..... 75,860 1950..... 382	Sheets, bulls, and steer calves.....	1954..... 1,569 1950..... 1,469
Crops on which commercial fertilizer was used, 1954:		Whole milk sold.....	1954..... 3,361 1950..... 7,398,442
Hay and cropland pastured.....	farms reporting 1954..... 1,317 1950..... 19,755	Cream sold.....	1954..... 5,837,544 1950..... 2,210,744
Other pasture.....	farms reporting 1954..... 5,692 1950..... 3,119	POULTRY	
Corn.....	farms reporting 1954..... 3,838 1950..... 23,508	Hogs and pigs.....	1954..... 3,408 1950..... 3,842
Tobacco.....	farms reporting 1954..... 4,119 1950..... 4,553	Born before June 1.....	1954..... 14,273 1950..... 16,771
Fruits, vegetables, potatoes, etc.....	farms reporting 1954..... 399 1950..... 208	Born since June 1.....	1954..... 3,041 1950..... 8,478
Other crops.....	farms reporting 1954..... 1,398 1950..... 2,661	Sows and gilts farrowing.....	1954..... 5,795 1950..... 806
Field-crop farms other than vegetable and fruit-and-nut.....	farms reporting 1954..... 17,251 1950..... 2,825	June 1 to December 1.....	1954..... 1,727 1950..... 858
Cash-grain.....	farms reporting 1954..... 2,105 1950..... 43	SHEEP AND WOOL	
Cotton.....	farms reporting 1954..... 2,790 1950..... 2,062	Sheep and lambs.....	1954..... 80 1950..... 62
Other field-crop.....	farms reporting 1954..... 2,062 1950..... 5	Lambs under one year old.....	1954..... 1,925 1950..... 2,245
Vegetable farms.....	farms reporting 1954..... 1950..... ...	Ewes one year old and over.....	1954..... 402 1950..... 76
Fruit-and-nut farms.....	farms reporting 1954..... 1950..... ...	Rams and wethers one year old and over.....	1954..... 1,404 1950..... 115
Dairy farms.....	farms reporting 1954..... 1950..... ...	Sheep and lambs shorn.....	1954..... 66 1950..... 55
Poultry farms.....	farms reporting 1954..... 1950..... ...	Wool shorn.....	1954..... 1,466 1950..... 9,011
Part-time farms include those with value of products sold of \$250-\$1,199 and operator either reporting 100 days or more of off-farm work or reporting other income exceeding value of agricultural products sold.		Average date of enumeration.....	1949 10/24-10/31

Item	County total	Item	County total
POULTRY AND POULTRY PRODUCTS		SPECIFIED CROPS HARVESTED—Continued	
Chickens, 4 months old and over, on hand.....farms reporting 1954.....	4,675	Sorghums—Continued	
1950.....	5,258	Sorghum for all purposes except sirup—Continued	
1950.....	238,289	Cut for silage.....farms reporting 1954.....	63
1950.....	259,492	1950.....	433
1950.....	687	1950.....	4
1950.....	1,690	1950.....	18
1950.....	36,504	1950.....	3,828
1950.....	48,326	1950.....	160
Broilers sold.....farms reporting 1954.....	3	Hogged or grazed, or cut for dry	
1954.....	6,000	forage or hay.....farms reporting 1954.....	271
1954.....	3,430	1954.....	130
1954.....	685	1954.....	427
1954.....	30,504	1954.....	177
1954.....	21,962	1954.....	897
1954.....	2,655	1954.....	1,989
1954.....	3,866	Small grains:	
1954.....	830,624	Grains grown together and threshed as a	
1954.....	300,735	mixture.....farms reporting 1954.....	847
1954.....	162	1954.....	1,005
1954.....	4,298	1954.....	6,425
1954.....	7,380	1954.....	8,183
1954.....	1,977	1954.....	158,028
1954.....	2,342	1954.....	190,745
1954.....	98	1954.....	1,285
1954.....	423	1954.....	11,814
1954.....	49	1954.....	8,307
1954.....	210	1954.....	163,054
1954.....	49	1954.....	158,089
1954.....	213	1954.....	697
1954.....	4,304	1954.....	650
1954.....	4,843	1954.....	4,866
1954.....	1,355,275	1954.....	9,923
1954.....	1,877,733	1954.....	132,915
1954.....	4,189	1954.....	104,801
1954.....	4,660	1954.....	204
1954.....	27,023	1954.....	1,209
1954.....	22,984	1954.....	565
1954.....	1,597	1954.....	31,811
1954.....	5,317	1954.....	11,545
1954.....	390,583	1954.....	56
1954.....	4,053	1954.....	43
1954.....	21,706	1954.....	224
1954.....	762,468	1954.....	127
1954.....	897	1954.....	3,328
1954.....	1,713	1954.....	1,634
1954.....	8,364	1954.....	7
1954.....	15,899	1954.....	105
1954.....	173,187	1954.....	126
1954.....	63	1954.....	160
1954.....	32	1954.....	444
1954.....	1,110	1954.....	90
1954.....	1,004	1954.....	80
1954.....	18,762	1954.....	607
1954.....	137	1954.....	10
1954.....	182	1954.....	10
1954.....	10,475	1954.....	15
1954.....	3,536	1954.....	22
1954.....	3,998	1954.....	12
1954.....	24,124	1954.....	15
1954.....	32,072	1954.....	15
1954.....	3,460	1954.....	15
1954.....	3,975	1954.....	13
1954.....	23,295	1954.....	5
1954.....	31,552	1954.....	5
1954.....	712,830	1954.....	4
1954.....	1,044,337	1954.....	4
1954.....	55	1954.....	2
1954.....	38	1954.....	2
1954.....	489	1954.....	2
1954.....	389	1954.....	2
1954.....	3,915	1954.....	2
1954.....	3,583	1954.....	6
1954.....	69	1954.....	6
1954.....	40	1954.....	6
1954.....	340	1954.....	6
1954.....	131	1954.....	6
1954.....	347	1954.....	6
1954.....	148	1954.....	6
1954.....	999	1954.....	6
1954.....	213	1954.....	6
1954.....	13	1954.....	6
1954.....	15	1954.....	6
1954.....	99	1954.....	6
1954.....	18	1954.....	6
1954.....	2,532	1954.....	6
1954.....	251	1954.....	6

APPENDIX D

SILAGE SCORE CARD

Silage is green forage which under anaerobic conditions has undergone a spontaneous lactic acid fermentation, by which it has become a stable, palatable product.

Based on Order of Observation		Perfect Score
1. CONDITION - 50 points		
A. STAGE OF MATURITY - Optimum stages of maturity are as follows: legumes - bud to early bloom stage, grasses-boot stage, corn-late dough to early dent stage, cereal grains-late milk to early dough stage, sorghums - dough stage.		25
B. MOISTURE CONTENT - Optimum moisture content ranges from 65 to 75%.		5
C. COLOR - Natural for species and type of additive with no indications of heating or molding.		10
D. PHYSICAL FORM-SILAGE should be finely chopped to insure adequate compaction.		5
E. FOREIGN MATERIAL - Grasses, legumes and cereal grains should be free of weeds and stubble.		5
F. GRAIN - Corn and sorghum should have ample quantity of grain.		-
2. FERMENTATION - 50 points		
A. ODOR - Pleasant and inoffensive, characteristic of type of silage being judged; free from putrefactive (butyric acid and ammonia), moldy and caramelized odors.		30
B. p^H - Grass, legume and cereal grain silages should have a p^H of 4.2 or less. Corn and sorghum silages should have p^H of 3.8 or less.		<u>20</u>
Total		100

Information

Name of Owner _____ Date _____

Address _____ County _____ State _____

Species _____ State of Maturity _____ Harvesting Date _____

Type and Amount of Additive _____ Type and Capacity of Silo _____

TABLE 4 (continued)

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SCORE	CLASSIFICATION	NUMERICAL CLASS
90-100	Excellent	I
80-90	Good	II
70-80	Fair	III
below 70	Poor	IV

CLASS CHARACTERISTICS

Class I.

Silage harvested at a desirable stage of maturity, finely chopped, which has undergone a favorable fermentation as indicated by a pleasant, in-offensive odor and a p^H which is in the desired range.

Class II.

Silage which has either (a) poor condition (advanced stage of maturity) or (b) an unfavorable fermentation as indicated by offensive odors (butyric acid, ammonia, caramelized, fishy) and/or a p^H which is well above the desired range.

Class III.

Silage which has both poor condition and an unfavorable fermentation.

Class IV.

Silage which is moldy, musty or in advanced stages of putrefaction as indicated by a high p^H , ammonia odor and slimy condition. This type of material is unfeedable and cannot justly be termed silage.

EVALUATION OF SILAGE DEFECTS

In slight to serious discrimination, the degree of seriousness shall be determined by the judge.

ADVANCE STAGE OF MATURITY: slight to serious discrimination.

HIGH p^H : slight to serious discrimination (suggested cut - 2 points for each 0.1 p^H unit above desired level.

HIGH OR LOW MOISTURE CONTENT: slight to serious discrimination.

COURSE CONDITION: slight discrimination.

FOREIGN MATERIAL: (weeds, stubble, etc.) slight to serious discrimination.

LACK OF GRAIN: (corn and sorghum) slight to serious discrimination.

OFFENSIVE ODOR: (Butyric acid, stench, sour, ammonia, fishy) slight to serious discrimination.

CARAMELIZED: serious discrimination.

MOLDY OR MUSTY: disqualification.

PUTREFACTION: disqualification.

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