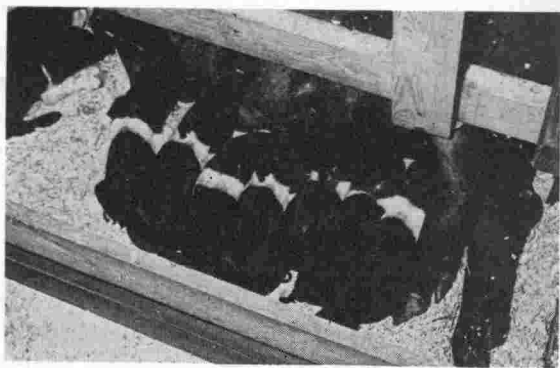


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Livestock Numbers and Practices Farms in the Elk River Watershed Area of Tennessee, 1964

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SUMMARY

The Tennessee Agricultural Experiment Station in cooperation with the Agricultural Extension Service and the Tennessee Valley Authority made a special study in the Elk River Watershed seven-county area of South Central Tennessee to gather information that would facilitate intensive educational efforts toward more efficient management of livestock.

In this study it was found that on many farms the different kinds of livestock and combinations of two or more kinds on individual farms were associated with various characteristics of the land and the farm labor. In general, the farmers in the study area have done quite well in adjusting livestock systems to the resources available. However, advantageous adjustments could be made in farm organization on some farms. These adjustments could involve one or more of the following: change to different kinds of livestock, a larger farm, more livestock, different cropping systems and practices, or doing some off-farm work.

In particular, this study shows that much improvement could be made in the management of the livestock enterprise or enterprises on many farms in the study area. If all farmers in these seven counties had followed most of the livestock practices encouraged by the Agricultural Extension Service, the gross income from livestock, on the basis of 1964 prices, would have been increased about \$6,000,000 in 1964. Of course, some of the increase in gross income would have been needed to pay for extra feed and other inputs to obtain the higher production of livestock. But some of the extra feed could have been produced on the farm by improving cropping systems and practices.

The study showed that more years in school would not always guarantee a more efficient farm manager. However, the managers who followed most of the livestock practices encouraged by the Agricultural Extension Service, and who obtained more livestock income per animal, in general, had more schooling than the other managers. Possibly the former were the type of persons who realized the need for more schooling, and who would make use of "information concerning livestock practices."

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Livestock Numbers And Practices on Farms In the Elk River Watershed Area Of Tennessee, 1964

by

W. P. Ranney*

INTRODUCTION

Purpose of Study

In 1959 the United States Census of Agriculture showed that 48.5% of the agricultural income in Tennessee came from livestock and livestock products.¹ This percentage for the seven-county area in South Central Tennessee which includes the Elk River Watershed was 64.0%. These data in 1954 for the State and the Elk River area were 41.0% and 55.6%, respectively. The Agricultural Extension workers in the seven-county area felt that the above facts called for greater emphasis on educational efforts designed to help farmers increase the efficiency of their livestock.

This publication reports the results of a study made in 1964 by the University of Tennessee Agricultural Experiment Station in cooperation with the University of Tennessee Agricultural Extension Service, and the Tennessee Valley Authority. The purpose of the study was to facilitate the above-mentioned educational efforts. The objectives were two-fold: 1) to ascertain the livestock situation in the area and the greatest needs for educational efforts that could be directed toward increasing farm income from livestock, and 2) to establish a benchmark for measuring the effectiveness of such educational efforts over some selected period of time.

The study included analyses to show the sizes and patterns of livestock combinations on the farm; selected characteristics of the farms and people on the farms; significant relationships of livestock practices to livestock production or income; the percentages of certain practices followed by the farmers for their major

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¹U. S. Bureau of Census, *Census of Agriculture, Tennessee, 1959.*

classes of livestock; and marketing information that may be pertinent to livestock income.

Description of Area

The seven counties studied were Coffee, Franklin, Giles, Grundy, Lawrence, Lincoln and Moore (Figure 1).² Most of these counties lie in the Southern highland Rim area; parts of Giles, Lincoln, and Moore counties lie in the Central Basin; and part of Grundy County is on the Cumberland Plateau.

There is considerable variation in the soil associations in the area. The following are included: Cumberland-Waynesboro-Decatur, Hartsells-Muskingum, Sango-Bodine, Baxter-Dellrose-Mimosa, and Dickson-Mountview-Bodine associations.³ Average annual precipitation in the area varies from 52 to 54 inches. Average number of days without a killing frost varies from about 190 to 210.

While there is considerable variation in physical characteristics among counties within the study area, there are also wide variations within each county and within individual farms in every county. However, the effects of livestock practices on livestock efficiency is pertinent to every farm.

Source of Data Used

The information used in this study was obtained by interviewing an estimated 11% of the farmers in the study area in 1964.⁴ Larger percentages of the total number of farmers were obtained in the small counties. An attempt was made to include all farms in the 2-mile square blocks selected at random.

The schedules used in the interviews included questions about size of farms; major land uses; crop yields and cropping practices pertaining to quantities and qualities of roughages produced; kinds and numbers of livestock kept; production and sales of livestock and products for beef cattle, dairy cattle, and hogs; production and

²Throughout this manuscript the term "study area" is meant to include the entire area in the seven counties shown in Figure 1.

³General descriptions of these soil associations and information on the climate are presented by Joe A. Martin and B. H. Luebke, **Types of Farming in Tennessee**, Agricultural Experiment Station Bulletin No. 311, March, 1960, pp. 15-22.

⁴Special thanks are extended to the farmers who provided information about their farms and to the county agricultural agents and marketing firms for their help in the study. Two Master's theses have been developed from this information: "An Analysis of Selected Livestock Practices and Enterprise Returns on Farms in the Elk River Watershed" by Daniel B. Smith, and "The Competitive Position of the Manufacturing Milk Enterprise in the Elk River Watershed" by Odie W. Smith, Jr.

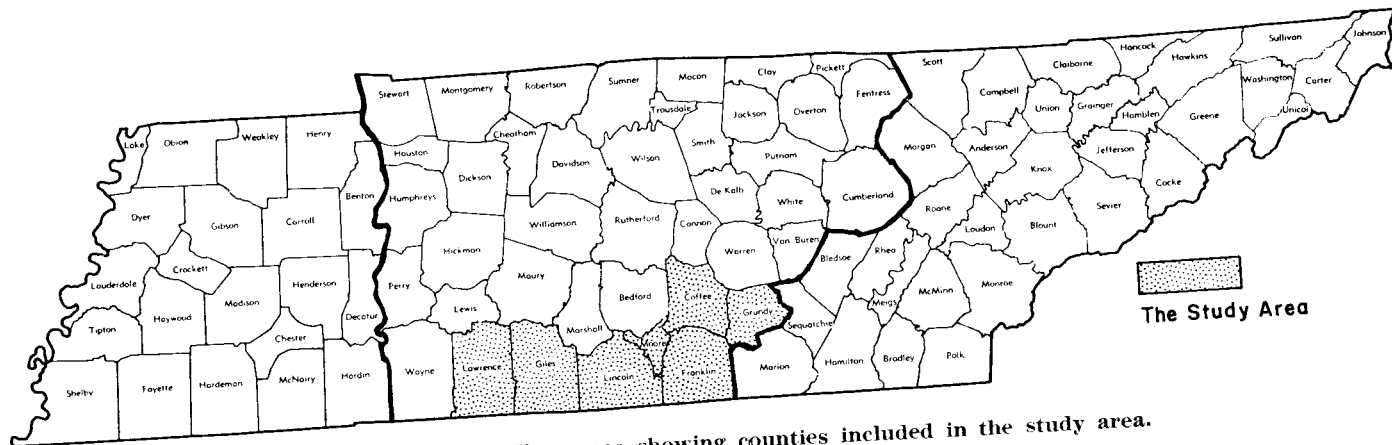


Figure 1. Map of Tennessee showing counties included in the study area.

marketing practices followed for these three kinds of livestock; age, years of schooling of the operator, and months worked off the farm; and months of labor provided by other members of the family and by hired help.

Preliminary reports summarizing the data for each class of livestock, by counties, were prepared early in 1965 for use by the Agricultural Extension workers in their educational programs in each county. The analyses for the present publication involve all of the data obtained for the whole area, rather than separately by counties.

Estimated Number and Percentage of Farms by Size, Type and Economic Class in Study Area, 1959 and 1964

The number of farms to expect in the seven counties and in the sample blocks were estimated from county highway maps.⁵ Farmsteads are shown on these maps as black squares. After adjusting for abandoned and new farmsteads found in the survey, the sample of 811 farms was estimated to represent about 11% of the total number of farms. The latter was projected at approximately 7,400. This figure might vary somewhat from the Census for 1964⁶ because no attempt was made to make adjustments for abnormal farms, such as institutional farms and nurseries. Also, the interviewers may have missed some of the small part-time and part-retirement farms.

The data in Table 1 show that the number of farms in the study area declined about 25% from 1959 to 1964. Census data show about 20% decline in number of farms from 1954 to 1959 and about 15% decline from 1950 to 1954.⁷ The average size of farms increased about 10% during the 1950-1954 period and about 14% during the 1954-1959 period.

The data in Table 1 show that the proportional decrease in number of farms was greatest for the smaller farms. In three

⁵General Highway Map, _____ County, Tennessee, prepared by the Tennessee State Highway Department, Highway Planning Survey Division in cooperation with the U. S. Department of Commerce, Bureau of Public Roads, 1960.

⁶The United States Census of Agriculture Report for Tennessee for 1964 had not been completed when this manuscript went to press for publishing.

⁷U. S. Bureau of Census, **Census of Agriculture for the years 1950, 1955, and 1960**. There were some minor differences in definitions of farms in these Census reports. Also, the estimated total number of farms in the study area in the 1960 Census varies among Tables 1, 2, and 3 in this manuscript because of some differences in subsamples used in the Census analyses.

of the size groups above 220 acres there was an absolute increase in the estimated number of farms.

The estimated data in Table 2 show that the percentage of total farms by type went up most markedly for the "livestock other than dairy or poultry" and the general type (vegetable farms also increased, but there were only a few of these farms). There was a pronounced decrease in the number and percent of cotton farms, and considerable decreases in the cash grain, tobacco, and poultry types.

Table 1. Comparisons of numbers of farms by size for study area, 1959 and 1964

Range in size, acres	U. S. Census of Agriculture, 1959		Present study, 1964	
	Number of farms	Percent of total	Estimated number of farms	Percent of total
Under 10	835	6.8	37	.5
10 - 49	3,275	26.7	906	12.2
50 - 69	1,486	12.1	758	10.2
70 - 99	1,861	15.2	1,396	18.8
100 - 139	1,733	14.2	1,396	18.8
140 - 179	1,041	8.5	765	10.3
180 - 219	630	5.2	579	7.8
220 - 259	371	3.0	461	6.2
260 - 499	764	6.2	713	9.6
500 - 999	224	1.8	364	4.9
1,000 or more	41	.3	52	.7
Total	12,261	100.0	7,427	100.0

Table 2. Comparisons of number and classification of farms in study area by type, 1964 study and 1959 Census Data

Type of farms ^a	From U. S. Census of Agriculture, 1959		Present study, 1964	
	No. of farms	Percent of total	Estimated no. of farms	Percent of total
Cash grain	257	4.2	185	3.8
Tobacco	245	4.0	137	2.8
Cotton	1,453	23.7	531	10.9
Other field crops	15	.2	10	.2
Vegetable	5	.1	29	.6
Fruits & nuts	15	.2	10	.2
Poultry	119	1.9	63	1.3
Dairy	1,272	20.7	1,023	21.0
Other livestock	1,719	28.0	1,720	35.3
General	1,041	17.0	1,164	23.9
Total commercial	6,141	100.0	4,872	100.0
Total commercial	6,141	49.8	4,872	65.6
Part-time	4,405	35.7	1,589	21.4
Part-retirement	1,777	14.4	966	13.0
Abnormal	6	.1		
Total farms	12,330	100.0	7,427	100.0

^aA farm was designated by the product name, if that product accounted for 50% or more of the cash sales of agricultural products, both in the 1959 Census of Agriculture and in the present study. Other commercial farms were classified as general farms.

Source: U. S. Bureau of Census, **Census of Agriculture, 1959**, and present study, 1964.

The estimated data in Table 3 show that the percentages of commercial farms falling in Economic Classes II and III increased materially from 1959 to 1964. This change would be expected in view of the decrease in number of the smaller farms, and an increase in the average size of farm. The upward change could also result from greater numbers of livestock in proportion to size of farm, and from increases in the productivity of the livestock and of the land. Any changes in prices of products would also have some effect on the proportions of farms in the various economic classes on the two dates.

Human Resources on Sample Farms in the Study Area, 1964

The human resources must be considered when planning the organization of farms and the improvement of the farm operations. These resources are related to numerous things, including amount of time spent at off-farm work, labor received from the family, labor hired, education and other training, age of operator, and age and sex of the other family labor. Coefficients used to convert workers by age and sex were presented in Tennessee Experiment Station Bulletin 304.⁸

For the present study, it is shown in Table 4 that in 1964, 60% of the farm operators were 50 years old or older, 30% were 60 years old or older, and 10% had already reached the age of 70. Only about 16% of the farm operators in the study area were under 40 years old.

⁸"The Labor Force on Tennessee Farms," by W. P. Ranney, University of Tennessee Agricultural Experiment Station Bulletin 304, October, 1959, Appendix 1.

Table 3. Comparisons of number and classification of commercial farms in study area, by economic class, 1964 study and 1959 Census Data

Economic class of commercial farms ^a	From U. S. Census of Agriculture, 1959		Present study, 1964	
	Estimated number of farms	Percent of total	Estimated number of farms	Percent of total
I	37	.6	10	.2
II	84	1.4	273	5.6
III	418	6.7	521	10.7
IV	1,224	19.7	780	16.0
V	2,384	38.4	1,749	35.9
VI	2,062	33.2	1,539	31.6
Total	6,209	100.0	4,872	100.0

^aThe basis for classification of commercial farms by Economic Class in the 1959 Census was by range of gross sales of agricultural products as follows: I, \$40,000 or over; II, \$20,000 - \$39,999; III, \$10,000 - \$19,999; IV, \$5,000 - \$9,999; V, \$2,500 - \$4,999; and VI, \$50 - \$2,499, provided (1) the farm operator was under 65 years of age, (2) he did not work off the farm 100 days, and (3) the income that he and members of his household received from nonfarm sources was less than the total value of farm products sold.

Source: U. S. Bureau of Census, **Census of Agriculture, 1959**, and present study, 1964.

About 23% of the operators had no more than 6 years of schooling. Only 35% of the farmers had more than 1 year of high school education; 5% had some college training.

Nearly 30% of the farm operators reported working full time off the farm in 1964. About two-thirds of the farmers worked less than 4 months off the farm, most of them less than 2 months (Table 5).

Also shown in Table 5, 75% of the farm operators received less than 1 month of man-equivalent labor from their families and only about 10% used 4 or more months of this type of labor. The amount of hired labor used was about the same as that of family labor, with most of it for less than 4 months.

Table 4. Percentage of farm operators in the sample studied, by age and years of schooling, 1964

Age of operator		Years of schooling of operator	
Range in age	Percent of operators	Range in years of schooling	Percent of operators
20 - 29	4.1	0	3.2
30 - 39	11.7	1 - 3	3.0
40 - 49	23.8	4 - 6	16.5
50 - 59	30.1	7 - 9	42.0
60 - 69	20.3	10 - 12	30.0
70 - 79	7.8	13 - 15	3.0
80 & above	2.2	16 & above	2.3
Total	100.0	Total	100.0

Table 5. Percentage of farm operators in the sample studied who worked off the farm and used family and hired labor, by number of months, 1964

Operator worked off farm		Operator used family & hired labor		
Range in number of months	Per-cent	Range in number of months	Family labor ^a	Hired labor
			Percent	
0 - 1.9	64.0	0 - .9	75.2	64.2
2 - 3.9	2.2	1.0 - 3.9	14.3	23.4
4 - 5.9	1.6	4.0 - 6.9	3.7	4.2
6 - 7.9	1.2	7.0 - 9.9	1.5	1.4
8 - 9.9	1.7	10.0 - 12.9	2.8	3.6
10 - 11.9	4	13.0 - 19.9	1.5	1.2
12	28.9	20.0 & above	1.0	2.0
Total	100.0	Total	100.0	100.0

^aThe months of family labor were computed on a man-equivalent basis, using the data in Appendix 1, Tennessee Agricultural Experiment Station Bulletin 304.

CLASSIFICATION AND DESCRIPTION OF THE FARMS IN THE STUDY AREA BY KINDS AND AMOUNTS OF LIVESTOCK, 1964

Kinds, Combinations, and Units of Livestock⁹

Nearly one-half (47%) of the farms in the study area were highly specialized in regard to kind of productive livestock. On more than half of these, 213 farms in the study sample, beef cows were kept for producing calves for sale approximately at weaning time (Tables 6 and 7). The other specialized livestock farms included 94 with dairy cows (sale of manufacturing milk), 32 with dairy cows (sale of grade-A milk), 13 with production of market hogs for sale, 20 with production and sale of feeder pigs, 6 farms on which cattle were purchased for feeding out, 3 farms that had only goats, and 1 on which there was only a large broiler enterprise. Among these groups with only one kind of livestock, the farms with grade-A dairy herds and the one with broilers had the largest number of livestock units.

On 284 farms (35% of the sample), there were 2 or 3 of the following livestock enterprises: beef cow-calf, dairy (sale of

⁹The basis for computing a livestock unit for each kind of livestock was the approximate average gross income per head in 1964 in the area studied. The factors used in the computations were the following (the herd sires and replacement animals were not figured separately):

	Units per head		Units per head
Dairy cow (manufacturing milk)	1	Sow (2 litters hogs)	3
Dairy cow (grade-A milk)	2	Feeder pig purchased	.20
Beef cow (sell weanling calf)	.67	Laying hen	.033
Steer or heifer fed out	.67	Broiler	.004
Ewe (or goat)	.25	Turkey	.05
Sow (2 litters feeder pigs)	1		

Table 6. Average number of livestock units per farm, number of farms in sample, and estimated number in study area, by kinds of livestock, 1964

Major kinds of livestock in group	Av. no. of livestock units per farm in sample	No. of farms in sample	Estimated no. of farms in 7 counties
Beef cow-calf	12	213	1,951
Beef cow-calf & sows (sell pigs)	16	56	513
Beef cow-calf & sows (sell hogs) & buy pigs	53	54	494
Beef cow-calf & feed out cattle	36	12	110
Beef cow-calf & sheep (or goats)	19	15	137
Grazing cattle, &/or milk cows for home use	3	62	568
Buy and feed out some cattle	21	6	55
Dairy cows (manufacturing milk)	11	94	861
Dairy cows (m'f'g milk), & beef c.c.	19	37	339
Dairy cows (m'f'g milk), beef c.c., & sows (sell hogs) & buy pigs	56	22	201
Dairy cows (m'f'g milk), beef c.c., & sows (sell pigs)	25	16	147
Dairy cows (m'f'g milk) & sows (sell pigs)	13	35	321
Dairy cows (m'f'g milk) & sows (sell hogs)	29	17	156
Dairy cows (grade-A milk)	102	32	293
Dairy cows (grade-A milk) & beef c.c.	68	6	55
Dairy cows (grade-A milk) & sows (sell hogs) & buy pigs	118	5	45
Sows (sell hogs) & buy pigs	14	13	119
Sows (sell pigs)	4	20	183
Poultry, with dairy cows (m'f'g milk) &/or a few other kinds	158	10	92
Goats	4	3	27
Workstock only livestock kept	2	19	174
No livestock	—	64	586
Total	—	811	7,427

Table 7. Average number per farm in sample of different kinds of livestock, by kinds of livestock, 1964

Major kinds of livestock in group ^a												
	Dairy cows	Beef cows	Cattle fed	Other cattle ^b	Sows (sell hogs)	Sows (sell pigs)	Pigs bought	Ewes	Goats	Hens	Broilers	Work-stock
Beef c.c.		18		5						2		.4
Beef c.c., sell pigs		15		7		5.0		1.0	2.0	8		.8
Beef c.c., sell hogs		30	9	8	6.0	.5	10.0	4.0	3.0	8	780	.9
Beef c.c., feed cattle		24	28	10				1.0		18		.7
Beef c.c., sheep ^c		17		3				20.0	7.0	7	4	.2
15 Grazing cattle, dairy cows, home use				5			.2	.6	.3	4		.4
Feed "purchased cattle"			29				8.0					1.2
Dairy (MM)	11			3						5		.9
Dairy (MM), beef c.c.	10	14		6			.1	1.0		4		.9
Dairy (MM), beef c.c., sell hogs	14	22	2	11	6.0	.3	16.0	1.0		96		1.1
Dairy (MM), beef c.c., sell pigs	10	12		5		3.0		6.0	12.0	14		1.1
Dairy (MM), sell pigs	9			4		2.0		4.0	.3	19	10	1.1
Dairy (MM), sell hogs	13			5	4.0			2.0	2.0	92	15	2.0

Table 7. (Continued)

Major kinds of livestock in group ^a	Dairy cows	Beef cows	Cattle fed	Other cattle ^b	Sows (sell hogs)	Sows (sell pigs)	Pigs bought	Ewes	Goats	Hens	Broilers	Workstock
Dairy (Gr. A.)	50			19	.2	.2				2	144	.7
Dairy (Gr. A.), beef c.c.	48	23		18	1.0	1.0				2		.5
Dairy (Gr. A.), sell hogs	25		2	14	4.0		39.0	5.0		20		.0
Sell hogs				5	3.0	.5	20.0	2.0				.6
Sell pigs				2		4.0				2		.7
Mainly poultry	14 ^d	8		13	1.0	2.0			6.0	930	3130 1760 ^e	3.0
Goats									14.0			.7
Workstock												1.9

^aBeef c. c.: beef cow-calf; Dairy (MM): dairy cows (manufacturing milk); Dairy (Gr. A.): dairy cows (grade-A milk).

^bReplacement stock and herd sires.

^cIncludes some goats.

^dSell manufacturing milk.

^eTurkeys

manufacturing or grade-A milk) and swine (sale of market hogs and/or feeder pigs). The principal combination was that of beef cow-calf and swine, which was found on 110 farms. These were about evenly divided in respect to sale of market hogs and feeder pigs. On 37 farms there was a combination of dairy (manufacturing milk) and beef cow-calf. Only on 41 farms was there a combination of three major livestock enterprises. On 38 of these there were dairy (manufacturing milk), beef cow-calf, and swine (on 22 of these market hogs, and on 16 feeder pigs were sold). On 3 of the 10 farms with large poultry enterprises, there were two other enterprises from among dairy (manufacturing milk), beef cow-calf, and/or swine.

A combination of dairy (manufacturing milk) and swine was on 52 farms studied; two-thirds of these swine enterprises involved the sale of feeder pigs. On 6 of the grade-A dairy farms there was a beef cow-calf enterprise, and on 5 there was the production and sale of market hogs. The farms in the latter group were on the average second to the poultry group in average number of livestock units.

The combination of beef cow-calf and fattening cattle was found on 12 farms. Beef cow-calf and sheep (or goats) were the major enterprises on 15 farms.

On 62 of the farms in the sample there were only a few head of cattle grazed and/or one or more milk cows kept for producing milk for home use. On 83 farms no productive livestock were kept. Workstock were reported on 19 of these 83 farms.

The above classification portrays the principal livestock setups on the farms in the sample. On one of the farms with a combination of beef cow-calf and swine (sell hogs) and on one of the farms specified as specialized grade-A dairy in Table 6, there were broiler enterprises. On many of the farms there were replacement cattle, herd sires, 1 or 2 hogs for home consumption, a few sheep or goats, and a few hens or other poultry (Table 7). Approximately one-third of the farms in the sample had one or more workstock.

For the various combinations of livestock enterprises shown in Tables 6 and 7, the percentages that the number of livestock units in each of the two major enterprises were of the total number of livestock units on the farms, respectively, are shown in Table 8. The standard deviations (of these percentages) presented in Table 8 indicate the degree of similarity or dissimilarity

Table 8. Average proportions of total livestock units represented by different kinds of livestock, sample farms in study area, 1964

Major kinds of livestock in group	Total units of livestock ^a	Major kind of livestock			Principal minor kind of livestock		
		Kind of livestock in group	Av. % of total units of livestock	Standard deviation ^b of %	Major kinds of livestock in group	Av. % of total units of livestock	Standard deviation ^b of %
Beef c.c., sell pigs	16	beef c.c.	59	20	sell pigs	38	17
Beef c.c., sell hogs	53	sell hogs	47	20	beef c.c.	43	20
Beef c.c., feed cattle	36	beef c.c.	52	21	feed cattle	45	19
Beef c.c., sheep	19	beef c.c.	64	13	sheep (or goats)	36	13
Dairy (MM), beef c.c.	19	dairy c. (MM)	52	17	beef c.c.	46	17
Dairy (MM), beef c.c., sell hogs	56	sell hogs	42	17	beef c.c.	29	15
Dairy (MM), beef c.c., sell pigs	25	dairy c. (MM)	42	13	beef c.c.	32	8
Dairy (MM), sell pigs	13	dairy c. (MM)	73	18	sell pigs	26	16
Dairy (MM), sell hogs	29	dairy c. (MM)	48	20	sell hogs	42	18
Dairy (Gr. A.), beef c.c.	68	dairy c. (Gr. A.)	78	12	beef c.c.	20	10
Dairy (Gr. A.), sell hogs	118	dairy c. (Gr. A.)	81	4	sell hogs	16	5
Mainly poultry	158	poultry	76	15	dairy (MM)	10	6

^aSee footnote on page 13 for method of computing total livestock units on each farm.

^bStandard deviation of the % of total livestock units represented by the kind of livestock, respectively; it represents the range above and below the average within which approximately two-thirds of the farms lie.

Table 9. Average acres of selected land uses and average index of crop yields, by kinds of livestock, sample farms, 1964

Livestock combinations	Acres land rented in	Total acres operated	Acres of cropland			Acres woodland past.	Acres corn for grain	Index of crop yields ^a
			Idle	Crops harvested	Pastured			
Beef c.c.	7	158	14	28	53	29	5	96
Beef c.c., sell pigs	9	192	13	33	60	31	11	95
Beef c.c., sell hogs	3	322	13	76	70	55	24	99
Beef c.c., feed cattle	27	240	5	84	68	31	23	115
Beef c.c., sheep	0	187	5	25	62	50	4	75
Grazing cattle, M. cows, home use	17	105	17	26	22	14	9	103
Feed purchased cattle	17	103	7	33	41	8	7	104
Dairy (MM)	12	116	3	25	34	22	9	94
Dairy (MM), beef c.c.	22	170	4	32	55	53	7	88
Dairy (MM), beef c.c., sell hogs	28	260	13	74	70	52	18	108
Dairy (MM), beef c.c., sell pigs	44	199	6	43	57	64	9	95
Dairy (MM), sell pigs	31	122	5	31	31	30	10	91
Dairy (MM), sell hogs	28	130	1	55	35	20	19	99

Table 9. (Continued)

Livestock combinations	Acres land rented in	Total acres operated	Acres of cropland			Acres woodland past.	Acres corn for grain	Index of crop yields ^a
			Idle	Crops harvested	Pastured			
Dairy (Gr. A.)	61	376	13	111	112	90	38	112
Dairy (Gr. A.), beef c.c.	67	368	25	93	108	86	16	85
Dairy (Gr. A.), hogs	94	296	10	146	77	38	48	111
Sell hogs	9	146	9	40	34	28	10	96
Sell pigs	12	85	10	17	14	18	7	94
Mainly poultry	11	192	29	63	42	35	17	98
Goats	0	60	2	15	7	24	1	89
Only workstock	4	64	9	10	14	15	3	64
No livestock	8	110	57	17	0	8	3	90

^aWeighted average percentage computed from the percentages that yields of crops harvested on a farm are of the averages of all farms in the study sample, weighted by the acres of each kind of crop on each farm, respectively.

among the farms in respect to the proportion of total livestock units that were of the kind specified.

Farm-Size and Land-Use Characteristics

Table 9 shows that the average size of the sample farms in this study was largest for the following three groups: 1) grade-A dairy specialized farms, 2) farms with grade-A dairy and beef cow-calf, and 3) farms with beef cow-calf and market hogs. Next in average size were the following groups: 1) farms with grade-A dairy and market hogs, 2) the combination of dairy (manufacturing milk), beef cow-calf, and market hogs, and 3) farms with beef cow-calf and feeding out cattle. The groups with smallest average size were: 1) those with only goats, 2) farms with only "sell feeder pigs," and 3) those with only workstock.

A few very large farms were in the following groups: 1) specialized grade-A dairy, 2) specialized beef cow-calf, 3) beef cow-calf and sell feeder pigs, and 4) beef cow-calf and sell market hogs. One or two farms with between 500 and 600 acres were found in each of 2 or 3 other groups. It appears that special effort was made on the grade-A dairy farms to enlarge the size because Table 9 shows that more land was "rented in" in the three groups with grade-A dairy cows than in the other groups.

The proportion of total acres that was idle cropland was largest in the group with no livestock. All cropland was idle on about 40% of these farms. Many of the farms in this group had the whole farm in government conservation programs.

The groups of farms in Table 9 that had most acres of corn harvested for grain were the specialized grade-A dairy farms and the farms with a combination of grade-A dairy and market hogs. Two groups that included either market hogs or feeding out cattle ranked next highest in acres of corn. It was not possible to determine whether more corn was raised because more was needed on the farms in these groups, or whether there was more land on the farms in these groups that was suitable for corn production. Soil maps were not obtained for the farms studied.

In most of the groups in Table 9, there were on the average more acres of cropland pasture than woodland pasture. Exceptions to this rule were found in the group that had only goats, the one that had only workstock, and in 2 of the 4 groups in which feeder pigs were an important enterprise.

About one-third of the farms in the sample had cotton and/or

burley tobacco allotments. No analysis was made in this study of the proportions of cropland used for cash crops.

Operator and Labor Characteristics

The data in Table 10 do not show any pronounced relationships of operator and labor characteristics with kinds and combinations

Table 10. Average selected data concerning the operator and other labor in the study area, by kinds of livestock, sample farms, 1964

Major kinds of livestock in group	Operator			Months labor from family	Months labor hired
	Age, yrs.	Yrs. in school	Months worked off farm		
Beef c.c.	52.8	9.0	5.4	.6	1.3
Beef c.c., sell pigs	48.5	8.8	6.0	1.1	1.0
Beef c.c., sell hogs	53.1	9.4	2.4	1.1	4.4
Beef c.c., feed cattle	51.2	10.4	5.0	2.7	4.8
Beef c.c., sheep	56.2	10.0	5.8	1.2	1.7
Grazing cattle, milk cows, h. u.	56.5	7.7	5.1	.9	1.4
Feed purchased cattle	53.7	7.8	10.7	2.6	.5
Dairy (MM)	54.2	7.5	2.8	1.4	1.1
Dairy (MM), beef c.c.	49.7	7.9	4.0	1.3	.9
Dairy (MM), beef c.c., sell hogs	48.9	9.1	1.1	2.3	3.1
Dairy (MM), beef c.c., sell pigs	52.1	7.9	3.2	.7	1.5
Dairy (MM), sell pigs	54.9	7.3	1.6	3.3	.5
Dairy (MM), sell hogs	46.5	7.9	2.4	1.8	1.3
Dairy (Gr. A.)	47.7	10.9	3.6	4.1	13.0
Dairy (Gr. A.), beef c.c.	45.7	10.5	2.0	1.3	7.3
Dairy (Gr. A.), sell hogs	48.2	11.6	0	3.2	9.2
Sell hogs	52.7	8.2	5.5	2.4	1.4
Sell pigs	48.0	8.4	6.9	1.2	.5
Mainly poultry	51.1	9.9	2.4	5.0	11.6
Goats	46.0	7.3	5.0	8.0	0
Only workstock	56.2	5.8	4.4	.9	.3
No livestock	56.5	8.3	4.3	1.3	3.3

of livestock. In general, as would be expected, more labor was hired in the groups with largest farms, particularly those with the large grade-A dairy herds and large poultry enterprises. Other relationships of personal characteristics with kinds of livestock may not be apparent because of interrelationships of these characteristics with size of enterprise. The relationships of certain characteristics with size of the livestock enterprise, and the relationships of various characteristics with kinds of livestock or size of enterprise held approximately constant, are discussed in the following section.

Relationships of Selected Farm and Labor Characteristics to Size of Livestock Enterprises and to Kinds of Livestock

The data in Table I in the Appendix show that in the study area the farmers with large livestock enterprises had larger farms and in general had more acres in crops, cropland pasture, woodland pasture, and corn than the farmers with smaller numbers of the same kind of livestock, respectively. In other words, keeping large numbers of cattle and hogs in confinement was not a general practice in this area in 1964.

There was a tendency for the farmers with large livestock enterprises to have had more schooling than the farmers who had smaller numbers of livestock of the same kind, respectively. However, the difference was significant in only half of the groups shown in Appendix Table I.

There was in general more family and/or hired labor on farms with larger numbers of livestock of a particular kind than on the farms with smaller livestock enterprises.

The average age of the operator and the months that the operator worked off the farm are not shown in Table I because in most of the groups they were not correlated significantly with the amount of a particular kind of livestock.

In Tables II to XV inclusive in the Appendix, comparisons are made between various characteristics for different kinds and combinations of livestock, with total number of livestock units held approximately equal. The following relationships are indicated by the comparisons in these tables for the year 1964:

1. More of the labor-intensive kinds of livestock were generally found on the smaller farms than on the larger farms;

2. More renting-in of land was found on the farms that had the more labor-intensive kinds of livestock than on other farms;
3. There were more acres of harvested crops, particularly corn, and less idle cropland, on farms where the livestock included dairy cows and hogs than on the farms where beef cow-calf, sheep, and/or sale of feeder pig enterprises predominated;
4. There was a tendency for the beef cow-calf enterprise to be found on more farms with low crop yields than on other farms;
5. More cropland and woodland pasture acreages were on farms that had mostly roughage-consuming types of livestock, particularly beef cow-calf and sheep, than on other farms;
6. More of the younger operators were found on the farms that had the more labor-intensive livestock enterprises;
7. In general, the operators with manufacturing milk dairies had fewer years of schooling and less time at off-farm work than operators with other kinds of livestock;
8. There was little association of use of family labor with kinds of livestock on the farms;
9. The average months of hired labor was greater on three groups of specialized dairy farms than on three diversified dairy, or beef and hog farms, respectively.
10. Amount of workstock was related to labor-intensity of livestock, probably because this kind of livestock (with the exception of grade-A dairies) was on the smaller farms.

DESCRIPTION OF LIVESTOCK AND LIVESTOCK PRODUCTION BY ENTERPRISES AND PRACTICES

Beef Cattle

The beef cow-calf enterprise was found on 436 farms, which amounts to over half of the farms in the sample (Table 11). Over 10% of these had only one brood cow. The average number of brood cows per farm was 19, with a range of 1 to 200. The average number of calves sold or weaned per 100 cows bred was 92.

Table 11. Number of farms in sample and estimated number of farms in study area, and number of animals per farm in sample by kinds of beef cattle, 1964

Kinds of beef cattle kept	Sample studied	Estimates for seven-county area
		Number of farms
Brood cows and/or other kinds	450 ^a	4,118
Brood cows only	436	3,993
More than one brood cow	389	3,562
Both brood cows and stockers & feeders	38	345
Stockers and feeders only	14	125
All farms with stockers and feeders	51	470
	Average per farm	
Number of brood cows	19	
Number of brood cows per herd sire	16	
% that number of calves sold or weaned were of number of cows bred	92	
For farms that had stockers & feeders		
Number of head per farm	25	
Number of steers that were home raised	10	
Number of heifers that were home raised	5	
Number of steers that were purchased	8	
Number of heifers that were purchased	2	

^aThis figure does not include small farms with a few calves grazed mainly for home consumption.

Table 12 shows that 57% of the brood cows and 70% of the herd sires were Herefords. Twenty-six percent of the brood cows were of mixed breeds, but only 2% of the herd sires were mixed.

Table 12. Percentages of brood cows and herd sires by breeds, study area, 1964

Breed	Brood cows	Herd sires
	Percent	
Hereford	57	70
Angus	15	24
Shorthorn	2	4
Mixed	26*	2

*There were a few mixed with dairy breeds.

Most of the beef calves were born in the 4 months, January to April, and most were sold in September and October (Table 13). The average weight of the home-raised calves when sold was 413

Table 13. Percentages of births and sales of most of calves by months, average per farm, study area, 1964

Months	Most of calves born	Most of calves sold
	Percent	
January	17	1
February	29	2
March	17	3
April	11	3
May	7	1
June	3	3
July	2	4
August	0	10
September	1	36
October	2	32
November	4	3
December	7	2

pounds (Table 14). The average price received per hundredweight was \$21.43, with an average receipt per calf of \$88. Most of the calves were sold ungraded, and most were sold at weekly auctions.

Table 14. Average value of calves sold and weaned per beef cow bred and marketing data on calf weights and prices, distance and cost of hauling, types of sale and grades of calves, study area, 1964

	Average per farm
1. Value of calves sold and weaned per brood cow bred	\$ 88
2. Weight of calves sold, lbs.	413
3. Price received per cwt. for calves sold at weaning time ^a	\$ 21.43
4. Distance hauling calves to market, miles	19
5. Hauling charge per load	\$ 7
6. Farmers selling most of their calves at following places:	Percent
(a) Weekly auctions	84
(b) Organizational sales	2
(c) Special stocker sales	1
(d) Home farm	11
(e) Other	2
7. Farmers selling most of their calves by grades as follows: ^b	
(a) Choice	1
(b) Good	11
(c) Medium	9
(d) Ungraded	79

^aThese prices do not include prices received for calves sold as registered stock for breeding purposes.

^bThis distribution is for only about 80% of the farmers questioned, because about 20% of the farmers questioned did not remember anything concerning the grades of calves sold.

In Table 15 are data pertaining to calves held over or purchased for grazing and/or feeding, with separate information for steers and heifers. More of these cattle than weanling calves were sold graded, with the largest percent being graded good.

Table 15. Information reported by farmers who kept stockers and feeders, by heifers and steers, study area, 1964

	Steers	Heifers
Information only for farms with calves purchased		
	Average per farm	
1. Weight per calf purchased, lbs.	464	340
2. Price paid per cwt.	\$21.86	\$19.60
Information for all stockers and feeders (both raised and purchased)		
3. Weight per animal sold, lbs.	825	748
4. Price received per cwt.	\$19.89	\$19.40
5. Farmers selling these cattle:	Percent	
(a) as feeders	26	32
(b) for slaughter	74	68
6. Farmers selling these cattle to:		
(a) packer buyer	21	12
(b) order buyer	13	4
(c) auction yard	52	65
(d) terminal yard	8	15
(e) organized sales	0	0
(f) other	6	4
7. Farmers reporting most of these cattle sold by grade:		
(a) choice	0	9
(b) good	48	54
(c) medium	16	11
(d) ungraded	36	26

Table 16 shows that there were numerous causes of beef animal deaths, with the most frequent causes being birth difficulty and scours.

Table 16. Average percent of cows that failed to get with calf, that dropped dead calves, percent of calves that died before weaning, and percentages of beef animal deaths by various causes, study area, 1964

	Percent
1. Average percent of cows failed to get with calf	3
2. Average percent of cows dropped dead calves	2
3. Average percent of calves died before weaning age	3
4. Average percentage of 289 beef animal deaths by various causes:	
Birth difficulty	31
Scours	10
Pneumonia	8
Bang's disease	8
Accidents	8
Frozen	6
Rabies	6
Lightning	3
Blackleg	3
Malnutrition	3
Drowned	2
Bloat	2
Other	10

In Table 17 it is seen that all of the farmers used hay for brood cows and very few used silage and protein supplement in addition to pasture. On 45% of the farms in the sample the brood cows were fed some grain. Less than half of the farmers with steers and heifers used hay, but 28% of them fed protein supplement. The average period of keeping these steers and heifers was about 5 months, the steers being fed concentrates most of this time, while the heifers were fed concentrates an average of 3.5 months.

Table 17. Kinds and amounts of feed used for beef cattle and percent of farmers using the feeds, by kinds of cattle, study area, 1964

Kinds of feed	Kinds of livestock		
	Brood cows	Stockers and feeders	
		Steers	Heifers
	Percent of farmers using the feed		
Hay	100	43	43
Silage	4	2	2
Grain	45	100	86
Protein supplement	9	28	28
	Pounds of feed per animal (for those using the feed)		
Hay	3,200	1,600	2,600
Silage	6,200	2,600	4,000
Grain	45	1,430	636
Protein supplement	73	143	85
	Average months per farm		
Period pastured and/or fed roughage		5.1	4.7
Period fed some concentrates		4.8	3.5

The percentages of farmers in the sample who followed various beef cattle practices are shown in Table 18. These percentages ranged from 7 to 96. On 96% of the farms the cows were bred on pasture, but only 20% used a restricted breeding season. Only 7% of the farmers used a sire that was performance tested. The practices that were related to control of diseases were not followed on many of the farms, and only 57% of the farms were above average in number of practices that generally tend to improve quality of roughages.

It is difficult to measure the amount of extra money income that would be realized in the seven-county area if all of the farmers

Table 18. Percent of farmers that followed specified beef cattle management practices, study area, 1964

Practice	Percent of farmers with brood cow herd that followed the practice
Cows purebred (but not necessarily registered)	16
Calves sold at 8 to 10 months	66
Calves creep fed	12
Cows fed protein supplement	9
Herd considered brucellosis free	84
Worming of calves practiced	24
Sire performance tested	7
Restricted breeding season used	20
Being above average in number of practices that improve quality of roughages	57
Raised polled calves or dehorned	57
Herd sire registered	48
Vaccinate for blackleg	58
Grub control practiced	67
Vaccinated for malignant edema	10
Vaccinated for leptospirosis	7
Herd tested for brucellosis	77
Sire of different breed than most of the cows	30
Cows bred on pasture	96

with beef-cow-calf cattle followed most of the practices. This is because there were so many practices included in the analysis. The beneficial effects of some approved practices followed were offset by the opposite effects when other practices were not followed on the same farms. The extra value per cow of the calf sold is shown in Table 19 for 13 different practices. For 5 of these, the variations within the groups were probably quite wide, for the differences in the average value per cow of the calf sold was not sufficient to be shown as significant at the .10 level by the t test.¹⁰

When the combined effect of following over 75% of the 13 practices is compared with that of having less than 25% followed, the difference in the average value per cow of the calf sold was above \$50, which difference tested significant with the t test at less than the .01 level. The extra gross income from beef cattle in the seven-county area, if all the farmers followed most of the practices considered, was estimated to amount to over \$3,000,000 per year.

¹⁰There were more than 10 chances in 100 that the differences were due to mere chance.

Table 19. Relationships of selected beef cow-calf herd practices to value of calf sold per cow bred for herds in sample with more than 20 brood cows, study area, 1964

Practice				Num- ber of farms	Aver. value of calf per cow bred	t test level ^a
1.	Over 50% of cows purebred	: Yes		34	\$110.70	****
	Over 50% of cows purebred	: No		80	83.54	
2.	Calves sold at 8 to 10 months old	: Yes		33	101.84	****
	Calves sold at 8 to 10 months old	: No		44	84.86	
3.	Calves creep fed	: Yes		26	104.31	****
	Calves creep fed	: No		88	87.90	
4.	Cows fed protein supplement	: Yes		15	104.33	**
	Cows fed protein supplement	: No		84	90.62	
5.	Herd considered brucellosis free	: Yes		99	93.68	**
	Herd considered brucellosis free	: No		14	77.93	
6.	Worming of calves practiced	: Yes		42	97.69	*
	Worming of calves practiced	: No		70	87.83	
7.	Herd sire performance tested	: Yes		18	102.22	*
	Herd sire performance tested	: No		95	89.56	
8.	Restricted breeding season used	: Yes		26	99.58	*
	Restricted breeding season used	: No		87	89.17	
9.	Over 75% of high quality rough- age practices	: Yes		38	97.50	—
	Under 55% of high quality rough- age practices	: No		25	89.24	
10.	Raised polled calves or dehorned	: Yes		85	93.54	—
	Raised polled calves or dehorned	: No		28	85.54	
11.	Used registered herd sire	: Yes		91	92.74	—
	Used registered herd sire	: No		23	87.30	
12.	Vaccinated for blackleg	: Yes		84	93.33	—
	Vaccinated for blackleg	: No		30	86.90	
13.	Grub control practiced	: Yes		86	92.76	—
	Grub control practiced	: No		28	88.21	
Farms having over 50% of above practices with Yes answer				49	102.63	****
Farms having under 50% of above practices with Yes answer				65	83.35	
Farms having over 9 of above practices with Yes answer				7	128.43	****
Farms having under 3 of above practices with Yes answer				7	74.28	

****, $P < .01$

**, $P > .02, < .05$

*, $P > .05, < .10$

—, $P > .10$

Dairy Cattle

Based on the number of dairy farms in the sample, it was estimated that in the seven-county area manufacturing milk was sold from over 2,000 farms and grade-A milk from about 400 farms (Table 20). But on the grade-A farms the average number of dairy cows per farm was four times as great, the average milk production per cow about 84% higher, and the average price received per hundredweight of milk sold about 50% higher than on the manufacturing milk farms (Tables 20 and 21). Hence, it is

Table 20. Estimated number of dairy farms, average annual amounts and values of milk sold per cow, per dairy farm and for study area, by types of markets for milk, 1964

Items	Types of markets	
	Grade-A milk	Manufacturing milk
Number of farms in sample	43	227
Estimated number of farms in 7 counties	391	2,064
Average number of cows per dairy farm	46	11
Average pounds of milk sold per dairy cow	6,100	3,866
Average cwt. of milk sold per dairy farm	2,806	425
Total amount of milk sold in 7 counties (10,000 lbs.)	10,971	8,772
Average net value of milk sold per dairy cow	\$ 280	\$ 119
Average net value of milk sold per dairy farm	\$12,880	\$1,309
Total net value of milk sold in 7 counties (\$1,000)	\$ 5,036	\$2,701

Table 21. Average percentages of total milk sold, percentages of butterfat in the milk, and prices received per hundred-weight of milk sold, by months and types of markets for milk, 1964*

Months	Aver. % of total milk sold		Aver. % of butterfat in the milk sold		Aver. price rec'd per cwt. of milk sold	
	Type of market milk		Type of market milk		Type of market milk	
	Grade A	Manufacturing	Grade A	Manufacturing	Grade A	Manufacturing
Jan.	7.7	4.6	4.5	4.8	\$5.35	\$3.63
Feb.	7.2	4.4	4.5	4.7	5.27	3.54
Mar.	8.2	5.6	4.2	4.3	5.12	3.34
Apr.	8.9	8.6	4.1	4.2	4.90	3.20
May	9.1	11.2	4.1	4.2	4.79	3.20
June	8.5	12.4	4.1	4.2	4.78	3.22
July	8.7	13.3	4.1	4.3	4.85	3.25
Aug.	9.2	12.8	4.1	4.3	4.92	3.28
Sept.	8.8	10.4	4.2	4.4	5.13	3.38
Oct.	8.2	7.5	4.3	4.5	5.34	3.58
Nov.	7.5	5.0	4.4	4.8	5.16	3.73
Dec.	8.0	4.2	4.5	5.0	5.54	3.82

*These are averages of the individual farm averages.

Table 22. Information pertaining to dairy herd feeding practices, study area, 1964

Practices	Percent of farms reporting
Milk cows	14
Fed silage	
Kinds of silage:	88
Corn	2
Grain sorghum	7
Sweet sorghum	3
Non-legume grass	
	36
Fed concentrates, commercial	64
Fed concentrates, home mixed	8
Fed grain according to production	11
Fed mineral supplement	64
Fed salt	43
Fed trace mineral salt	18
Mineral salt mixed with feed	
	14
Concentrates fed to yearling heifers	
Fed to calves	81
Whole milk	9
Whole milk and calf starter	10
Milk replacer and calf starter	
	Average per farm
Silage fed per cow on farms silage was fed, tons	4.6
Hay fed per cow, tons	1.7
Legumes in hay, % (mostly lespedeza hay)	92
Acres of pasture per cow equivalent unit of all livestock (good improved legume pasture equivalent)	2.0
% of practices to improve quality of roughage that were followed	70
Concentrates per cow, lbs.	1,861
Months that concentrates were fed to yearling heifers	6
Pounds of concentrates fed per yearling heifer per day	4
Estimated feed cost per cow ^a	
Grade-A dairy farms	\$171
Manufacturing milk farms	\$104

^aPrices used in computing the feed costs were: silage, \$8 per T.; Alfalfa hay, \$30 per T.; other legume hay, \$24 per T.; other hay, \$20 per T.; concentrates (protein supplement mixed in), 2.8 cents per lb.; and pasture, per acre of good legume pasture equivalent, \$15.

estimated that yearly over \$2 million more income in the seven counties came from grade-A than from manufacturing milk farms. On the other hand the average feed cost per cow was about 65% higher for the grade-A herds than for the manufacturing milk herds. Based on the differences in feed cost per cow shown in Table 22, the income above feed cost in the seven counties would amount to over \$1.5 million in favor of the grade-A herds.

Another important fact shown in Table 21 is that a much greater percent of manufacturing milk than of grade-A milk was sold during the summer months when milk prices were lower than in other months. Table 22 shows that 14% of the dairy herds were fed silage, which is higher than the percent of beef herds fed silage. However, it is a low percentage.

The data in Table 23 show that over 50% of the dairy herds were Jerseys, but that 43% of the herd sires were Herefords and 10% were Angus.

Table 23. Percentage of farmers selling milk to plants reporting specified breeds as the major breeds, study area, 1964

Breeds	Cows	Bulls
	Percent of farmers reporting	
Jersey	51	14
Crossbred	21	0
Holstein	15	18
Guernsey	10	7
Brown Swiss	1	3
Milking Shorthorn	1	2
Ayrshire	1	1
Shorthorn	0	2
Angus	0	10
Hereford	0	43

Some information in Table 24 is pertinent to amounts of depreciation per cow, and to certain disease control measures. It is rather striking that 17% of the dairy farmers reported some foot rot trouble. Miscellaneous information that may be useful in

Table 24. Information pertaining to replacement and disposal of animals for study area, 1964

	Purchases		Sales	
	Age, months	Value	Age, months	Value
	Average per farm			
Cows	44	\$137	96	\$111
Heifers	12	107	17	94
Bulls	15	119	32	187
				Average per farm
% of heifer calves sold to dairymen				23
% of bull calves sold to dairymen				68
% of bull calves sold at birth				15
% of calves sold for veal				68
Time after calving before rebreeding, days				60
Age heifers first freshen, months				25
Number of deaths per farm: cows				.4
heifers				.1
calves				.8
Veterinary costs, total per farm				\$44
				Percent
Farms reporting: foot rot trouble				17
treating for mastitis				39
treating for lice & grubs				62

formulating educational programs for dairy farmers is presented in Table 25.

Table 25. Information pertaining to miscellaneous dairy herd management practices for study area, 1964

Practices	% followed
% of cows freshening Sept. through Dec. (Aver. per farm)	24
% of dairy farmers who dehorn calves	51
Method of dehorning:	
% of dairy farmers who used: Clip	73
Caustic	12
Saw	0
Other	15
% of farmers reporting:	
Milk same time every day	98
Operator helps in milking	79
Others in family help in milking	53
Hired laborers help in milking	17
Use milking machine	43
For those using hired laborers to help in milking:	
% who used incentive payments	8
% of milk receipts given as incentive payments (Aver. per farm for those using incentive payments)	19
For those using milking machines:	
Number of units per worker (Average per farm)	1.6
% reporting vacuum level checked periodically	82
% reporting hand stripping	71
% reporting using strip cup	35

In Table 26 there is presented information showing the degree of significance of relationships of seven selected practices to milk production per cow. The combined effect of following a number of these practices is rather striking. The 3 farmers following all 7 practices had average milk production per cow more than double the 10 farmers who followed none of the 7 practices considered in Table 26. It is estimated that if all the dairy farmers followed all 7 of these practices, about \$2 million more income per year would be received by farmers in the seven counties studied.

Table 26. Relationship of selected dairy herd practices to pounds of milk sold per cow for herds in sample with more than 10 dairy cows, study area, 1964

Practice		Number of farms	Average lb. of milk sold per cow	t test level ^a
1. % of cows freshening Sept. to Dec. above average	: Yes	62	5,403	****
% of cows freshening Sept. to Dec. above average	: No	47	4,000	
2. Production record on individual cows	: Yes	14	6,722	****
Production record on individual cows	: No	95	4,514	
3. Ident. heifers by sire and dam	: Yes	28	5,847	****
Ident. heifers by sire and dam	: No	81	4,435	
4. Use artificial insemination	: Yes	40	5,458	****
Use artificial insemination	: No	69	4,415	
5. Feed cost per cow above average	: Yes	46	5,646	****
Feed cost per cow above average	: No	63	4,179	
6. Silage was fed	: Yes	26	5,747	****
Silage was fed	: No	83	4,501	
7. % of roughage quality practices followed above average	: Yes	68	5,010	—
% of roughage quality practices followed above average	: No	41	4,446	
% of roughage quality practices followed above 80%		16	5,206	**
% of roughage quality practices followed below 40%		19	3,904	
Farms having 3 or more of above practices with yes answer		48	5,860	****
Farms having 2 or less of above practices with yes answer		61	3,962	
Farms having 7 of above practices with yes answer		3	7,571	****
Farms having none of above practices with yes answer		10	3,378	

a****, $P < .01$

** , $P > .02$, $< .05$

., $P > .10$

Swine

The data in Table 27 give some indication of the extent of swine production in the seven-county study area. It was estimated from these data that approximately 60,000 market hogs were sold per year from farms in the seven counties in 1964 (including the hogs produced from the purchased pigs). About 52,000 feeder pigs were estimated to have been sold in the seven counties. These

Table 27. Number of farms in sample studied and estimated number of farms in study area, and number of animals per farm by type of swine enterprise, 1964

Swine enterprise	Sample studied	Estimates for seven-county area
Number of farms with hogs	262	2,382
Number of farms with brood sows	248	2,255
Number of farms with purchased pigs only	14	132
Number of farms with both sows and purchased pigs	31	281
		Average per farm
Farms with 2-litter sows, number of sows		3.6 ^a
Farms with 1-litter sows, number of sows		2.8 ^a
Number of pigs weaned per litter		7.0
Farms with purchased pigs, number of purchased pigs		50
Farms with market hogs, number of market hogs sold		45
Farms with feeder pigs, number of feeder pigs sold		40
% of pigs from all litters, sold as market hogs		53
% of pigs from spring litters, sold as market hogs		49
% of pigs from fall litters, sold as market hogs		58
Aver. weight per hog for all market hogs sold, lbs.		216
Aver. weight per pig for all feeder pigs sold, lbs.		46
Aver. weight per pig for all feeder pigs bought, lbs.		52
Lb. of grain (corn equiv.) per pig from weaning to market ^b		855
Lb. of supplement per pig from weaning to market ^b		98

^aThese averages do not include farms with only one brood sow, nor those farms that had both some sows raising only one litter per year and some raising two litters per year.

^bThese estimated quantities appear to be high. There may be considerable errors in these estimates, which were made by only a small percentage of the farmers. Most of the farmers were unwilling to try to estimate quantities fed.

may have included part of the approximately 14,000 feeder pigs that were purchased in these counties.

On the basis of the above estimates and on data in Table 28, it was estimated that total swine income to farmers in the seven counties studied amounted to a little above \$2,500,000 in 1964. The prices (Table 28) used for these estimates were approximately at a low point in a hog-price cycle.

Table 28 shows that most of the market hogs were sold at auction yards. One-fourth of the feeder pigs were sold at organized sales. Other methods of sale of feeder pigs were reported by

Table 28. Values, prices, markets, delivery to markets, and month of marketing swine, by kinds of swine, study area, 1964

Items	Average per farm
Price received per cwt. for spring litter market hogs sold	\$ 15.54
Price received per cwt. for fall litter market hogs sold	14.79
Price received per cwt. for purchased pigs sold as hogs	15.11
Price received per head for all feeder pigs sold	10.33
Price paid per head for all feeder pigs bought	9.72
Total value of market hogs sold per sow (2-litter basis)	455.00
Total value of feeder pigs sold per sow (2-litter basis)	131.00
Distance to market for market hogs sold, miles	16
Distance to market for feeder pigs sold, miles	7
	Per:cent
Farmers custom hired hauling market hogs to market	24
Farmers custom hired hauling feeder pigs to market	28
Farmers custom hired hauling feeder pigs purchased	0

	Market hogs	Feeder pigs
	Percent	
Farmers selling to:		
packer buyer	13	0
order buyer	14	17
auction yards	63	14
organized sales	5	26
other	3	43
Marketings by months:		
January	5	5
February	6	9
March	13	7
April	12	16
May	8	9
June	10	13
July	6	6
August	10	8
September	9	4
October	8	8
November	10	9
December	3	6

43% of the farmers. These were probably sold at the farm to other farmers within or outside the home counties. More feeder pigs were sold in April and June than in any other month, and more market hogs in March and April than in any other month.

In Table 29 there are listed 18 practices that were considered to have some relationship to total value of market hogs per sow. There appears to be a low adoption in respect to many practices that

Table 29. Percent of 111 farmers raising hogs for sale who gave a "yes" answer about practices related to total value of market hogs sold per sow per year, study area, 1964

Practice	Percent
Pigs from sows and boars of different breeds	65
Pigs self-fed protein supplement after weaning	49
Most of hogs sold were sold in June through Aug. period	43
Pigs self-fed grain after weaning	52
Pigs were meat type or cross-bred (partly meat type)	27
Pigs fed minerals after weaning	42
Pigs not weaned and castrated at the same time	64
Pigs treated for lice and/or mange	85
Pigs treated for worms	76
Pigs raised on clean pastures and/or concrete	5
Pigs creep-fed before weaning	58
Pigs have continuous access to water	99
Pigs vaccinated for cholera	10
Pigs vaccinated for erysipelas	10
Pigs treated for navel infection	4
Pigs treated for needle teeth	13
Pigs treated for anemia	5
Sows washed and houses scrubbed before farrowing	9

have a bearing on swine health. Likewise, the data in Table 30 show how adoption of many practices should help farmers to save a high percentage of good healthy pigs from the number born. Also there was a rather low adoption of many practices that tend to increase the number of pigs farrowed per litter.

The large effect of size of litter on income per sow, both when market hogs or feeder pigs were sold, is shown by data in Table 31. This factor was so important that it was difficult to show the relationship of each of the many important practices to total income from market hogs per sow per year, except cross-breeding which was significantly related to income per sow, and self-feeding of a protein supplement, which was significant between the .05 and .10 level (t test).

Table 30. Percent of 238 farmers raising hogs or feeder pigs for sale who gave a "yes" answer about practices related to number of pigs weaned per litter, study area, 1964

Practice	Percent
Boar performance tested	10
Sows flushed or self-fed just before & after breeding	16
Sows fed protein supp. or on legume or grass pasture	97
Boar not allowed to remain continuously with the sows	13
Most of litters from old sows	91
Sows fed more grain or self-fed when nursing pigs	91
Gilts had been picked from good milkers with big litters	60
Sows treated for lice and/or mange	82
Sows treated for worms	58
Sows fed more lightly during remainder of gestation period	89
Sows fed minerals	40
Sows have continuous access to water	98
Sows were meat type or cross-bred (partly meat type)	31
Boar not used for more than 15 sows	97
Sows vaccinated for leptospirosis	3
Concrete feeding floor for the sows	2
Guard rails for farrowing pens	2
Heat lamps for farrowing pens	1

The accumulated effect of following over 6 of the 11 practices listed in Table 31 was highly significant. The following of over 6 of these practices by all of the swine farmers would have added about \$500,000 to income from swine sold as market hogs in the seven counties in 1964. The net income would not have increased by that amount unless these farmers also made similar improvements in the production of feed for the hogs.

Because of the importance of size of litter in the production of both market hogs and feeder pigs for sale, an analysis was

Table 31. Relationships of number of pigs per litter and selected swine practices to value of feeder pigs or market hogs sold per sow (2-litter basis), study area, 1964

Number of pigs per litter		Num- ber of farms	Av. val. of feeder pigs sold per sow	t test level ^a
Aver. no. of pigs weaned per litter, 7 or more		28	\$158	***
Aver. no. of pigs weaned per litter, under 7		38	107	
			Av. val. of market hogs sold per sow	
Aver. no. of pigs weaned per litter, 7 or more		38	\$546	***
Aver. no. of pigs weaned per litter, under 7		44	403	
Selected Practices Followed				
1. Pigs were from sows and boars of dif. breeds	: Yes	44	511	****
Pigs were from sows and boars of dif. breeds	: No	33	418	
2. Pigs self-fed protein supplement	: Yes	40	500	*
Pigs self-fed protein supplement	: No	38	443	
3. Most of hogs marketed June to Aug.	: Yes	35	479	—
Most of hogs marketed June to Aug.	: No	46	466	
4. Pigs self-fed grain	: Yes	46	489	—
Pigs self-fed grain	: No	34	448	
5. Use clean pasture or concrete floors	: Yes	12	488	—
Use clean pasture or concrete floors	: No	61	464	
6. Pigs fed minerals	: Yes	40	483	—
Pigs fed minerals	: No	38	456	
7. Pigs treated for lice and/or mange	: Yes	69	477	—
Pigs treated for lice and/or mange	: No	11	431	
8. Pigs treated for worms	: Yes	68	478	—
Pigs treated for worms	: No	13	436	
9. Pigs not weaned & castrated at same time	: Yes	47	481	—
Pigs not weaned & castrated at same time	: No	29	442	
10. Pigs were meat type or partly meat type	: Yes	26	502	—
Pigs were meat type or partly meat type	: No	53	456	
11. Pigs creep fed before weaning	: Yes	50	472	—
Pigs creep fed before weaning	: No	30	471	
Seven or more of above 11 practices were followed		40	530	****
Six or less of above 11 practices were followed		41	414	

^a****, $P < .01$

*, $P > .05$, $< .10$

-, $P > .10$

made of practices related to size of litters. Here again it was difficult to demonstrate significant relationships of some of the practices to litter size by using data secured from the sample farms. The most important practices appeared to be the use of performance-tested boars and feeding the sows more heavily before breeding (Table 32).

Table 32. Relationship of selected swine practices to number of pigs weaned per litter, study area, 1964

Practice		Num- ber of farms	Average no. of pigs weaned per litter	t test level ^a
1. Boar was performance tested	: Yes	13	8.4	****
Boar was performance tested	: No	101	6.8	
2. Sows flushed before breeding	: Yes	35	7.4	**
Sows flushed before breeding	: No	113	6.7	
3. Sows fed protein supplement or on legume or grass pasture	: Yes	144	6.9	*
Sows fed protein supplement or on legume or grass pasture	: No	4	5.3	
4. Boar not allowed continuously with sows	: Yes	22	7.5	*
Boar not allowed continuously with sows	: No	125	6.8	
5. Most of litters were from old sows	: Yes	125	7.0	*
Most of litters were from old sows	: No	23	6.3	
6. Sows fed more heavily while nursing	: Yes	130	6.9	—
Sows fed more heavily while nursing	: No	15	6.4	
7. Gilts had been selected from good milkers, large litters	: Yes	80	7.1	—
Gilts had been selected from good milkers, large litters	: No	50	6.7	
8. Sows were treated for worms	: Yes	83	6.9	—
Sows were treated for worms	: No	59	6.7	
9. Sows were treated for lice &/or mange	: Yes	131	6.9	—
Sows were treated for lice &/or mange	: No	29	6.7	
Seven or eight of above practices followed		31	7.7	****
Two to four of above practices followed		31	6.3	

****, $P < .01$

**, $P > .02, < .05$

*, $P > .05, < .10$

—, $P > .10$

The accumulated effect of following the practices listed had a highly significant bearing on the size of litters. An estimate was made that about \$500,000 would have been added to swine income in 1964 in the seven counties if all farmers had done as well as those who followed at least 7 of the practices listed in Table 32.

RELATIONSHIP OF LIVESTOCK PRACTICES TO AGE AND YEARS OF SCHOOLING OF OPERATOR

It was estimated above that if all farmers had followed improved livestock practices in 1964, there would have been an increase in income to farmers of about \$6,000,000 from livestock in the seven-county study area. In other words, better management of the beef cattle, dairy, and swine enterprises would have brought these results.

On most of the farms, management is one of the functions performed principally by the farm operator. No specific attempt was made in this study to measure the managerial ability of the operators. The information on age and amount of schooling of the operator may have some bearing on his performance as a manager. A young man may be willing to exert more effort than an old man would toward being a proficient manager. On the other hand, experience in the making of decisions may be an advantage to the older operator. If the schooling beyond the eighth grade included courses in agriculture, the extra years in school may enhance decision-making ability on the farm. If a student was inclined to discipline himself to go to school more years, this self-discipline may carry over to later years and cause him as a farmer to continue searching for information to help in managing his farm. He probably took advantage of opportunities to attend short courses and extension meetings that became available.

The averages in Table 33, wherein the data were sorted on the basis of age of operator, show that there was not much relationship of age of operator to number of recommended practices followed, or to the livestock output.

Table 33. Relationship of age of operator to management of livestock, study area, 1964

Items	Age of operator, years		t test level ^a
	Under 55	55 and over	
Beef cow-calf			
Number of farms in groups	73	40	
	Averages		
Age of operator	42.1	60.7	
Years schooling of operator	10.5	10.2	—
No. of selected practices followed	6.0	6.5	—
Calf income per brood cow	\$87.64	\$96.48	*
Dairy cows			
Number of farms in groups	74	35	
	Averages		
Age of operator	44.5	60.1	
Years schooling of operator	9.7	9.5	—
No. of selected practices followed	2.7	2.4	—
Milk sales per dairy cow, lbs.	4858	4670	—
Swine (analysis of litter size)			
Number of farms in groups	87	60	
	Averages		
Age of operator	42.8	61.3	
Years schooling of operator	9.3	8.6	—
No. of selected practices followed	5.6	5.3	—
No. of pigs weaned per litter	6.8	6.9	—
Swine (analysis of income per sow from sale of market hogs)			
Number of farms in groups	45	36	
	Averages		
Age of operator	43.6	61.2	
Years schooling of operator	9.6	9.1	—
No. of selected practices followed	6.8	6.2	—
Income per sow (2-litter basis)	\$462.	\$483.	—

^a*, $P > .05$, $< .10$

—, $P > .10$

Table 34. Relationship of years of schooling of operator to management of livestock, study area, 1964

Items	Years schooling of operator		t test level ¹¹
	12th grade and above	8th grade and below	
Beef cow-calf			
Number of farms in groups	60	36	
	Averages		
Years schooling of operator	12.8	6.4	
Age of operator	47.6	50.3	—
No. of selected practices followed	6.7	5.7	*
Calf income per brood cow	\$96.30	\$86.69	—
Dairy			
Number of farms in groups	38	41	
	Averages		
Years schooling of operator	12.1	7.0	
Age of operator	48.3	51.2	—
No. of selected practices followed	3.5	2.0	****
Milk sales per dairy cow, lbs.	5140	4540	—
Swine (analysis of litter size)			
Number of farms in groups	36	88	
	Averages		
Years schooling of operator	12.7	7.2	
Age of operator	48.1	51.8	—
No. of selected practices followed	5.8	5.3	*
No. of pigs weaned per litter	7.1	6.7	—
Swine (analysis of income per sow from sale of market hogs)			
Number of farms in groups	23	45	
	Averages		
Years schooling of operator	12.9	7.4	
Age of operator	48.1	53.1	—
No. of selected practices followed	6.1	6.3	—
Income per sow (2-litter basis)	\$469.	\$481.	—

****, $P < .01$

*, $P > .05$, $< .10$

—, $P > .10$

Likewise the results of sorting on basis of years of schooling (Table 34) show that more years of schooling did not appear in general to cause farmers to decide to follow important practices or to get greater output from livestock.¹¹ The one exception was in

¹¹In Table 34, the farmers with 4 years of high school and a few with some college training were compared with those that had no high school attendance. Only in the case of beef cattle were there sufficient cases to make a separate comparison of farmers with some college training with those with only 4 years of high school training. The differences in average number of practices followed and income per cow were not significant between these two groups and were not presented in Table 34.

regard to dairy practices. But in Table 35 where the sample farms were sorted on the basis of number of selected practices followed, there were significant relationships to increases in out-

Table 35. Relationship of number of practices followed to age and years of schooling of operator, and to livestock output, study area, 1964

	Groups sorted on basis of no. of selected practices followed		t test level ^a
Beef cow-calf			
Range in number of practices	8 or more	3 or less	
Number of farms in groups	17	43	
	Averages		
Number of practices followed	9.9	3.6	
Age of operator, years	50.7	48.6	—
Schooling of operator, years	11.8	9.8	**
Calf income per brood cow	\$119.	\$82.	****
Dairy cows			
Range in number of practices	3 or more	2 or less	
Number of farms in groups	48	61	
	Averages		
Number of practices followed	4.3	1.3	
Age of operator, years	49.3	49.7	—
Schooling of operator, years	10.6	8.8	****
Milk sales per dairy cow, lbs.	5,860	3,962	****
Swine (analysis of litter size)			
Range in number of practices	7 or more	4 or less	
Number of farms in groups	31	31	
	Averages		
Number of practices followed	7.4	3.3	
Age of operator, years	49.8	53.7	—
Schooling of operator, years	9.7	8.0	***
No. of pigs weaned per litter	7.7	6.3	****
Swine (analysis of hog income per sow)			
Range in number of practices	7 or more	6 or less	
Number of farms in groups	40	41	
	Averages		
Number of practices followed	8.5	4.6	****
Age of operator, years	46.7	56.1	****
Schooling of operator, years	10.2	8.6	****
Hog income per sow (2-litter basis)	\$530.	\$414.	****

a****, $P < .01$

***, $P > .01, < .02$

**, $P > .02, < .05$

-, $P > .10$

put per brood animal, to years of schooling of operator and, for the analysis of market hogs, to the age of operator.¹²

Why was there a difference in results of the two types of analyses of years of schooling? Sorting on basis of years of schooling showed that more schooling did not necessarily result in higher managerial performance. On the other hand, sorting on the basis of "number of management practices followed" showed that the latter was related significantly to years of schooling. Among various characteristics or inherent abilities of farm operators who were "above average in making good decisions" there must have been also, in their youth, an inherent inclination for self-discipline or felt need for remaining in school to acquire more knowledge and/or more training for some occupation. It would seem that these analyses show justification for this study, which was pointed toward making additional information pertaining to livestock practices available to the farmers.

¹²For dairy cows and for hog income per sow the sortings on basis of number of practices in Table 35 were between less extremes in number of practices than were the sortings on basis of years of schooling—Table 34. For beef cow-calf and pigs per litter, the sortings were between greater extremes in number of practices than were the sortings on basis of years of schooling in Table 34.

APPENDIX

Explanation of t tests in Tables I to XV

****, $P = < .01$

***, $P = > .01, < .02$

**, $P = > .02, < .05$

*, $P = > .05, < .10$

—, $P = > .10$

In Table I the comparisons of significance are between the averages of the characteristics stated at the head of the column, for farms with large and small enterprises of the kind or combinations of livestock stated in the left hand column, on each line, respectively.

In Tables II to XV inclusive, the comparisons of significance are between the averages of specified characteristics for farms in each of two groups of specified kinds of livestock or livestock combinations on each line, respectively. The two groups on each line were selected in a manner to hold the differences between the average number of livestock units in the two groups on each line approximately constant in order to eliminate as much as possible any interrelationships of the characteristics with size of enterprises.

**Table I. Relationships of size of livestock enterprises
to selected farm and labor characteristics, by special or combinations
of kinds of livestock, study area, 1964**

Live- stock group	No. of farms in size groups selected		Av. no. of livestock units in size groups selected		Average number of selected characteristics in livestock size groups selected															
					Acres in farm		Acres crops harvested		Acres cropland pasture		Acres woodland pasture		Acres corn harvested		Years schooling of oper.		Months family labor		Months hired labor	
	La. ^a	Sm. ^a	La.	Sm.	La.	Sm.	La.	Sm.	La.	Sm.	La.	Sm.	La.	Sm.	La.	Sm.	La.	Sm.	La.	Sm.
Beef c.c.	14	157	59	6	474	113	109	20	153	35	111	20	25	4	11.3	9.0	2.2	.4	5.9	.8
			****		****		****		****		****		****		—		****		****	
Beef c.c., sell pigs	14	29	33	9	341	135	63	20	123	38	73	26	22	6	10.9	8.2	2.4	.4	2.7	.4
			****		****		****		****		—		****		****		*		****	
Beef c.c., sell hogs	17	26	117	16	684	134	149	33	110	46	135	19	45	12	11.2	8.3	1.4	1.1	7.8	.8
			****		****		****		****		****		****		****		—		****	
Beef c.c., feed cattle	8	7	25	14	233	135	33	17	73	49	50	50	4	4	12.3	7.4	1.5	.8	1.8	1.7
			****		*		**		—		—		—		**		—		—	
Dairy (MM)	30	27	18	5	178	80	43	14	51	25	28	15	14	5	8.6	5.8	2.7	.4	2.0	.7
			****		****		****		****		*		****		****		**		—	
Dairy (MM), beef c.c.	13	7	30	8	228	95	61	12	63	47	78	16	11	2	10.0	5.3	1.9	.8	1.8	.3
			****		***		***		—		*		*		****		—		—	
Dairy (MM), beef c.c., sell hogs	8	14	91	36	386	188	103	58	83	63	86	33	24	15	9.5	8.9	4.7	1.0	5.5	1.7
			****		****		**		—		*		—		—		***		**	
Dairy (MM), sell pigs	17	18	19	8	164	82	38	24	42	21	49	13	12	8	7.8	6.9	3.1	3.6	.7	.4
			****		****		**		*		*		—		—		—		—	
Dairy (MM), sell hogs	6	11	50	17	207	88	107	27	59	23	21	20	39	9	7.3	8.3	3.7	.8	2.6	.5
			****		****		****		****		—		***		—		***		*	
Dairy (gr. A.)	20	12	128	58	470	220	123	89	138	69	132	19	47	24	11.2	10.5	5.0	2.7	16.6	6.9
			****		***		—		****		—		—		—		—		***	

^aLa. signifies the group with the larger number of livestock units; Sm. signifies the group with the smaller number of livestock units, respectively.
(See footnote on page 13 for explanation of livestock units.)

Table II. Comparisons of acres in farm, between two kinds of livestock or livestock combinations, with total livestock units approximately equal, study area, 1964

† test for difference in av. acres in farm	Livestock group	Number of farms	Averages		Livestock group	Number of farms	Averages	
			Total livestock units	Acres in farm			Total livestock units	Acres in farm
**	Beef c.c.	42	19	222	Beef c.c., sell hogs	18	20	144
**	Beef c.c.	20	23	258	Feed cattle	6	21	103
****	Beef c.c.	14	59	474	Dairy (MM), beef c.c., sell hogs	22	57	260
****	Beef c.c.	28	28	261	Dairy (MM), sell hogs	17	29	130
****	Beef c.c.	6	87	747	Dairy (Gr. A.)	26	81	326
**	Beef c.c., sell pigs	14	33	341	Dairy (MM), sell hogs	17	29	130
***	Beef c.c., sell pigs	6	51	600	Dairy (Gr. A.)	12	58	220
****	Beef c.c., sheep	13	17	159	Dairy (MM), sell hogs	11	17	88
**	Dairy (MM), beef c.c.	30	22	187	Feed cattle	6	21	103
****	Dairy (MM), beef c.c., sell pigs	7	21	219	Feed cattle	6	21	103
****	Dairy (MM)	30	18	178	Dairy (MM), sell hogs	11	17	88
***	Dairy (MM), beef c.c.	13	30	228	Dairy (MM), sell hogs	17	29	130
**	Dairy (MM), beef c.c., sell pigs	13	29	224	Dairy (MM), sell hogs	17	29	130
**	Dairy (MM), sell pigs	17	19	164	Dairy (MM), sell hogs	11	17	88
****	Dairy (Gr. A.)	11	159	632	Mainly poultry	10	158	192

Table III. Comparisons of acres of land rented in, between two kinds of livestock or livestock combinations, with total livestock units approximately equal, study area, 1964

t test for difference in av. acres rented in	Livestock group	Number of farms	Averages		Livestock group	Number of farms	Averages	
			Total livestock units	Acres rented in			Total livestock units	Acres rented in
****	Dairy (MM), sell pigs	29	15	35	Beef c.c.	118	15	7
*	Dairy (MM), beef c.c.	37	19	22	Beef c.c., sheep	15	19	0
**	Dairy (MM), sell hogs	15	22	32	Beef c.c., sheep	15	20	0
**	Feed cattle	6	21	17	Beef c.c., sheep	15	20	0

Table IV. Comparisons of acres of crops harvested, between two kinds of livestock or livestock combinations, with total livestock units approximately equal, study area, 1964

t test for difference in acres crops harvested	Livestock group	Number of farms	Averages		Livestock group	Number of farms	Averages	
			Total livestock units	Acres crops harvested			Total livestock units	Acres crops harvested
**	Beef c.c., sell hogs	18	20	38	Beef c.c., sheep	15	20	25
**	Sell hogs	13	14	40	Dairy (MM), beef c.c.	17	15	18
****	Dairy (MM), sell pigs	29	15	35	Dairy (MM), beef c.c.	17	15	18
**	Dairy (MM), sell pigs	17	19	38	Dairy (MM), beef c.c., sell pigs	11	19	22
*	Dairy (MM), beef c.c., sell hogs	14	36	58	Dairy (MM), sell pigs	5	27	26
***	Dairy (Gr. A.)	11	159	159	Mainly poultry	10	158	63

Table V. Comparisons of acres of corn for grain, between two kinds of livestock or livestock combinations, with total livestock units approximately equal, study area, 1964

t test for difference in acres corn for grain	Livestock group	Num- ber of farms	Averages		Livestock group	Num- ber of farms	Averages	
			Total live- stock units	Acres corn for grain			Total live- stock units	Acres corn for grain
****	Beef c.c., sell hogs	18	20	14	Beef c.c.	42	19	6
****	Beef c.c., sell hogs	18	20	14	Beef c.c., sheep	15	20	4
***	Beef c.c., sell hogs	18	19	14	Dairy (MM), beef c.c.	34	17	7
**	Dairy (MM), sell hogs	15	22	18	Beef c.c., sheep	15	20	4
**	Dairy (MM), sell hogs	17	29	19	Beef c.c.	28	28	8
****	Dairy (MM), sell pigs	29	15	11	Beef c.c.	118	15	5
***	Dairy (MM), sell pigs	17	19	12	Beef c.c., sheep	15	19	4
***	Dairy (MM)	30	18	14	Beef c.c.	42	19	6
***	Dairy (MM)	30	18	14	Beef c.c., sheep	15	19	4
**	Dairy (MM)	30	18	14	Dairy (MM), beef c.c.	37	19	7
*	Dairy (MM)	30	18	14	Dairy (MM), beef c.c. sell pigs	11	19	5
***	Dairy (Gr. A.)	11	159	66	Mainly poultry	10	158	17

Table VI. Comparisons of acres of cropland idle, between two kinds of livestock or livestock combinations, with total livestock units approximately equal, study area, 1964

t test for difference in acres cropland idle	Livestock group	Number of farms	Averages		Livestock group	Number of farms	Averages	
			Total live-stock units	Acres cropland idle			Total live-stock units	Acres cropland idle
**	Beef c.c.	50	22	18	Dairy (MM), beef c.c.	30	22	5
**	Beef c.c.	42	19	20	Dairy (MM)	30	18	5
**	Beef c.c., sell pigs	56	16	13	Dairy (MM), beef c.c.	34	16	4
****	Beef c.c., sell pigs	14	33	16	Dairy (MM), sell hogs	17	29	1
**	Dairy (Gr. A.), beef c.c.	6	68	25	Dairy (MM), sell hogs	6	50	0
***	Sell hogs	13	14	9	Dairy (MM), sell hogs	11	17	1
**	Sell hogs	13	14	40	Dairy (MM)	67	13	31

Table VII. Comparisons of index of crop yields, between two kinds of livestock or livestock combinations, with total livestock units approximately equal, study area, 1964

t test for difference in index of crop yields	Livestock group	Num- ber of farms	Averages		Livestock group	Num- ber of farms	Averages	
			Total live- stock units	Index of crop yields			Total live- stock units	Index of crop yields
**	Beef c.c., sheep	14	19	79	Beef c.c., sell pigs	54	16	95
***	Beef c.c., sheep	6	14	64	Sell hogs	11	14	96
**	Beef c.c., sheep	14	19	79	Dairy (MM), sell pigs	16	19	105
***	Beef c.c., sheep	14	20	79	Dairy (MM), sell hogs	15	22	100
***	Beef c.c., sheep	14	19	79	Dairy (MM)	30	18	103
*	Dairy (MM), beef c.c.	37	19	88	Dairy (MM)	30	18	103
**	Dairy (MM), sell pigs	17	8	77	Sell pigs	9	7	98
*	Dairy (MM), sell hogs	6	11	88	Sell pigs	4	10	112
**	Dairy (Gr. A.), beef c.c.	6	68	85	Dairy (MM), beef c.c., sell hogs	18	66	112
**	Dairy (Gr. A.), beef c.c.	6	68	85	Dairy (Gr. A.)	8	65	116

Table VIII. Comparisons of acres of cropland pasture, between two kinds of livestock or livestock combinations, with total livestock units approximately equal, study area, 1964

t test for difference in acres cropland pasture	Livestock group	Number of farms	Averages		Livestock group	Number of farms	Averages	
			Total live-stock units	Acres cropland past.			Total live-stock units	Acres cropland past.
****	Beef c.c.	14	59	153	Beef c.c., sell hogs	46	60	77
**	Beef c.c.	42	19	85	Beef c.c., sell hogs	18	20	55
**	Beef c.c.	28	28	103	Beef c.c., feed cattle	11	29	59
**	Beef c.c.	20	23	100	Feed cattle	6	21	41
****	Beef c.c.	22	15	71	Sell hogs	13	14	34
****	Beef c.c.	50	22	89	Dairy (MM), beef c.c.	30	22	57
***	Beef c.c.	14	59	153	Dairy (MM), beef c.c., sell hogs	22	57	70
****	Beef c.c.	42	19	85	Dairy (MM), beef c.c., sell pigs	14	17	44
****	Beef c.c.	118	15	63	Dairy (MM), sell pigs	29	15	32
****	Beef c.c.	28	28	103	Dairy (MM), sell hogs	17	29	35
****	Beef c.c.	42	19	85	Dairy (MM)	30	18	51
***	Beef c.c.	6	87	210	Dairy (Gr. A.)	26	81	95

Table VIII. (Continued)

t test for difference in acres cropland pasture	Livestock group	Num- ber of farms	Averages		Livestock group	Num- ber of farms	Averages	
			Total live- stock units	Acres crop- land past.			Total live- stock units	Acres crop- land past.
**	Beef c.c., sell pigs	29	9	38	Sell pigs	11	7	19
***	Beef c.c., sell pigs	14	33	123	Dairy (MM), sell hogs	17	29	35
***	Beef c.c., sell pigs	6	51	114	Dairy (Gr. A.)	12	58	89
***	Beef c.c., sheep	13	17	52	Dairy (MM), sell hogs	11	17	23
****	Dairy (MM), beef c.c.	7	8	47	Sell pigs	11	7	20
**	Dairy (MM), beef c.c.	17	15	52	Dairy (MM), sell pigs	29	15	32
****	Dairy (MM), beef c.c.	30	22	67	Dairy (MM), sell hogs	15	22	31
**	Dairy (MM), beef c.c.	13	30	63	Dairy (MM), sell hogs	17	29	35
**	Dairy (MM), beef c.c., sell pigs	13	29	67	Dairy (MM), sell hogs	17	29	35
**	Dairy (MM)	30	18	51	Dairy (MM), sell hogs	11	17	23
***	Dairy (Gr. A.)	5	119	141	Dairy (Gr. A.), sell hogs	5	118	77
****	Dairy (Gr. A.)	11	159	164	Mainly poultry	10	158	42

Table IX. Comparisons of acres of woodland pasture, between two kinds of livestock or livestock combinations, with total livestock units approximately equal, study area, 1964

† test for difference in acres woodland pasture	Livestock group	Number of farms	Averages		Livestock group	Number of farms	Averages	
			Total live- stock units	Acres wood- land past.			Total live- stock units	Acres wood- land past.
***	Beef c.c., sheep	15	20	50	Beef c.c., sell hogs	18	20	18
**	Beef c.c., sheep	15	20	50	Feed cattle	6	21	9
*	Beef c.c., sheep	13	17	52	Dairy (MM), sell hogs	11	17	20
***	Dairy (MM), beef c.c.	34	17	58	Beef c.c., sell hogs	18	19	18
****	Dairy (MM), beef c.c.	13	29	67	Beef c.c., sell hogs	29	27	19
****	Dairy (MM), beef c.c., sell pigs	7	21	92	Feed cattle	6	21	9
***	Dairy (MM), beef c.c.	13	30	78	Dairy (MM), sell hogs	17	29	20
*	Dairy (MM), beef c.c.	37	19	53	Dairy (MM)	30	18	28
**	Dairy (MM), beef c.c., sell pigs	9	35	86	Dairy (MM), beef c.c., sell hogs	19	46	41
***	Dairy (MM), beef c.c., sell pigs	11	19	67	Dairy (MM)	30	18	28
****	Dairy (MM), beef c.c., sell pigs	13	29	67	Dairy (MM), sell hogs	17	29	20
***	Dairy (Gr. A.), beef c.c.	6	68	86	Dairy (Gr. A.)	21	72	24

Table X. Comparisons of age of operator, between two kinds of livestock or livestock combinations, with total livestock units about equal, study area, 1964

t test for difference in age of operator	Livestock group	Num- ber of farms	Averages		Livestock group	Num- ber of farms	Averages	
			Total live- stock units	Age of operator, years			Total live- stock units	Age of operator, years
*	Beef c.c.	42	19	49.0	Beef c.c., sell hogs	18	20	55.6
*	Beef c.c.	42	19	49.0	Beef c.c., sheep	15	19	56.2
***	Beef c.c., sell pigs	27	24	47.4	Beef c.c., sell hogs	18	20	55.6
***	Beef c.c., sell pigs	56	16	48.5	Beef c.c., sheep	15	19	56.2
**	Dairy (MM), beef c.c.	37	19	49.7	Beef c.c., sheep	15	19	56.2
**	Dairy (MM), beef c.c.	34	17	49.7	Beef c.c., sell hogs	18	20	55.6
**	Dairy (MM), sell hogs	17	29	46.5	Beef c.c., sell hogs	29	27	54.8
****	Dairy (MM), sell hogs	11	17	43.0	Beef c.c., sheep	13	17	55.5
**	Dairy (MM), sell hogs	11	17	43.0	Sell hogs	13	14	52.7
**	Dairy (MM), sell hogs	11	17	43.0	Dairy (MM)	30	18	51.3
****	Dairy (MM)	64	7	44.3	Sell pigs	11	7	55.6
****	Sell pigs	11	7	44.3	Dairy (MM), sell pigs	18	8	58.9
***	Sell pigs	20	4	48.0	Grazing cattle and/or milk cows (h.u.)	62	4	56.5

Table XI. Comparisons of years of schooling of operator, between two kinds of livestock or livestock combinations, with total livestock units about equal, study area, 1964

t test for difference in years schooling of opera.	Livestock group	Num- ber of farms	Averages		Livestock group	Num- ber of farms	Averages	
			Total live- stock units	Years school- ing of operator			Total live- stock units	Years school- ing of operator
***	Dairy (MM)	64	7	7.0	Sell pigs	11	7	9.6
****	Dairy (MM), beef c.c.	7	8	5.3	Sell pigs	11	7	9.6
**	Dairy (MM), sell pigs	29	15	7.4	Beef c.c., sell pigs	56	16	8.8
****	Dairy (MM), sell pigs	18	8	6.9	Sell pigs	11	7	9.6
***	Dairy (MM), beef c.c., sell pigs	7	12	5.4	Sell pigs	5	10	10.8
****	Dairy (MM), beef c.c., sell hogs	22	57	9.1	Beef c.c.	14	59	11.3
**	Dairy (MM), beef c.c., sell hogs	14	36	8.9	Beef c.c., sell pigs	14	33	10.9
****	Dairy (MM), sell hogs	17	29	7.9	Beef c.c.	28	28	10.0
****	Dairy (MM), sell hogs	17	29	7.9	Beef c.c., sell pigs	14	33	10.9
**	Dairy (MM), sell hogs	17	29	7.9	Beef c.c., sell hogs	29	27	9.0
***	Dairy (MM), sell hogs	17	29	7.9	Dairy (MM), beef c.c.	13	30	10.0
***	Dairy (MM), sell hogs	6	11	8.2	Sell pigs	5	10	10.8
****	Dairy (MM), sell hogs	6	50	7.3	Dairy (Gr. A.)	12	58	10.5
**	Dairy (MM), sell hogs	6	50	7.3	Dairy (Gr. A.), beef c.c.	6	68	10.5
**	Dairy (Gr. A.)	12	58	10.5	Beef c.c., sell pigs	6	51	13.0
***	Beef c.c., sell hogs	8	8	6.5	Sell pigs	11	7	9.6

Table XII. Comparisons of months operator worked off-farm, between two kinds of livestock or livestock combinations, with total livestock units about equal, study area, 1964

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t test for difference in months oper. worked off farm	Livestock group	Num- ber of farms	Averages		Livestock group	Num- ber of farms	Averages	
			Total live- stock units	Months operator worked off farm			Total live- stock units	Months operator worked off farm
*	Beef c.c.	14	59	4.9	Beef c.c., sell hogs	46	60	2.3
***	Beef c.c.	34	38	5.2	Dairy (MM), beef c.c., sell hogs	19	46	1.3
****	Beef c.c.	118	15	5.4	Dairy (MM), sell pigs	29	15	2.0
***	Beef c.c., sell pigs	27	24	5.7	Dairy (MM), sell hogs	18	20	1.5
**	Beef c.c., sell pigs	14	33	6.4	Dairy (MM), beef c.c., sell pigs	14	36	1.8
****	Beef c.c., sell pigs	56	16	6.2	Dairy (MM), sell pigs	29	15	2.0
**	Beef c.c., sell pigs	14	33	6.4	Dairy (MM), sell hogs	17	29	2.4
**	Beef c.c., sheep	15	20	5.8	Beef c.c., sell hogs	18	20	1.5
**	Beef c.c., feed cattle	11	29	5.5	Dairy (MM), sell hogs	9	30	.5
****	Sell pigs	11	7	6.9	Dairy (MM), sell pigs	18	8	1.1
****	Sell pigs	11	7	6.9	Dairy (MM)	64	7	2.6
***	Sell hogs	13	14	5.5	Dairy (MM), sell pigs	35	13	1.6
**	Sell hogs	13	14	5.5	Beef c.c., sell hogs	14	14	1.0
*	Feed cattle	6	21	10.7	Beef c.c.	20	23	5.4
****	Feed cattle	6	21	10.7	Beef c.c., sell hogs	18	20	1.5
****	Feed cattle	6	21	10.7	Dairy (MM), beef c.c.	30	22	4.1
****	Feed cattle	6	21	10.7	Dairy (MM), beef c.c., sell pigs	7	21	2.1
****	Feed cattle	6	21	10.7	Dairy (MM), sell pigs	17	19	2.2
****	Feed cattle	6	21	10.7	Dairy (MM), sell hogs	11	17	3.4
****	Feed cattle	6	21	10.7	Dairy (MM)	30	18	3.8

Table XIII. Comparisons of months of family labor, between two kinds of livestock or livestock combinations, with total livestock units about equal, study area, 1964

t test for difference in months family labor	Livestock group	Number of farms	Averages		Livestock group	Number of farms	Averages	
			Total live-stock units	Months of family labor			Total live-stock units	Months of family labor
**	Dairy (MM), beef c.c., sell hogs	8	91	4.7	Beef c.c., sell hogs	28	87	1.1
***	Dairy (MM), sell pigs	29	15	3.5	Beef c.c., sell pigs	56	16	1.1
***	Dairy (MM), sell pigs	5	27	5.3	Dairy (MM), beef c.c., sell hogs	14	36	1.0

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Table XIV. Comparisons of months of hired labor, between two kinds of livestock or livestock combinations, with total livestock units about equal, study area, 1964

t test for difference in months hired labor	Livestock group	Number of farms	Averages		Livestock group	Number of farms	Averages	
			Total live-stock units	Months of hired labor			Total live-stock units	Months of hired labor
**	Dairy (Gr. A.)	23	86	12.6	Beef c.c., sell hogs	28	87	7.8
**	Dairy (Gr. A.)	9	65	9.3	Dairy (MM), beef c.c., sell hogs	18	66	3.7
**	Dairy (MM)	67	13	1.3	Dairy (MM), sell pigs	35	13	.5
*	Beef c.c., feed cattle	11	29	1.6	Dairy (MM), sell pigs	5	28	.3

Table XV. Comparisons of number of workstock, between two kinds of livestock or livestock combinations, with total livestock units approximately equal, study area, 1964

t test for difference in number of workstock	Livestock group	Number of farms	Averages		Livestock group	Number of farms	Averages	
			Total live-stock units	Number of work-stock			Total live-stock units	Number of work-stock
****	Beef c.c.	50	22	.4	Dairy (MM), beef c.c.	30	22	1.1
****	Beef c.c.	14	59	.1	Dairy (MM), beef c.c., sell hogs	22	57	1.1
****	Beef c.c.	118	15	.4	Dairy (MM), sell pigs	29	15	1.3
**	Beef c.c.	28	28	.4	Dairy (MM), sell hogs	17	29	2.1
**	Beef c.c., sheep	15	19	.2	Dairy (MM), beef c.c.	37	19	.9
***	Beef c.c., sheep	13	17	.2	Dairy (MM), beef c.c., sell pigs	14	17	1.1
**	Beef c.c., sheep	15	19	.2	Dairy (MM), sell pigs	17	19	1.4
**	Beef c.c., sheep	13	17	.2	Dairy (MM), sell hogs	11	17	1.8
**	Beef c.c., sheep	15	19	.2	Dairy (MM)	30	18	.9
*	Beef c.c., sheep	15	20	.2	Beef c.c., sell hogs	18	20	1.0

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