

THE REPRESENTATIVENESS OF KANSAS FARM  
MANAGEMENT ASSOCIATION FARMS

by

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## INTRODUCTION

In 1931 the Farm Management Service was organized in Kansas.<sup>1</sup> Since that time this service has gradually and continually expanded until, at the present time, it cooperates with more than 800 individual farmers located in 67 different Kansas counties. Closely supervised farm records are kept by each cooperator, and upon completion they are turned over to the Department of Agricultural Economics, Kansas Agricultural Experiment Station for summary and analysis. This project furnishes complete and detailed farm records to be analyzed and used as data in farm management research. Data from these records have been extremely valuable for agricultural economic research, extension work, and for work in the classroom.

Although there has been no question about the desirability of the data from these farm records, there has always been the question as to the limit of their usefulness. Are these Farm Management Association farms that keep records to supply this data representative of Kansas farms in general? Can they be considered to be typical of other farms in the same community? Or are they of a distinctly separate class of farms that are entirely different from ordinary Kansas farms? These questions express some of the problems that are uppermost in the minds of Extension and research workers who deal with these data.

Until some light can be thrown on these questions, there is danger of drawing faulty conclusions from these data. The pitfall

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<sup>1</sup> For discussion of the Farm Management Service in Kansas, see Kansas Agricultural Experiment Station, Agricultural Economics Report No. 22, 1943.

is ever present of attempting to apply these data to a universe when it is not definitely known just what the sample represents.

### Purpose of Study

The purpose of this study was to determine, in so far as was possible, how representative the Farm Management Association farms were of Kansas farms as a whole. The intention was to isolate and study Farm Management Association farms as a group and then to compare them with the group consisting of farms other than Association farms within the same locality. It would be helpful to anyone disseminating agricultural economic information to know how Association farms compare with other farms. If it could be ascertained that the record-keeping farms in the Associations were representative of Kansas farms in general, then the information obtained through the records could be safely applied to the entire universe of Kansas farms. If the Association farms could be viewed as a representative sample of all Kansas farms, the data obtained from these farms could be safely extended to the entire farm population. On the other hand, if the Association farms were found to be non-representative of Kansas farms, then there would be need of discretion in applying any recorded data to the entire universe of Kansas farms. Any light that can be thrown on the question of representativeness should be of value in interpreting and using the data tabulated from Farm Management Association records.

### Limitations of Study

One of the important limitations of this study was the lack

of analysis-of-variance comparisons for such factors as expenses, gross and net income, crop yields, and similar comparisons that would have been helpful in measuring the relative managerial abilities of the operators on the two types of farms. Such comparisons would have been of value, but unfortunately the necessary data to make any such comparisons were not available.

A survey to contact farmers to obtain the necessary data for a complete study did not seem advisable at this time. Instead, it was decided to go ahead with the study and utilize available data. Any light that could be thrown on the degree of representativeness of Association farms should be helpful in any future, more exhaustive study. It was felt that the individual farm schedules as tabulated by the Federal Agricultural Census would make excellent data for any such study. This idea was prompted by the fact that the 1945 Federal Agricultural Census had only recently been taken. If permission could be obtained to use these data and a representative sample drawn and tabulated from it, such data should have been very satisfactory for the study in mind. The possibility of getting permission from the Bureau of Census to use these data was investigated and was found to be very remote.<sup>2</sup>

The year 1944 was not chosen as one representative of all the years in which the Farm Management Service had been in operation in Kansas, but was selected primarily as it was the most recent year that the Kansas Statistical Rolls were made available to the Department of Agricultural Economics. Also, the information in

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<sup>2</sup> Verbal information from Mr. H. L. Collins, Kansas Agricultural Statistician, Topeka, Kansas.

the Census of Agriculture for 1945 was current, and, inasmuch as most of its data pertained to 1944, its data were comparable to the other data to be used.

Although 1944 was not selected to be typical of several years, it seems logical to assume that any relationships that existed between the two groups in 1944 would indicate a normal relationship between Association farms and other farms for years other than 1944.

Another limitation of this study was concerning its scope. The Farm Management Service is not state-wide, as farmers in only 67 of the 105 counties cooperate in the Service at the present time. It seemed desirable to limit the study to only those counties that participated in the Association work, rather than to project any conclusions to the entire state. For example, Area 8 is represented in the Association by having its five eastern counties included. There are no farmer-cooperators in the western two counties at present. If Association farms in the five counties were to be compared with a sample of all farms from the seven counties which make up type-of-farming Area 8, bias might be injected into the study by the failure to make a comparison that is comparable.

#### REVIEW OF LITERATURE

The possibility of applying data from record-keeping farms to all farms in a state is an individual state's problem. Even though a definite relationship could be established between record-keeping farms and other farms of one state, such a relationship might not

necessarily exist between the two groups in another state. At the present time, five states other than Kansas have an accounting project somewhat similar to the one in use here.<sup>3</sup> In so far as is known, the Iowa Agricultural Experiment Station is the only one to make any serious and comprehensive attempt to compare their record-keeping farms with a random sample drawn from the entire population of Iowa farms. John A. Hopkins<sup>4</sup>, in reporting on the results of his study, says:

The record group was found to contain many more large farms than the representative sample. Also, it contained more farms on the cattle-feeding type, and fewer crop farms and dual-purpose cattle farms than the sample.

Even when the record farms were compared to random sample groups of farms of the same size and the same type, there were many pronounced differences. The record farms commonly produced a gross income at least half again as great as the representative farms. . . .

Net income per 100 acres also varied significantly between the two groups of farms, with the record farmers well above the representative sample. Thus an extra acre on the record farms added \$9.18 to net income on the average while an extra acre on the random sample added only \$5.01.

There were also significant differences in the amount of investment in liquid and working assets per 100 acres. The greater amount of short-lived capital on the record farms, however, was handled with approximately the same amount of labor. This may be taken as another evidence of superior management.

<sup>3</sup> Illinois, Iowa, Minnesota, Missouri, and Wisconsin are the states in addition to Kansas that have a Farm Management Service which serves as a source of data for farm management research.

<sup>4</sup> John A. Hopkins, "Statistical Comparisons of Record-Keeping Farms and a Random Sample of Iowa Farms for 1939." Iowa Agri. Expt. Sta. Res. Bul. 308, Ames, Iowa.



Acreages in corn did not differ significantly between the record and the random sample farms. But the record farmers obtained higher yields by five to nine bushels per acre. In the production of livestock and livestock products, also, the record farmers far outstripped their neighbors in the same size and type classes. This results not only from superior production on the farms but even more from the fact that the record farmers customarily bought more livestock and also more feed, and made heavier expenditures for operating expenses. Further, they paid out more for interest on borrowed funds, which suggests that the better farmers are able to use greater amounts of capital and to increase their returns by doing so.

The conclusions drawn from this study indicate that caution needs to be observed in interpreting data obtained from record-keeping farms in Iowa.

#### METHOD OF PROCEDURE

An opportunity to throw a considerable amount of light on the problem occurred recently when the 1945 Census of Agriculture for Kansas was released. Tabulations could be made from the census data and used to make comparisons with comparable data from the Association records. Kansas Agricultural Statistical Rolls that covered the period comparable to the 1945 Census of Agriculture were made available to the Department of Agricultural Economics. These Statistical Rolls contained data of each individual farm in the State. Such a source of data would make an analysis-of-variance possible for any factors that these rolls might contain.

This study was divided into two main parts. The first part and the one thought to be the more important was a statistical approach to the problem. In this approach, an analysis-of-variance

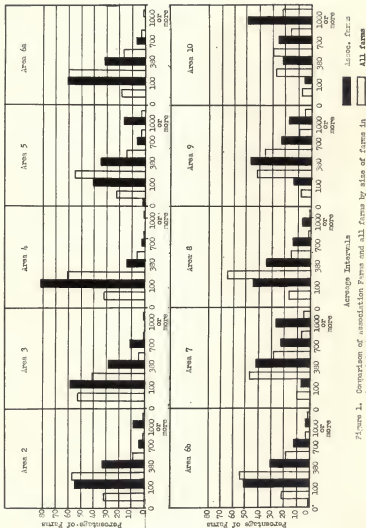
was used to determine if any difference existed between Association farms and a stratified-random sample of all farms other than Association farms. The sample was drawn from the farms other than Association farms instead of from the population of all farms. It seemed advisable to do this and thereby keep the two samples entirely separate. This technique should make possible a more clear-cut comparison. For all practical purposes this sample could be viewed as representative of all Kansas farms in these areas as the ratio of Association farms to all farms was very small and therefore the elimination of Association farms should not greatly affect the representativeness of the sample. The second part was intended to supplement the first and consisted of a group of comparisons made by obtaining averages for all farms and comparing them with averages of Association farms.

#### STATISTICAL COMPARISONS OF SELECTED FACTORS

##### The Statistical Approach

Two groups may be different because of different means, different variances, or because both mean and variance are different. Because of this, it seemed desirable to use a method that would furnish not only information about the group means, but one that would also indicate and analyze the amount of variation to be associated with each mean.

The difference that existed, on the average, between the two groups can quite readily be shown. Fig. 1 gives the percentage



distribution of the two groups among various average intervals. It is striking to note how the bars representing the Association farms are consistently shorter than the ones for all farms in the lower acreage intervals. As one approaches the larger acreages, the reverse is true. This indicates that, on the average, the Association farms are larger in size. Should this be interpreted to mean the Association farms are consistently larger? Could it mean that a few extremely large farms in either group have a leveling-out effect on many times their number of small farms? These are some of the questions that can not be answered by an approach such as the one used in Fig. 1. It was deduced that in order to make a complete study of the problem it would be necessary not only to calculate means for the two groups, but it would also be essential to calculate and analyze the variation to be associated with these means. Such an approach requires data giving individual farm values for the factors in question. The Kansas Statistical Rolls were used as a source of data for this part of the study. These rolls contained individual farm schedules for each farm in the State. Although this source furnished very detailed data, the rolls were quite limited in the kinds of information they contained. From this source, data were available to calculate means and make analyses of variance on the following factors:

1. Total acres in farm.
2. Crop acres in farm.
3. Acres in winter wheat.

4. Acres in corn.
5. Acres in oats.
6. Acres in grain sorghum.
7. Acres in alfalfa.
8. Acres in pasture.
9. Number of milk cows.
10. Number of chickens raised.

An assumption underlying this study was as follows: If it could be proved definitely that Association farms were not different from a representative sample of Kansas farms, then it could be deduced that Association farms in themselves were a representative sample of Kansas farms. Stating it conversely, if such comparisons revealed that Association farms were significantly different from a representative sample, then it could be deduced that Association farms were not representative of Kansas farms. Proceeding then from this assumption, the tests in this section were made between Association farms and a stratified-random sample of all farms other than Association farms.

The comparisons made in this study were limited to those counties in the type-of-farming areas that were represented in the Farm Management Associations. It was not deemed desirable to project the implication of any comparisons to include the entire type-of-farming area when all counties within that area were not represented. Therefore, for the purpose of this study, the type-of-farming areas were adjusted to include only those counties of the area that were represented in the Farm Management Associations.

Fig. 2 gives the type-of-farming areas as used in this study.<sup>5</sup> Area boundaries were changed slightly in some cases to eliminate counties that contained no farmer-cooperators. Area 10 was handled as one area in this study instead of using the "a", "b", and "c" sub-divisions. This decision was made to avoid small numbers in the sample. It was thought the entire area was sufficiently homogeneous to justify grouping for this study.

The statistical rolls carry the notation in bold print: "These returns are not used for taxation purposes." Although this principle is emphasized time and time again, many research workers maintain there is a tendency for farmers to underestimate items when interviewed by an assessor. Jesson<sup>6</sup> made a study of assessor bias and found that when farmers reported to assessors, they underestimated some acreages, yields, and all livestock numbers, except sheep, when compared with these facts obtained by a survey.

To eliminate any possibility of non-comparable data affecting the comparisons made, both groups of data were taken from the same source. Data for the Association farms were available from tabulations of the records, but it was believed that by taking data for Association farms from the source used for the sample, the comparisons would be more comparable. The Association farms were identified in the statistical rolls and the data for these farms tabulated to use for comparison with the data of sample farms.

<sup>5</sup> For description of type-of-farming areas in Kansas, see J. A. Hodges, P. P. Elliott, W. E. Grimes, "Types of Farming in Kansas." Kansas Agricultural Experiment Station Bulletin 251, 1930.

<sup>6</sup> Raymond J. Jesson, "Statistical Investigation of A Sample Survey for Obtaining Farm Facts." Iowa Agri. Expt. Sta. Research Bulletin 304, June 1942, Ames, Iowa.



It was realized that in order to reduce bias the majority of the Association farms must be identified so they could be included in the comparison. Table 1 shows that the majority of the Association farms were identified. The percent located varied from area to area and ranged from 79 to 98 percent, with an identification of 95 percent for all areas combined. This was considered to be a very satisfactory proportion of the Association farms, and, therefore, the data should not be biased by failure to include any particular class of farms.

Table 1. Number of Association farms and the number and percent of these farms identified in the Kansas Statistical Rolls, 1944.

Association farms	Type-of-farming area										Total
	2	3	4	5	6a	6b	7	8	9	10	
Total number	36	38	81	111	68	137	33	61	125	100	790
Number identified	34	30	78	101	65	132	31	59	123	94	747
Percent identified	94	79	96	91	97	96	94	97	98	94	95

The data for the Association farms and farms that constituted the stratified-random sample were tabulated and checked for accuracy. The means and sums of squares of deviations from the mean were calculated for each component of each group. The test applied was one which showed the average difference between the two groups and, at the same time, took into account the degree of variation to be associated with each mean. The formula used was as follows:



$t = \frac{\bar{d}}{s_{\bar{d}}}$  where "t" is a test of significance using the "t" distribution as developed by R. A. Fisher;  $\bar{d}$  is the average difference between the two means and  $s_{\bar{d}}$  is the standard deviation of the average difference.<sup>7</sup> Its formula is as follows:

$s_{\bar{d}} = \sqrt{\frac{\text{Pooled } Sx^2}{\text{Pooled Degrees of Freedom} \left( \frac{1}{n_1} + \frac{1}{n_2} \right)}}$  "n<sub>1</sub>" and "n<sub>2</sub>" represent the number in each sample of the comparison.

The hypothesis that is being tested is as follows: The two samples, i.e., the Association farms and the sample farms, are from the same population. The question is being asked, "Is the average difference between the two sample means nothing more than variation due to sampling?" If the hypothesis is disproved, then there is proof that an important difference exists between Association farms and the farms in the sample. On the other hand, if the hypothesis holds up and is not disproved, then Association farms and the representative sample of Kansas farms can be considered to be from the same universe.

It must be kept in mind that a significant value of "t" does not always mean an absolute difference between the two groups being compared. Instead, a "t" at the five percent level of probability should be interpreted as meaning that for 19 times out of 20 such trials, one can expect a real difference to exist between the two groups. One is never positive that a significant "t" is nothing more than the one-out-of-twenty chance occurring.

<sup>7</sup> For a discussion of group comparison, see George W. Snedecor "Statistical Methods" (Ames, Iowa, C. 1946).

### Sampling Technique

One of the first steps taken in making this comparison was to obtain data of the population. In the type-of-farming areas in which this comparison was made, the population consisted of more than 100,000 farm units. Such a large number of farms under consideration made it almost impossible to use data of the entire population. Even if time were available, it would be questionable if the population should be tabulated in its entirety. The obvious answer to any such problem was to sample the population and make statistical estimates of various population parameters.

George W. Snedecor<sup>8</sup> states that the two main problems that face the statistician are: (1) The collection of appropriate samples, and (2) the drawing of valid conclusions from them. In focusing attention on the first question, "Just what is an appropriate sample?"

When sampling, a few individuals are observed closely to learn something about the population. Because only a small percent of the population is usually included in the sample, it is imperative that the sample drawn be representative of the entire population. A great deal of work has been done on sampling and how the most reliable results can be obtained with a minimum of time and money. Authorities in the field seem to be in mutual agreement on the type of sampling that is best adapted to agriculture and it is pretty

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<sup>8</sup> George W. Snedecor, "Statistical Methods," (Ames, Iowa, C. 1946), 1.

well summed up when Snedecor<sup>9</sup> quotes Jerzy Neyman as saying, ". . . the only method which can be advised for general use is the method of stratified random sampling." For these reasons it was decided to use a geographical stratified random sample.

Selection of Strata. Stratifying the population is a technique used to increase the efficiency of sampling. It is a process of dividing the population into two or more parts known as "strata". These subdivisions are chosen in such a way that there is a maximum of variation between the various strata and a minimum of variation within each stratum. In searching for a logical method to stratify the population, it was realized that existing type-of-farming areas as formulated by J. A. Hodges and associates were geographical stratifications of the population.<sup>10</sup> These areas were designed so there would be a high degree of homogeneity of type of farming within each area. In the population under consideration, there were 10 type-of-farming areas and each was used as a stratum in sampling the universe.

Size of Sample. One of the most perplexing decisions for the sampler to make is to determine the size of sample. The larger the sample, the more time, expense and effort that is required, while if it is not large enough, there is danger that the sample will not properly represent the population. Snedecor states: "Investigators are often content with samples less than one-tenth of one percent

<sup>9</sup> George W. Snedecor, "Design of Sampling Experiments", Jour. of Farm Econ. 21:846, November, 1939.

<sup>10</sup> Hodges, loc. cit.

of the population, while a sample of 10 percent is usually considered large.<sup>11</sup> As the author goes on to say, that is only a loose statement, but it does tend to give a common range of sample size. Hopkins<sup>12</sup> used a sample which contained thirty-nine hundredths of one percent of the population in his study of comparing record-keeping farms with a sample that represented Iowa farms.

A sample of one percent was the size of sample decided upon. One percent was selected as it was thought that although it would not be considered a large sample, neither would it be extremely small, and it should be large enough to properly represent the population.

Weighting. Inasmuch as the individual farm is the sampling unit, the number of units drawn from each stratum should be determined by the number of farms in that stratum. This indicates the necessity of weighting the sample. If the sample were not weighted, each stratum would receive the same relative importance. This would certainly not make for a representative sample, as it is a known fact that the farms vary in number among the 10 type-of-farming areas. The sample drawn in this study was weighted by calculating the percent that the number of farms in each type-of-farming area were of the total number of farms.<sup>13</sup> This percent was then applied to the number in the entire sample to get the number of units that would be allotted to each stratum.

<sup>11</sup> Snedecor, loc. cit., p. 456.

<sup>12</sup> Hopkins, loc. cit.

<sup>13</sup> For number of farms, see Table 2. The number of farms as given by 1945 Census of Agriculture was used for the total number.

Sampling Procedure. The sampling problem that was involved in this study was to draw a sample from the entire universe of farms to compare with the Association farms. The population was defined as being all farms in 1944 other than Association farms in the 10 type-of-farming areas.<sup>14</sup>

The Statistical Rolls are prepared by counties and each township is contained in one booklet. The farm schedules can, in effect, be arranged in a definite consecutive order from the first farm to the last by arranging the counties in alphabetical order and the townships within the county in order, according to the alphabet. Such an arrangement facilitates the sampling procedure. By this method, each farm schedule, in effect, is assigned a number and can be identified at any time by this number.

Drawing the Sample. Random selection of sampling units is a "must" if unbiased statistical estimates of population parameters are to be made. To be assured of randomness, some mechanical method which cannot reflect any personal bias should be used to select the sample. In this study, as one out of every 100 schedules was drawn, the stratum was first divided into groups of 100 farms. A table of random numbers was used to determine which schedule in the first 100 to draw. The schedule indicated by the random number was tabulated, as well as every successive one hundredth schedule. Table 2 shows the number of farms other than Association

<sup>14</sup> The Statistical Rolls define a farm as follows: A farm is considered as any tract of land three acres or more in extent, owned or rented, which may be a single tract of land or a number of separate tracts operated by the same person, either by his own labor alone or with the assistance of members of his household, or hired employees. The land operated by a partnership is likewise considered as one farm. This definition is almost identical with the farm definition used in the Census of Agriculture.

farms in each type-of-farming area, the first farm schedule selected as was determined by random numbers and the number of sampling units to be allotted to each area. Any deviation from the number of the sample given here and the number actually used in the data was due to two factors: (1) The number of sampling units allotted to each stratum was determined by the number of farms in that area. The only data available giving number of farms were for one year later than the data used in this study. Therefore, there might have been some discrepancy between the number of farms as given by the 1945 Census and the number actually appearing in the statistical rolls. (2) The other reason for a discrepancy was due to incorrect farm schedules.

Table 2. The determination of the size of sample in each area by weighting the sample with the number of farms in that area.

Type-of-farming area	No. of farms (1945 census)	No. of farms, 1944	No. farms other than Assoc. farms	First farm schedule to take*	Number of farms in sample
2	9,092	36	9,056	8	91
3	11,869	38	11,931	22	118
4	9,465	81	9,384	53	94
5	16,698	111	15,577	54	156
5a	8,263	68	8,195	48	82
5b	16,698	137	16,561	85	166
7	5,958	33	5,925	21	59
8	10,456	61	10,395	38	104
9	7,169	125	7,044	77	70
10	7,616	100	7,516	17	75
Total	102,264	790	101,474		1,015

\* Determined by a table of random numbers.

When the schedules were tabulated, the acreages were added to see how closely the listed acreages would check with the figure given as the total acreage. If acreages were correctly entered, the calculated total should check with the total acreage figures with the exception that the portion of the farm commonly known as farmstead, timber, roads, wasteland, etc., was not included in the statistical rolls. A farm schedule was eliminated from the study when the calculated total acres varied 25 percent or more from the figure listed as the total acreage. This was done as an attempt to eliminate obvious errors from the data.

Figure 3 shows the dispersion of both Association farms and the sample farms used in this study. The position of the dot may not indicate the exact position of the farm because information as to the exact farm location was not available. However, information was available as to the township in which the farm appeared, and, therefore, both Association and sample farms were plotted in Fig. 3 within the township in which they were located. This figure illustrates the tendency for Association farms to be bunched and grouped together more than would be expected for a stratified-random sample drawn from the same universe. However, it is doubtful if the bunching effect is serious enough to greatly affect the representativeness of Farm Management Association farms.





## Statistical Comparisons

The statistical comparisons of Association farms and sample farms were divided into two main parts. These kinds of comparisons were: (1) Comparisons of physical quantities of selected factors, and (2) comparisons of percentage figures of the two groups. Physical quantity comparisons were made for: (1) Total acres, (2) crop acres, (3) acres of winter wheat, (4) acres of oats, (5) acres of corn, (6) acres of grain sorghum, (7) acres of alfalfa hay, (8) acres in pasture, (9) number of milk cows, and (10) number of chickens raised. Percentages were arrived at by calculating the percent that each acreage was of the total acreage on the individual farm. This study was made to endeavor to determine if Association farms had a larger or smaller proportion of their total acreage in certain crops than Kansas farms as a whole. The percentage-difference comparisons were made for the following acreages: (1) Crop acres, (2) winter wheat, (3) corn, (4) oats, (5) grain sorghum, (6) alfalfa hay, and (7) pasture. Comparisons were made between the two groups within type-of-farming areas, therefore, the sample as analyzed constituted several random samples instead of one stratified-random sample.

Total Acres. Are the Farm Management Association farms larger than the other farms in the community? This has always been a prevalent question when working with the data obtained from these records. It had been agreed generally that Association farms were larger than the average-sized farm. Such generalizations were based upon personal observations and upon information obtained by comparing average farm size of Association farms with county and state averages. Is the difference in acreage between the two types

of farms due to the inclusion of some extremely large farms in the Association groups and by averaging them arriving at a mean that is larger than the mode? If the Association farms are larger, then how much larger are they? These are some of the questions that needed answering. That Association farms are larger than neighboring farms is shown by Table 3. The difference is a significant one in all cases except in Area 10. All areas but Area 6a had differences that were highly important. The variation in acreage of the sample farms in Area 10 was extremely large in that the acreages ranged from 90 - 15,200. Even though the Association farms averaged 329 acres larger, the great amount of variation present resulted in the difference being nothing more than what could be expected due to sampling variation.

Table 3. Average number of total acres that Association farms exceeded sample farms and the significance of these differences, 1944.

Type-of-farming area	Difference in total acres
2	351.8**
3	220.9**
4	142.2**
5	231.7**
6a	95.0*
6b	137.0**
7	512.3**
8	201.0**
9	358.8**
10	329.0

\* Significant at the 5 percent level of probability.

\*\* Significant at the 1 percent level of probability.

Crop Acres. Acres of the Association farms that were devoted to crop production averaged from 83 to 200 acres larger than sample farms, Table 4. In all cases these differences represented significant ones and in all areas but Area 10 the differences were highly significant.

Table 4. Average amounts that Association farms exceeded sample farms and the significance of these differences, 1944.

Type-of-farming area	Kind of Comparison	
	Crop acres	Percent (Crop A. in % of Total A.)
2	125.6**	-4.1
3	148.2**	8.1
4	83.1**	-1.2
5	103.6**	-0.1
6a	79.4**	6.8*
6b	100.9**	2.8
7	198.8**	-3.2
8	77.6**	-6.6*
9	170.9**	-6.2*
10	200.8*	-7.5

\* Significant at the 5 percent level of probability.  
 \*\* Significant at the 1 percent level of probability.

Do Association farms have a larger proportion of their acreage devoted to crop land than sample farms? The study tabulated in Table 4 shows in 7 out of 10 areas, the sample farms had a larger proportion of their farm area in crops than was true for Association farms. In only three cases, however, was the difference an important one. Two of these cases indicated a higher percent for the sample farms, while Area 6a showed that Association farms in that area had a larger portion of the total area in crops.

Acres in Corn. The comparisons made for corn were not calculated for Areas 9 and 10, as it was thought that this crop was not of sufficient importance in these two areas to attach any meaning to any calculated comparisons. Table 5 indicates no definite trend; however, in most cases Association farms had a larger corn acreage, and in three of these areas the difference was either significant or highly significant. It is revealing to note that in every area the proportion of the sample farms that was devoted to corn was larger than in the case of Association farms. In more than one-half of the areas the percentage difference was a significant one.

Table 5. Average amounts that Association farms exceeded sample farms and the significance of these differences, 1944.

Type-of-farming area	Kind of Comparison	
	Corn acres	Percent (corn A. in % of Total A.)
2	19.8**	-8.2**
3	35.7*	-0.4
4	-1.3	-9.1**
5	13.0**	-4.5*
6a	-3.1	-4.1*
6b	3.2	-0.2
7	7.1	-0.1
8	13.2	-6.6**
9	--	--
10	--	--

\* Significant at the 5 percent level of probability.

\*\* Significant at the 1 percent level of probability.

Acres in Wheat. Winter wheat is an important crop in all parts of Kansas. That wheat acreage of Association farms averaged larger than sample farms is shown by Table 6. In all but two areas the difference was significant, and in most of these

Table 6. Average amounts that Association farms exceeded sample farms and the significance of these differences, 1944.

Type-of-farming area	Kind of comparison	
	Acres in wheat	Percent (wheat A. in % of total A.)
2	15.1*	1.0
3	24.3**	1.7
4	15.0**	1.0
5	21.2**	0.5
6a	36.7**	3.0
6b	33.3*	-4.1
7	115.9**	-7.6
8	18.7	-2.4
9	100.1**	-6.8*
10	115.6	-6.8

\*Significant at the 5 percent level of probability.

\*\*Significant at the 1 percent level of probability.

areas it was highly significant. A trend is indicated by the comparison of percent of farm acreage in wheat. A larger percent of the farm area was in wheat on Association farms in the eastern type-of-farming areas as compared with the sample farms. This trend was reversed in the western half of the state, where the larger proportion of the farm area was in wheat on sample farms. It must be kept in mind, however, that this is only an indication, as the difference in Area 9 is the only one that is significant statistically.

Acres in Oats. All areas in this study with the exception of Areas 9 and 10 are important in the production of oats. For this reason comparisons were made for Areas 2-8 only. In all eight areas for which the comparisons were made, Table 7 shows that Association farms had larger acreages in oats than the sample farms.

Table 7. Average amounts that Association farms exceeded sample farms and the significance of these differences, 1944.

Type-of-farming area	Kind of comparison	
	Acres in oats	Percent (oat A. in % of total A.)
2	18.0**	-2.3
3	18.8*	-0.4
4	7.3	0.1
5	4.9	-2.0*
6a	7.6*	0
6b	10.4**	-0.9
7	2.0	-0.7
8	10.7**	-0.8
9	--	--
10	--	--

\* Significance at the 5 percent level of probability.

\*\* Significance at the 1 percent level of probability.

More than half of these areas had differences that were significant. The percentage comparison showed a tendency for sample farms to have a larger proportion of their total acres in oats as compared with the Association farms. Area 5 was the only area that revealed a significant difference.

Acres in Grain Sorghum. Comparisons for grain sorghum were restricted to those areas where they were considered to be of importance. All areas in which the comparisons were made show a larger acreage on the average for Association farms, Table 8. No definite trend is indicated, however, as only three of the seven areas show a difference that is significant. In five of these seven areas, sample farms indicated a larger percent of the farm was in grain sorghum than was the case for Association farms.

Table 8. Average amounts that Association farms exceeded sample farms and the significance of these differences, 1944.

Type-of-farming area	Kind of comparison	
	Acrea in grain sorghums	Percent (grain sorghums A. in % of total A.)
2	13.1*	-2.0
3	--	--
4	--	--
5	1.4	-3.2**
6a	2.8	0.3
6b	1.0	-0.7
7	14.6*	0.7
8	--	--
9	15.9**	-1.1
10	14.8	-1.2

\* Significance at the 5 percent level of probability.

\*\* Significance at the 1 percent level of probability.

Acrea in Alfalfa Hay. The comparisons made between Association farms and sample farms for alfalfa acreage as shown in Table 9 makes an interesting comparison. Association farms not only exceeded sample farms in alfalfa acreage in every area, but the difference was highly significant in every one of these areas.

Table 9. Average amounts that Association farms exceeded sample farms and the significance of these differences, 1944.

Type-of-farming area	Kind of comparison	
	Acrea in alfalfa hay	Percent (alfalfa A. in % of total A.)
2	15.5**	1.2
3	19.2**	2.1
4	12.4**	2.3**
5	16.9**	2.6**
6a	12.0**	2.6**
6b	17.2**	3.9**
7	9.5**	1.1*
8	17.5**	2.7**
9	11.1**	2.0**
10	--	--

\* Significant at the 5 percent level of probability.

\*\* Significant at the 1 percent level of probability.

In considering the proportion of the farm devoted to alfalfa acreage, in every case Association farms had a larger percent of their total acreage devoted to alfalfa hay than sample farms. The differences in all areas excepting Areas 2 and 3 were significant ones. That Areas 2 and 3 are relatively less important in alfalfa production may explain this result. Alfalfa hay is not an important crop in Area 10, and, therefore, this comparison was not made for that area.

Acres in Pasture. Pasture acreage on Association farms exceeded sample farms on the average in every type-of-farming area. Table 10 shows that in 6 of the 10 areas the difference was an important one. It is interesting to note that two of the four areas where no significant difference existed were our important pasture areas, namely, Areas 5 and 10. The percentage comparisons reveal no important difference between Association farms and sample farms in regard to the proportion of the farm that is devoted to pasture.

Table 10. Average amounts that Association farms exceeded sample farms and the significance of these differences, 1944.

Type-of-farming area	Kind of comparison	
	Acres in pasture	Percent (pasture A. in % of total A.)
2	200.5**	6.2
3	69.0**	-3.1
4	80.2*	4.7
5	180.2	1.3
6a	13.7	-5.8
6b	80.2	-3.7
7	287.3**	5.1
8	105.0**	5.7
9	142.7*	0.9
10	127.5	7.5

\* Significant at the 5 percent level of probability.

\*\* Significant at the 1 percent level of probability.



Number of Milk Cows and Chickens. Table 11 indicates that Association farms had more cows on the average in all areas except in Area 2. Here again it must be remembered that in only four of these areas was the difference a significant one, and in the other cases the average difference was only an indication of any real difference between the two groups. This table also shows a comparison of number of chickens raised on Association farms as compared with sample farms. Eight of the 10 areas showed a larger number of chickens on Association farms, with six of these average differences being significant.

Table 11. Average number of milk cows and chickens that Association farms exceeded sample farms and the significance of these differences, 1944.

Type-of-farming area	Kind of comparison	
	Number of milk cows	Number of chickens
2	-0.3	52.4
3	4.1*	85.4**
4	0.2	-13.6
5	1.5	143.3**
6a	0.3	96.3**
6b	1.2	115.7**
7	4.5*	-12.6
8	1.4*	134.9**
9	1.6	51.3
10	1.5*	83.9**

\* Significant at the 5 percent level of probability.

\*\* Significant at the 1 percent level of probability.

#### COMPARISONS MADE WITH CENSUS DATA

This part of the study was devoted to making comparisons between Association farms and average Kansas farms for any factors that might be useful for which data were available. Most of the

comparisons were made by tabulating Census data and comparing the calculated averages with averages obtained from tabulations taken from the Farm Management Association record books for a comparable period. This part of the study was not intended to furnish information to draw definite and precise conclusions about the relationship between Association farms and average Kansas farms. Instead, it was hoped that this part of the study would furnish some general information about these relationships to supplement the statistical comparisons that have been made. It was believed that even though the technique used in this section was not refined, nevertheless any such comparisons should be useful in establishing the relationship that exists between the two groups of farms.

#### Type of Farming

Are the types of farming that are represented in the Farm Management Associations typical of the types to be found on Kansas farms in general? A study of Fig. 4 and Table 12 shows that Association farms represented a larger percent of some types and fewer of other types of farming, as compared with a distribution of all Kansas farms. In almost every area, Association farms had a larger percentage distribution in the general farms and live-stock farms, while they had a smaller percent of the total number

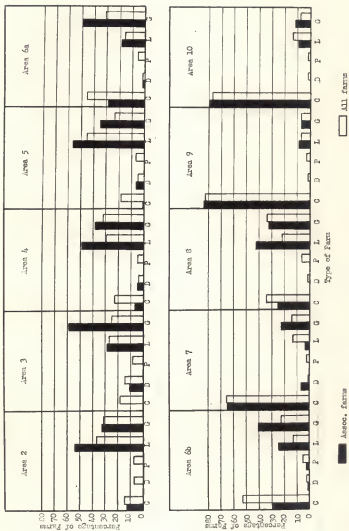


Figure 4. Comparison of Association farms and all farms in type-of-farming areas, 1944.

Table 12. The frequency with which types of farming occur in Farm Management Associations as compared with all farms in type-of-farming areas, 1945.

Area:	Crop	Type of farming									
		Dairy	Poultry	Livestock	General	Other	Total	Assoc:	All	Assoc:	All
farms:	farms:	farms:	farms:	farms:	farms:	farms:	farms:	farms:	farms:	farms:	farms:
2	12.5	15.5	-	7.5	-	7.7	54.1	37.4	33.4	31.5	-
3	-	13.9	11.7	15.5	-	8.1	29.4	27.9	53.9	24.7	-
4	7.6	23.4	5.2	4.0	-	4.9	45.7	34.0	38.5	32.1	-
5	1.2	18.7	6.4	4.7	-	6.8	56.5	45.2	35.9	24.0	-
6a	29.7	45.3	2.2	2.1	-	5.3	19.1	15.3	40.0	55.2	-
6b	29.7	53.3	1.6	3.3	3.3	5.3	24.9	13.4	40.5	23.2	-
7	65.3	36.0	7.7	1.2	-	3.1	3.9	14.1	23.1	15.5	-
8	24.4	35.2	-	1.6	-	7.0	42.9	22.1	32.7	33.9	-
9	83.9	82.2	-	1.1	-	2.2	8.6	7.2	7.5	7.0	-
10	79.9	76.3	-	1.1	-	1.3	8.6	13.2	11.6	6.7	-

1 The "Assoc. farms" are tabulated from Association farm records by using the classifications as used in the 1945 Census of Agriculture.

2 The term "All farms" is used here to mean all of the farms classified by the 1945 Census of Agriculture for the area designated. Calculated from 1945 Census of Agriculture for Kansas.

in crop farms than was the case for Kansas farms as a whole.<sup>15</sup> Dairy and poultry farms were insufficiently represented to indicate a trend. Figure 4 portrays effectively the relationship between the two groups for the various types in each area, but fails to show satisfactorily the relative values for specific types throughout all areas. Table 12 was included to illustrate the percentage distribution that existed throughout all areas for specific types. Figure 4 was patterned after the data in Table 12.

#### Farm Tenure

That Association farms were not typical of the tenure of operators on Kansas farms in general is illustrated by Table 13.

<sup>15</sup> The 1945 Census of Agriculture classified only those farms that produced primarily for sale and used the following classification of farm types. "If the value of products sold from one source of income was more than 50 percent of the total value of all farm products sold, then the farm was classified as the type corresponding to that source of income. Farms for which the value of products from any one of the eight sources of income did not exceed 50 percent of the total value of all farm products sold were classified as 'general' farms." The eight types were (1) fruit-and-nut, (2) vegetable farms, (3) horticultural-speciality farms, (4) all-other crop, (5) dairy farms, (6) poultry farms, (7) livestock farms, (8) forest-product farms, and (1) general farm. Types number 1, 2, 3, and 8 were tabulated as "other farms" in Table 19 as they were relatively unimportant.

Table 13. Tenure of farm operators of Association farms and comparison with all farms in type-of-farming areas, 1944.

Type-of-farming area	Owner		Part owner		Tenant		Total	
	:Assoc.:	:All	:Assoc.:	:All	:Assoc.:	:All	:Assoc.:	:All
	:farms	:farms	:farms	:farms	:farms	:farms	:farms	:farms
(Percent each is of total)								
2	16.6	45.1	66.7	20.7	16.7	33.9	100.0	100.0
3	23.5	51.8	52.9	17.1	23.6	30.2	100.0	100.0
4	35.8	40.8	41.1	18.7	23.1	40.1	100.0	100.0
5	30.7	41.1	52.6	20.8	16.7	37.5	100.0	100.0
6a	25.5	36.0	57.4	27.0	17.1	36.7	100.0	100.0
6b	17.3	32.3	59.5	26.5	23.2	40.9	100.0	100.0
7	3.8	31.6	73.1	33.3	23.1	34.8	100.0	100.0
8	26.5	35.8	55.1	25.0	18.4	38.9	100.0	100.0
9	11.8	25.2	51.6	33.2	36.6	41.3	100.0	100.0
10	15.9	28.7	58.0	35.2	26.1	35.4	100.0	100.0
Total	20.4	37.6	55.9	24.8	23.7	37.2		

The Association farms represented more part-owner, fewer owner, and fewer tenant farms than was the case when all farms within these areas were classified as to tenure. It is convincing to note that the above statement was true for every type-of-farming area in the study. The census definition of tenure was applied to the farms in the Farm Management Associations. The tenure classifications were as follows: (1) owner, (2) part owner, and (3) tenant. These classifications were defined in the 1945 Census of Agriculture as follows: (1) Owner--operators that own all the land they operate; (2) part owner--operators that own a part and rent from others the remaining part of the land they operate; and (3) tenant--operators that operate hired or rented land only.

### Gross Income by Type

The gross income of Association farms was much larger on the average than the average for all farms within the area. Tables 14 and 15 show that in only one case--livestock farms for Area 10--was the amount for average farms greater than for Association farms. The percentage deviation of general farms appeared to be more consistent than any other type of farm in exceeding average farms the greatest amount. The Association livestock farms had the most erratic variation in that they ranged from -49 to 205 percent larger than average for all farms. Association crop farms tended to be more nearly similar to the average of all crop farms in the area than was true for any other type of farm.

Table 14. Gross income of Association farms and comparison with all farms in type-of-farming areas, by type, 1944.

Type-of-farming area	Type of farming									
	Crop	Dairy	Poultry	Livestock	General	Other	Assoc.:all farms	Assoc.:all farms	Assoc.:all farms	Assoc.:all farms
	farms	farms	farms	farms	farms	farms	farms	farms	farms	farms
	Average per farm in dollars									
2	1/	2,786 --	2,577 --	1,493 11,405	4,302 4,991	2,429 --	7,394			
3	--	3,399 1/	3,734 --	1,357 13,030	4,277 10,183	2,971 --	2,944			
4	1/	4,017 1/	2,471 --	1,760 8,799	5,617 6,551	3,379 --	4,310			
5	1/	3,393 9,305	2,675 --	1,900 10,715	6,299 7,473	2,624 --	2,756			
6a	6,867	4,640 1/	3,911 --	2,139 8,927	7,127 6,627	3,673 --	7,738			
6b	10,758	5,646 1/	4,082 1/	2,342 12,924	7,277 10,407	4,100 --	3,212			
7	13,027	5,960 1/	2,833 --	1,233 1/	8,032 6,645	3,641 --	3,061			
8	9,953	4,152 --	2,232 --	1,691 8,795	4,577 6,887	3,320 --	3,599			
9	12,836	9,234 --	2,937 --	2,290 21,063	10,061 12,660	4,555 --	3,575			
10	16,164	11,196 --	3,769 --	2,459 9,302	13,853 11,244	4,662 --	3,269			

1/ Averages were not given for groups having less than five farms.



Table 15. Percent that average gross income of Association farms exceeded the average gross income of all farms in the type-of-farming areas, 1944.

Type-of-farming area	Type of farming				
	Crop	Dairy	Poultry	Livestock	General
2	1/	1/	1/	165.1	105.5
3	1/	1/	1/	204.7	254.7
4	1/	1/	1/	56.5	93.9
5	1/	244.1	1/	70.1	184.8
6a	48.0	1/	1/	23.9	80.4
6b	90.5	1/	1/	77.6	153.8
7	118.6	1/	1/	1/	82.5
8	139.7	1/	1/	91.9	113.9
9	39.0	1/	1/	109.4	177.9
10	44.4	1/	1/	-48.9	141.2

1/ Comparison not made when less than five farms were represented.

#### Sales of Crops, Dairy Products, Poultry and Poultry Products and Livestock and Livestock Products

Tables 16, 17, and 18 show that sales of poultry, poultry products, dairy products and crops averaged larger for Association farms than for an average of all farms. However, in most cases the difference was not large. These data would tend to indicate that for sales of crops, dairy products, poultry and poultry products, the Association farms on the average are not greatly different from average Kansas farms. It is interesting to note how the percentage deviation increases substantially as one passes from the above comparisons to value of sales of livestock and livestock products. Table 19 shows that in every area Association farms far exceeded the average of all farms in the sale of livestock and their products. The percentage difference ranged from 65-450. This is a striking difference and should indicate that in respect to the sale of livestock and livestock products the Association farms are much above average.

Table 16. Value of sales of poultry and poultry products of Association farms and comparison with all farms in type-of-farming areas, 1944.

Type-of-farming area	Association farms	All farms <sup>1/</sup>	Percentage devia- tion from all farms
Average per farm			
2	\$550	\$338	42
3	391	310	26
4	418	399	5
5	679	420	62
6a	668	518	29
6b	1,108	510	117
7	354	361	-2
8	833	499	67
9	485	393	23
10	446	357	25

<sup>1/</sup> Tabulated from 1945 Census of Agriculture.

Table 17. Value of sales of dairy products of Association farms and comparison with all farms in type-of-farming areas, 1944.

Type-of-farming area	Association farms	All farms <sup>1/</sup>	Percentage devia- tion from all farms
Average per farm			
2	\$520	\$497	5
3	1,440	1,008	43
4	671	559	20
5	946	528	79
6a	533	434	23
6b	801	586	37
7	1,603	341	370
8	460	370	24
9	679	439	55
10	371	465	-25

<sup>1/</sup> Tabulated from 1945 Census of Agriculture.

Table 18. Value of crop sales of Association farms and comparison with all farms in type-of-farming areas, 1944.

Type-of-farming area	Association farms	All farms <sup>1/</sup>	Percentage devia- tion from all farms
Average per farm			
2	\$1,485	\$ 570	161
3	2,668	740	261
4	1,288	1,180	9
5	1,229	729	69
6a	2,521	1,787	41
6b	3,474	2,492	39
7	6,059	3,181	90
8	2,337	1,384	62
9	6,832	6,041	13
10	7,790	7,230	8

<sup>1/</sup> Tabulated from 1945 Census of Agriculture.

Table 19. Value of sales of livestock and livestock products of Association farms and comparison with all farms in type-of-farming areas, 1944.

Type-of-farming area	Association farms	All farms <sup>1/</sup>	Percentage devia- tion from all farms
Average per farm			
2	\$9,084	\$1,653	450
3	7,801	1,449	438
4	6,320	2,072	205
5	7,257	2,323	157
6a	3,428	1,686	103
6b	7,660	1,665	360
7	5,153	1,799	186
8	5,467	1,399	291
9	6,173	1,853	233
10	5,248	3,182	65

<sup>1/</sup> Tabulated from 1945 Census of Agriculture.

### Value of Real Estate

Tables 20 and 21 show the comparison of the value of real estate of Association farms with average value of Kansas farms. In interpreting these tables, it should be kept in mind that different sources of data are used for the two groups. The Census enumerators were instructed to tabulate farm real estate values at the market price. In contrast with this, Farm Management Association cooperators were asked to enter their real estate at a value as nearly "normal" as possible. In some instances, such as recent land purchases, the value was recorded at a price above normal. There is reason to believe that the average real estate value is more above the normal value for all farms than for Association farms. Table 21 gives a comparison of the value of real estate per acre of Association farms and average farms. In 7 of the 10 areas, the Association farms averaged less per acre than all farms. Table 20 shows that Association farms represented a considerably larger investment in real estate than was the case for average farms. This table indicates that on the average, Association farms ranged from 20 - 149 percent larger than the average for all farms. That the larger investment was not due to a higher value per acre is illustrated by Table 21. The greater investment of Association farms might have been due to better improvements or larger acreage per farm. Probably the latter is the more important factor.

Table 20. Value of real estate of Association farms with comparison of all farms in type-of-farming area, 1944.

Type-of-farming area	Association farms	All farms	Percentage devia- tion from all farms
Average per farm			
2	\$18,000	\$ 8,305	117
3	28,409	11,391	149
4	16,907	12,165	39
5	26,593	14,824	79
6a	22,479	16,044	40
6b	30,744	21,613	42
7	27,369	18,397	49
8	24,034	11,416	111
9	40,127	25,581	57
10	32,144	26,303	22

1/ Tabulated from 1945 Census of Agriculture.

Table 21. Value of real estate per acre of Association farms with comparison of all farms in type-of-farming area, 1944.

Type-of-farming area	Association farms	All farms	Percentage devia- tion from all farms
2	\$33.51	\$38.55	-15
3	73.62	68.75	7
4	58.42	61.90	-6
5	36.16	37.73	-4
6a	57.24	56.29	2
6b	68.56	71.18	-4
7	27.74	42.07	-52
8	47.85	42.37	13
9	46.19	57.82	-25
10	24.83	29.78	-20

1/ Tabulated from 1945 Census of Agriculture.

### Cost of Feed Purchased

An interesting relationship is shown by Table 22 for cost of feed purchased for Association farms and average farms.

Table 22. Cost of feed purchased on Association farms and comparison with all farms in type-of-farming areas, 1944.

Type-of-farming area	Association farms	All farms <sup>1/</sup>	Percentage devia- tion from all farms
Average per farm			
2	\$1,375	\$493	179
3	1,235	576	123
4	1,772	633	180
5	1,742	667	161
6a	947	460	106
6b	2,029	655	210
7	1,241	367	238
8	1,183	444	166
9	1,038	524	96
10	1,068	627	70

<sup>1/</sup> Tabulated from Census of Agriculture, 1945.

Association farms on the average bought 70-238 percent more feed than was the case for average Kansas farms. It is helpful to refer to Table 18 to recall how much larger the sales of livestock were for Association farms. This indicates that Association farms had more livestock and bought more feed when compared with the average of all farms.

### Value of Farm Machinery

That Association farms had a much larger investment in machinery than average farms is indicated by Table 23. The data for the two groups are not entirely comparable, as the figures for the "all farms" group do not include the value of the farm-share

Table 23. Values of machinery of Association farms with comparison of all farms in type-of-farming areas, 1944.

Type-of-farming area	Association farms	All farms	Percentage deviation from all farms
Average per farm			
2	\$2,315	\$1,016	128
3	2,339	986	203
4	2,065	1,182	75
5	2,747	1,260	118
6a	2,503	1,739	44
6b	3,008	2,041	47
7	2,986	2,048	46
8	2,430	1,321	88
9	3,820	2,675	43
10	3,521	2,306	21

1/ Tabulated from Census of Agriculture, 1945.

of the automobile, while the averages for the Association farms do. The average value of the farm-share of the automobile for 121 farms in type-of-farming Area 6b for 1944 was \$298. These two groups would make a better comparison if approximately this amount were added to the average of all farms. It is readily seen that even after this adjustment, Association farms far exceeded the average for all farms in value of machinery.

## SUMMARY AND CONCLUSIONS

Since 1931 the farm record books of cooperators in the Farm Management Associations have made available a vast amount of farm management data. These records have given some of the most complete and extensive information that was available of the internal organization and functioning of the farm business. The data collected from these farm records have been of invaluable assistance in farm management research, teaching and administering agriculture.

The extent to which these data could be used has been limited by the lack of any information regarding the position which Farm Management Association farms held in the distribution of Kansas farms. Can these record-keeping farms be considered representative of Kansas farms?

That caution should be used when interpreting these data was revealed when a study was made by comparing Association farms with a stratified random sample of Kansas farms. The following facts were determined in this study:

1. Association farms were much larger in total acres than sample farms.
2. The crop areas of Association farms were significantly larger than sample farms.
3. Association farms in most areas except our main pasture areas--5 and 10--were significantly larger in pasture acreages.
4. There appeared to be very little difference when comparing the two kinds of farms in grain sorghum acreages. Although in every instance Association farms averaged more acres in grain



sorghums, in only three of these comparisons were the differences significant.

5. The study revealed that more than one-half of the areas showed significantly more acres of oats on Association farms when compared with sample farms.

6. Although there was not much difference in corn acreage, sample farms had a significantly larger proportion of their acreage in this crop than did Association farms.

7. Acres in wheat on Association farms represented a much larger acreage than did the sample farms. Although it was not a significant difference, it was of interest to note that in approximately the eastern one-half of the state, Association farms had a larger percent of their farm area in wheat than did the sample farms. In the western part of the state this situation was just the reverse, and sample farms had a larger proportion of their farms in wheat when compared with the Association farms.

8. Association farms had significantly more alfalfa hay--both in acres of hay and in percentage that the alfalfa acreage was of the total farm area.

9. There did not appear to be much difference between the two groups of farms in regard to average number of milk cows. However, there appeared to be an important difference in the average number of chickens raised in that all but two areas averaged more on Association farms while three-fourths of these comparisons were highly significant.

A study of the comparison of Association farms with massed data of all farms in the area revealed the following information:

1. The Farm Management Associations included more general farms, more livestock farms, and fewer crop farms than would have been expected in a sample that was really representative of the universe.
2. The farms in the Associations represented fewer tenants, fewer owners, and more part-owners than was true for Kansas farms in general.
3. Association farms exceeded average Kansas farms in almost every instance when the gross income--which measured volume of business--was compared.
4. There did not appear to be much difference between the two groups in regard to sales of crops, poultry, dairy, and their products. However, when comparing livestock sales, feed purchased, and value of machinery, Association farms far exceeded the values for average Kansas farms.
5. Association farms had a much larger investment in real estate. This appeared to be due more to the larger size of farm than to any higher priced land. In fact, in most areas Association farms showed a lower land value per acre than the average for all farms.

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## STATISTICAL APPENDIX

## AREA 2

Table 24. Average differences between Association farms and sample farms for selected factors and the significance of these differences, Area 2, 1944.

Comparison : of acreages : or numbers :	Ave. Assoc. farms :	Ave. of sample farms :	Ave. dif- ference :	t	Signif- icance
:	(31)	(82)	:	:	:
Total A.	570.8	219.0	351.8	4.793	N.S.
Crop A.	228.4	102.8	125.6	6.576	N.S.
Corn	53.5	33.7	19.8	3.414	N.S.
Wheat	27.2	12.1	15.1	2.323	S.
Oats	38.4	18.4	18.0	2.857	N.S.
G. Sorghum	23.7	11.6	12.1	2.574	S.
Pasture	296.8	96.3	200.5	3.353	N.S.
Alfalfa	20.9	5.4	15.5	4.844	N.S.
Chickens	269.7	217.3	52.4	1.120	N.S.
Milk cows	4.6	4.9	-0.3	.375	N.S.

Table 25. Average percent that Association farms exceeded sample farms and the significance of these differences, Area 2, 1944.

Comparison : of acreages : or numbers :	Ave. Assoc. farms :	Ave. of sample farms :	Ave. dif- ference :	t	Signif- icance
:	(31)	(82)	:	:	:

Percent that each crop acreage is of total acres

Crop acres	49.2	53.3	-4.1	.932	N.S.
Wheat	5.3	5.3	1.0	.556	N.S.
Oats	7.5	9.8	-2.3	1.533	N.S.
Corn	11.4	19.6	-8.2	2.828	N.S.
G. Sorghums	4.2	6.2	-2.0	1.429	N.S.
Pasture	43.7	37.5	6.2	1.630	N.S.
Alfalfa	3.8	2.6	1.2	1.500	N.S.

## AREA 3

Table 26. Average differences between Association farms and sample farms for selected factors and the significance of these differences, Area 3, 1944.

Comparison of acreages or numbers	Ave. Assoc. farms	Ave. of sample farms	Ave. difference	t	Significance
	(26)	(115)			
Total A.	407.1	186.2	220.9	5.708	H.S.
Crop acres	258.3	110.1	148.2	5.722	H.S.
Corn	77.7	42.0	35.7	2.525	S.
Wheat	39.7	15.4	24.3	3.240	H.S.
Oats	39.7	22.9	16.8	2.435	S.
O. Sorghum	8.1	3.1	5.0	2.778	H.S.
Pasture	126.3	57.8	68.0	4.423	H.S.
Alfalfa	25.2	6.0	19.2	8.727	H.S.
Chickens	257.7	172.3	85.4	3.072	H.S.
Milk cows	10.2	6.1	4.1	2.278	S.

Table 27. Average percent that Association farms exceeded sample farms and the significance of these differences, Area 3, 1944.

Comparison of acreages or numbers	Ave. Assoc. farms	Ave. of sample farms	Ave. difference	t	Significance
	(26)	(115)			

Percent that each crop acreage is of total acres

Crop acres	65.0	56.9	8.1	1.800	N.S.
Wheat	9.2	7.5	1.7	.680	N.S.
Oats	10.0	10.4	-.4	.200	N.S.
Corn	20.6	21.0	-.4	.123	N.S.
Pasture	29.9	33.0	-3.1	.646	N.S.
Alfalfa	6.5	4.4	2.1	1.312	N.S.

## AREA 4

Table 28. Average differences between Association farms and sample farms for selected factors and the significance of these differences, Area 4, 1944.

Comparison of acreages: or numbers :	Ave. Assoc. farms :	Ave. of sample farms :	Ave. dif- ference :	t :	Signif- icance :
	(67)	(94)			
Total A.	370.0	227.8	142.2	3.052	H.S.
Crop A.	201.7	138.6	63.1	3.756	H.S.
Corn	58.2	59.5	-1.3	.220	N.S.
Wheat	35.3	20.5	15.0	2.995	H.S.
Oats	32.0	24.7	7.3	1.490	N.S.
Pasture	147.9	67.7	80.2	2.408	S.
Alfalfa	24.7	12.3	12.4	5.391	H.S.
Chickens	220.6	234.2	-13.6	.544	N.S.
Milk cows	6.8	6.6	.2	.250	N.S.

Table 29. Average percent that Association farms exceeded sample farms and the significance of these differences, Area 4, 1944.

Comparison of acreages: or numbers :	Ave. Assoc. farms :	Ave. of sample farms :	Ave. dif- ference :	t :	Signif- icance :
	(67)	(94)			

Percent that each crop acreage is of total acres

Crop acres	62.7	63.9	-1.2	.416	N.S.
Wheat	10.6	9.6	1.0	.581	N.S.
Oats	9.8	9.7	.1	.063	N.S.
Corn	20.1	29.2	-9.1	4.212	H.S.
G. Sorghum	2.4	.9	1.5	2.586	S.
Pasture	31.7	27.0	4.7	1.821	N.S.
Alfalfa	8.3	6.0	2.3	2.911	H.S.



## AREA 5

Table 30. Average differences between Association farms and sample farms for selected factors and the significance of these differences, Area 5, 1944.

Comparison : of acreages : or numbers :	Ave. : Assoc. : farms : (92)	Ave. of : sample : farms : (156)	Ave. dif- : ference : t	Signif- : icance
Total A.	691.1	409.4	281.7	2.799 H.S.
Crop A.	222.2	119.6	103.6	7.000 H.S.
Corn	40.7	27.7	13.0	3.291 H.S.
Wheat	46.0	24.8	21.2	3.113 H.S.
Oats	24.8	19.9	4.9	1.689 N.S.
G. Sorghum	15.3	13.9	1.4	.482 N.S.
Pasture	421.8	281.6	160.2	1.692 N.S.
Alfalfa	29.3	11.4	16.9	5.314 H.S.
Chickens	361.4	218.1	143.3	3.752 H.S.
Milk cows	6.7	6.2	1.5	1.923 N.S.

Table 31. Average percent that Association farms exceeded sample farms and the significance of these differences, Area 5, 1944.

Comparison : of acreages : or numbers :	Ave. : Assoc. : farms : (92)	Ave. of : sample : farms : (156)	Ave. dif- : ference : t	Signif- : icance
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Percent that each crop acreage is of total acres

Crop acres	44.5	44.6	-.1	.031	N.S.
Wheat	8.9	8.4	.5	.316	H.S.
Oats	5.1	7.1	-2.0	2.247	S.
Corn	8.5	13.0	-4.5	3.020	H.S.
G. Sorghum	3.3	6.5	-3.2	2.909	H.S.
Pasture	47.5	46.2	1.3	.376	N.S.
Alfalfa	5.8	3.2	2.6	4.492	H.S.

## AREA 6a

Table 32. Average differences between Association farms and sample farms for selected factors and the significance of these differences, Area 6a, 1944.

Comparison of acreages or numbers	Ave. Assoc. farms (60)	Ave. of sample farms (82)	Ave. dif- ference	t	Signif- icance
Total A.	360.6	265.6	95.0	2.572	S.
Crop A.	252.8	173.4	79.4	4.186	H.S.
Corn	24.2	27.3	-3.1	.608	N.S.
Wheat	136.3	99.6	36.7	2.823	H.S.
Oats	26.7	19.1	7.6	2.262	S.
G. Sorghum	7.3	4.5	2.8	1.647	N.S.
Pasture	98.3	74.8	13.7	.953	N.S.
Alfalfa	19.0	7.0	12.0	5.992	H.S.
Chickens	327.6	231.3	96.3	2.728	H.S.
Milk cows	5.2	4.9	.3	.442	N.S.

Table 33. Average percent that Association farms exceeded sample farms and the significance of these differences, Area 6a, 1944.

Comparison of acreages or numbers	Ave. Assoc. farms (60)	Ave. of sample farms (82)	Ave. dif- ference	t	Signif- icance
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Percent that each crop acreage is of total acres

Crop acres	72.5	65.7	6.8	2.193	S.
Wheat	39.8	35.8	3.0	1.086	N.S.
Oats	7.9	7.9	0.0	0.000	H.S.
Corn	7.0	11.1	-4.1	2.290	S.
G. Sorghum	2.4	2.1	.3	.454	N.S.
Pasture	21.5	27.3	-5.8	1.901	N.S.
Alfalfa	5.6	3.0	2.6	3.466	H.S.

## AREA 6b

Table 34. Average differences between Association farms and sample farms for selected factors and the significance of these differences, Area 6b, 1944.

Comparison of acreages: or numbers	Ave. : Assoc. : farms : (126)	Ave. of : sample : farms : (149)	Ave. dif- : fference : t	Signif- : icance
Total A.	423.3	291.3	137.0	5.080 H.S.
Crop A.	303.9	208.0	100.9	6.042 H.S.
Corn	14.3	11.1	3.2	1.231 N.S.
Wheat	162.4	124.1	38.3	3.179 H.S.
Oats	31.9	21.5	10.4	2.955 H.S.
G. Sorghum	13.2	12.2	1.0	.355 N.S.
Pasture	86.2	66.0	20.2	1.365 N.S.
Alfalfa	26.3	9.6	17.2	6.165 H.S.
Chickens	342.1	226.4	115.7	4.976 H.S.
Milk cows	7.2	6.0	1.2	1.619 N.S.

Table 35. Average percent that Association farms exceeded sample farms and the significance of these differences, Area 6b, 1944.

Comparison of acreages: or numbers	Ave. : Assoc. : farms : (126)	Ave. of : sample : farms : (149)	Ave. dif- : fference : t	Signif- : icance
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Percent that each crop acreage is of total acres

Crop acres	76.4	73.6	2.8	1.339	N.S.
Wheat	39.2	43.3	-4.1	1.720	N.S.
Oats	7.7	8.6	-.9	.769	N.S.
Corn	4.2	4.4	-.2	.217	N.S.
G. Sorghum	3.1	3.8	-.7	1.000	N.S.
Pasture	16.1	19.8	-3.7	1.850	N.S.
Alfalfa	7.3	3.4	3.9	4.814	H.S.

## AREA 7

Table 36. Average differences between Association farms and sample farms for selected factors and the significance of these differences, Area 7, 1944.

Comparison of acreages or numbers	Ave. Assoc. farms (26)	Ave. of sample farms (59)	Ave. difference	t	Significance
Total A.	931.9	419.6	512.3	3.792	E.S.
Crop A.	427.9	239.0	198.9	3.955	E.S.
Corn	17.8	10.7	7.1	1.584	N.S.
Wheat	286.1	170.2	115.9	2.800	E.S.
Oats	8.4	6.4	2.0	.989	N.S.
G. Sorghum	25.1	10.5	14.6	2.585	S.
Pasture	438.4	181.1	257.3	2.912	E.S.
Alfalfa	11.8	2.3	9.5	2.353	E.S.
Chickens	259.6	272.2	-12.6	.291	N.S.
Milk cows	10.0	5.5	4.5	2.601	S.

Table 37. Average percent that Association farms exceeded sample farms and the significance of these differences, Area 7, 1944.

Comparison of acreages or numbers	Ave. Assoc. farms (26)	Ave. of sample farms (59)	Ave. difference	t	Significance
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Percent that each crop acreage is of total acres

Crop acres	56.8	60.0	-3.2	.616	N.S.
Wheat	36.5	44.1	-7.6	1.535	N.S.
Oats	1.2	1.9	-.7	1.129	N.S.
Corn	2.8	2.9	-.1	.097	N.S.
G. Sorghum	3.8	3.1	.7	.472	N.S.
Pasture	36.7	31.6	5.1	1.007	N.S.
Alfalfa	1.6	.5	1.1	2.291	S.

## AREA 8

Table 38. Average differences between Association farms and sample farms for selected factors and the significance of these differences, Area 8, 1944.

Comparison of acreages or numbers	Ave. : farms : (56)	Ave. of : sample : farms : (93)	Ave. dif- : ference : t	Signif- : icance
Total A.	485.7	284.7	201.0	4.988 H.S.
Crop A.	256.2	172.3	77.3	4.125 H.S.
Corn	74.1	60.3	13.2	1.481 N.S.
Wheat	74.6	55.9	18.7	1.390 N.S.
Oats	32.2	21.5	10.7	3.292 H.S.
G. Sorghum	2.9	6.3	-3.4	1.988 S.
Pasture	196.5	91.5	105.0	4.245 H.S.
Alfalfa	27.2	9.7	17.5	6.730 H.S.
Chickens	404.2	269.3	134.9	3.513 H.S.
Milk cows	6.0	4.6	1.4	2.258 S.

Table 39. Average percent that Association farms exceeded sample farms and the significance of these differences, Area 8, 1944.

Comparison of acreages or numbers	Ave. : Assoc. : farms : (56)	Ave. of : sample : farms : (93)	Ave. dif- : ference : t	Signif- : icance
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## Percent that each crop acreage is of total acres

Crop acres	58.7	65.3	-6.6	1.976	S.
Wheat	17.4	19.8	-2.4	.892	N.S.
Oats	7.8	8.6	-.8	.672	N.S.
Corn	16.1	22.7	-6.6	3.000	H.S.
G. Sorghum	.8	2.1	-1.3	2.407	S.
Pasture	35.2	29.5	5.7	1.798	N.S.
Alfalfa	6.5	3.8	2.7	3.292	H.S.

## AREA 9

Table 40. Average differences between Association farms and sample farms for selected factors and the significance of these differences, Area 9, 1944.

Comparison : of acreages : or numbers :	Ave. : Assoc. : (111)	Ave. of : sample : farms : (63)	Ave. dif- : ference :	t :	Signif- : icance :
Total A.	738.7	377.9	358.8	4.045	H.S.
Crop A.	455.3	284.4	170.9	5.194	H.S.
Corn	5.9	5.7	.2	.053	N.S.
Wheat	314.9	214.8	100.1	3.754	H.S.
Oats	10.5	4.3	6.2	2.792	H.S.
G. Sorghum	32.1	16.2	15.9	2.933	H.S.
Pasture	218.2	75.5	142.7	1.985	S.
Alfalfa	13.9	2.8	11.1	3.814	H.S.
Chickens	330.0	278.7	51.3	1.036	N.S.
Milk cows	6.5	4.9	1.6	1.818	N.S.

Table 41. Average percent that Association farms exceeded sample farms and the significance of these differences, Area 9, 1944.

Comparison : of acreages : or numbers :	Ave. : Assoc. : (111)	Ave. of : sample : farms : (63)	Ave. dif- : ference :	t :	Signif- : icance :
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Percent that each crop acreage is of total acres

Crop acres	70.4	75.5	-5.2	2.012	S.
Wheat	48.8	55.5	-6.3	2.029	S.
G. Sorghum	4.6	5.7	-1.1	.964	S.
Pasture	20.2	19.3	.9	.297	N.S.

## AREA 10

Table 42. Average differences between Association farms and sample farms for selected factors and the significance of these differences, Area 10, 1944.

Comparison : of acreages : or numbers :	Ave. Assoc. farms :	Ave. of sample farms :	Ave. dif- ference :	t	Signif- icance
:	(75)	(75)	:	:	:
Total A.	1,273.6	944.6	329.0	1.336	N.S.
Crop A.	651.2	450.4	200.9	2.554	S.
Corn	--	--	--	--	--
Wheat	435.2	319.6	115.6	1.929	N.S.
Oats	--	--	--	--	--
G. Sorghum	59.7	44.9	14.3	.967	N.S.
Pasture	553.2	435.7	127.5	.569	N.S.
Alfalfa	--	--	--	--	--
Chickens	285.2	201.3	83.3	2.632	N.S.
Milk cows	5.3	3.8	1.5	2.272	S.

Table 43. Average percent that Association farms exceeded sample farms and the significance of these differences, Area 10, 1944.

Comparison : of acreages : or numbers :	Ave. Assoc. farms :	Ave. of sample farms :	Ave. dif- ference :	t	Signif- icance
:	(75)	(75)	:	:	:
Percent that each crop acreage is of total acres					
Crop acres	60.1	67.6	-7.5	1.898	N.S.
Wheat	40.5	47.3	-6.8	1.683	N.S.
G. Sorghum	4.7	5.9	-1.2	.902	N.S.
Pasture	34.2	26.7	7.5	1.856	N.S.