FACTORS AFFECTING THE USE OF FROZEN FOOD LOCKERS AND HOME FREEZER UNITS FOR STORING MEAT

by

FLOYD EARL ROLF

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INTRODUCTION

The purpose of this study was to determine the effect of certain factors on the use of frozen food lockers and home freezer units as a means of storing meat by individual families. The major factors studied were size of family, number of lockers rented, number of years a locker has been rented and distance from locker plant. Number of lockers rented and number of years a locker has been rented were not applicable to home freezer users. Other minor factors are brought out which this study indicates influence the use of locker plants and home freezer units. Other information is included which bears on the use of these two means for storing meat.

Preliminary information was gathered on the history and development of the locker industry in Kansas and recent trends in the use of home freezers and their relationship to the locker industry.

The locker industry has been a rapidly expanding industry in Kansas during the last 15 years. The most rapid expansion occurred during the war and early post-war period. A large demand for lockers developed during the war and locker plants were built and enlarged as materials became available. It is apparent that demand for lockers has now been satisfied in most areas and the expansion of the locker industry is beginning to level off. This does not necessarily mean that the number of locker plants will become static, but the increase probably will be at a much lower rate than previously. There is still considerable possi-

bility of expanding locker services, and as these expand a new demand for lockers may develop.

A summary of an analysis of the early growth of the locker industry in the United States by the Farm Credit Administration[1] is presented in the following statements:

> The latest major development, which promises to exert a far-reaching influence upon the marketing, processing, and distribution of meat and other perishable food products, has been the result of inventions in the field of electrical refrigeration and the perfection of processes to freeze meat and other foods near local points of production.
>
> Locker plants now in operation may be classified into two general groups known as "limited-service" plants and "complete-service" plants. "Limited-service" plants provide cold-storage service only.... "Complete-service" plants resemble in many ways a small, modern packing plant. Services include butchering either on the farm or at the plant, chilling, cutting, wrapping, grinding, sharp freezing, curing, smoking, lard rendering, and cold storage of meat as well as the freezing and storing of fruits and vegetables. In addition some plant operators buy "packer-killed" meat at wholesale for town patrons and some plants sell meat at retail. Although the services rendered by this kind of plant vary, it is generally conceded that a fairly complete service should be arranged for in constructing a modern plant.

Since the locker industry is comparatively new, there have not been many complete studies made of the operation of locker plants. A fairly complete study of the locker industry in Minnesota was made by Dowell and others[2] in 1939. This provides a basis for making an analysis of the use made of locker plants as a means of storing meat.

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[1] L. B. Mann, Refrigerated Food Lockers, A New Cooperative Service. Farm Credit Administration Circular No. C-107, May, 1938. 30 p.

[2] A. A. Dowell and others, Minnesota Cold Storage Locker Plants. Minnesota Agricultural Experiment Station Bulletin 345, January, 1940. 39 p.

> Based upon the reports of patrons of locker plants, it appears that farmers are attracted to the locker plants, not because of cash savings over farm butchering and processing, but primarily because the locker plant makes available the equivalent of fresh meat throughout the year and eliminates the work of home butchering, processing, and canning. Patrons also emphasized the importance of cash savings and the possibility of obtaining a higher quality of meat through the locker than if purchases are made over the retail counter.

L. B. Mann,[3] Senior Agricultural Economist, Farm Credit Administration, has kept in close touch with the development of the locker industry in the United States in his work with cooperative locker plants. He has also followed the development of the home freezer industry as it affects the locker industry.

> The rapid expansion of the frozen-food locker-plant industry in the United States during the past decade is one of the outstanding developments in the field of food processing and preservation. From less than 1,300 plants in 1938 the number increased to more than 9,500 on July 1, 1947, and at present it is estimated that there are over 10,000 plants in operation.
>
> Plants located in or near larger towns and cities are doing an increasing volume of business in processing and supplying home-unit customers, particularly with meats and poultry.... Here it would seem is another way by which locker plants can broaden the market for locally produced livestock and poultry.

Home freezers are having an effect on the locker industry, but the extent of their influence is not yet definitely known. Some significant trends are developing in the relationship of home freezers and the locker industry. It is readily apparent that the locker industry will continue to perform an important

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[3]L. B. Mann, The Locker Plant--A Factor in Marketing. Taken from an address given at the Annual Convention of the Association of Southern Agricultural Workers, Washington, D. C., February 13, 1948.

service to rural people and, in a lesser degree, to the urban people of Kansas.

LIMITATIONS OF STUDY

The scope of this analysis was limited to a study of the use made of lockers and home freezers for storing meat by families in Kansas. It is further restricted in a large part to a study of the conditions existing in 1947.

This study was limited by the lack of detailed statistical data on the locker and home freezer industries in Kansas. A limited amount of data was available on the locker industry from unpublished studies, but because of the rapid expansion of the industry some of these data were obsolete and did not apply to the situation in 1947. Data on home freezers in Kansas were totally lacking. As far as is known this is the first study made of the use of home freezers in Kansas. There was very little information available on the use of home freezers in other states.

Most of the data used for this study were obtained by mail survey of a randomly selected sample of locker patrons and former locker patrons in Kansas. These data are subject to the errors of random sampling. Much of the information asked for was subjective in nature. The pounds of meat stored as reported by locker patrons and home freezer users were estimates in many cases. Therefore much of the data is subject to error in human judgment.

Data for which it was possible to do so were subjected to statistical analysis.

Many of the conclusions reached depended upon certain assumptions, which are included with the main subject matter where they apply. Insofar as the assumptions are valid, the conclusions drawn are believed to be valid.

METHODS OF PROCEDURE

To obtain preliminary and basic data on locker plants in Kansas, post card questionnaires were sent to all locker plants in Kansas known to be in operation during 1947. Type of ownership and number of lockers were obtained by this method from 357 of 425 plants sent cards. From information obtained from the post card survey and from other information the number of plants which were in operation during the entire year of 1947 was found to be 381. These 381 plants were used as the actual population from which a 12 percent stratified, randomly selected sample was taken for further study. All plants were stratified as to geographical location, type of ownership--private or co-operative, and size of plant. Fifty-one plants were finally selected, and a personal visit was made to each of these plants. While at these plants, mailing lists were obtained of patrons and former patrons of those plants and of home freezer users known to the plant operator.

This study is primarily a summarization and analysis of three mail surveys taken in the spring of 1948. One schedule was sent to 3,800 locker patrons who did not use home freezers, from which 862 usable schedules were returned. Another schedule was sent to 564 former patrons of locker plants, from which 80

usable schedules were returned. A third schedule was sent to 637 users of home freezer units, from which 221 usable schedules were returned. A copy of each of these schedules is included in the Appendix.

The names of locker patrons were obtained by taking every fifth name from the list of patrons of the 51 locker plants which were visited except for 3 plants that had between 1,500 and 2,000 patrons from which a 10 percent sample was taken, and one plant that had approximately 4,000 patrons, from which a 5 percent sample was taken.

Names of former patrons were obtained from these same locker plants. All names which the plants could supply were taken and a schedule sent to each one.

Names of home freezer users were obtained partially from these same locker operators. However, this list of names was supplemented by lists of names obtained from county agricultural agents and home demonstration agents. A request for names of home freezer users was sent to either the county agricultural agent or the home demonstration agent of each county in Kansas having one or the other or both. A very few names were obtained from home freezer dealers.

The first part of this thesis is preliminary information which shows the development and growth of the locker industry in Kansas. In succeeding sections the three surveys are summarized and, when possible, analyzed statistically.

The survey of locker patrons who did not also use a home freezer was analyzed with principal emphasis on the effect of

size of family, number of lockers rented, number of years a locker has been rented, and distance from locker plant on the quantity of meat each patron stored in lockers.

In succeeding sections data obtained from surveys of former patrons and home freezer users were analyzed and compared with data pertaining to locker patrons.

RECENT DEVELOPMENTS IN THE FROZEN FOOD LOCKER INDUSTRY IN KANSAS

Introduction

No attempt has been made in this manuscript to make a detailed study of the history and development of the locker industry. Eggert[4] and others covered this in detail in an unpublished study made in 1941. Neither was an attempt made to study locker plants on the basis of their internal organization, capacity and operational methods. These factors were studied by Otto and Phelps[5] in 1945.

The purpose of this phase of the study is to summarize the geographical distribution and rate of development of locker plants in Kansas. A knowledge of this is essential in understanding the effect which locker plants have had on the distribution and consumption of meat. A summary also has been made concerning changes which locker plants have made in services

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[4]R. J. Eggert, Unpublished study. Department of Economics and Sociology, Kansas State College, 1941.

[5]M. L. Otto and E. B. Phelps, The Locker Plant Industry in Kansas. A Mimeographed report. Kansas State College, June, 1946.

provided for their customers. This is an essential factor in the development of the locker industry. McKenzie[6] made a study of slaughter plants affiliated with locker plants, which has been helpful in this discussion.

Growth of the Locker Industry in Kansas

The locker industry had its beginning in Kansas in 1912 when the manager of the Carey Ice and Cold Storage Company of Hutchinson discovered that he had an unusual amount of unoccupied storage space and tried to put it into use by suggesting to the farmers in the vicinity of Hutchinson that they could maintain a supply of fresh meat of their own throughout the year by freezing it and that "Carey" had the necessary storage space which they could rent reasonably. While the undertaking was successful, the system used had many short-comings and the service was discontinued. An improved locker service was opened in 1930 and the plant is still operating.[7]

According to available records the next locker plant to open in Kansas after the beginning made by the Carey Ice and Cold Storage Company in 1912 was the Parsons Cold Storage Company of Parsons in 1928. This plant is still in operation. As the re-

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[6]G. Nolan McKenzie, An Economic Analysis of Frozen Food Locker Plants in Kansas with Emphasis on Those Offering Slaughtering Facilities. An unpublished thesis. Kansas State College. Manhattan, Kansas, 1947.

[7]Freezer lockers in Kansas; David L. Mackintosh, Kansas Agricultural Experiment Station Contribution No. 134, Department of Animal Husbandry.

sult of a contest sponsored by the Locker Management Magazine this Parsons plant recently was listed as the oldest plant in the United States from the standpoint of years of continuous service. There may have been other plants that have been in continuous operation for a longer period of time but which were not entered in the contest.

A locker plant also was opened in Abilene during 1928 shortly after the Parsons plant opened.

It has been impossible to keep a completely accurate record of the number of locker plants in Kansas. Each individual locker plant is not required to become a member of the Kansas Frozen Food Locker Association, nor is it required to obtain a license from the state or register with the Kansas State Board of Health in order to operate. However, an unofficial directory of locker plants in Kansas has been compiled by George A. Filinger, Secretary of the Kansas Frozen Food Locker Association. This directory was revised in 1941, 1944, 1946, 1947 and 1948. These lists tabulated the number and location of cold storage locker plants in Kansas and were of sufficiently uniform periodicity to indicate the trend in development of this industry in Kansas from 1941 to the present time.

In his unpublished study made in 1941, Eggert[8] shows the growth in number of locker plants from 1935 to 1940. This information was obtained by survey.

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[8]Eggert, op. cit.

These two sources of information provide a comprehensive picture of the development in numbers of locker plants in Kansas. This information is given in Table 1. There is no information available for the period 1928 to 1935.

Table 1. Number of frozen food locker plants in Kansas, 1935-48, and rate of increase per year.

Year	Number of plants	Rate of increase per year
1935[1]	23	--
1936[1]	41	78 percent
1937[1]	71	73 percent
1938[1]	95	34 percent
1939[1]	115	21 percent
1940[1]	157	37 percent
1941[2]	181	15 percent
1944[2]	289	20 percent
1945[2]	325	12 percent
1946[2]	379	17 percent
1947[2]	481	27 percent
1948[2]	506	5 percent

[1]R. J. Eggert, Unpublished Study, Department of Economics and Sociology, Kansas State College, 1941.

[2]Data obtained from Dr. G. A. Filinger, Secretary of Kansas Frozen Food Locker Association, Kansas State College.

The largest increase in numbers of locker plants in recent years was during 1947. There was a large demand for lockers at this time which had accumulated during the war years. Materials

for building new plants began to become more available at this time and there was a big boom in locker plant numbers. It can be seen from this table that the expansion in number of plants is leveling off. Most of the expansion in the industry is now in size of plant and services rendered.

McKenzie[9] described in detail the development of the locker industry by crop reporting districts in Kansas from 1939 to 1946. He showed that the industry's earliest development was in the central part of Kansas. By 1946 all counties in Kansas had at least one locker plant.

Fig. 1 shows the location of 506 locker plants known to be in operation on November 1, 1948. This is the latest information available.

Services Provided by Locker Plants

It appears at the present time that there is a locker plant available to people in all parts of Kansas. Any further expansion in the locker industry probably will take place largely within those plants operating at the present time. This expansion probably will be in the form of increased number of lockers per plant and/or increased services to their patrons. It seems that increased services to the patrons offers the greatest possibility. Percentage of lockers rented has been decreasing the last two or three years[10] which would indicate that the possi-

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[9]McKenzie, op. cit.
[10]L. B. Mann, op. cit.

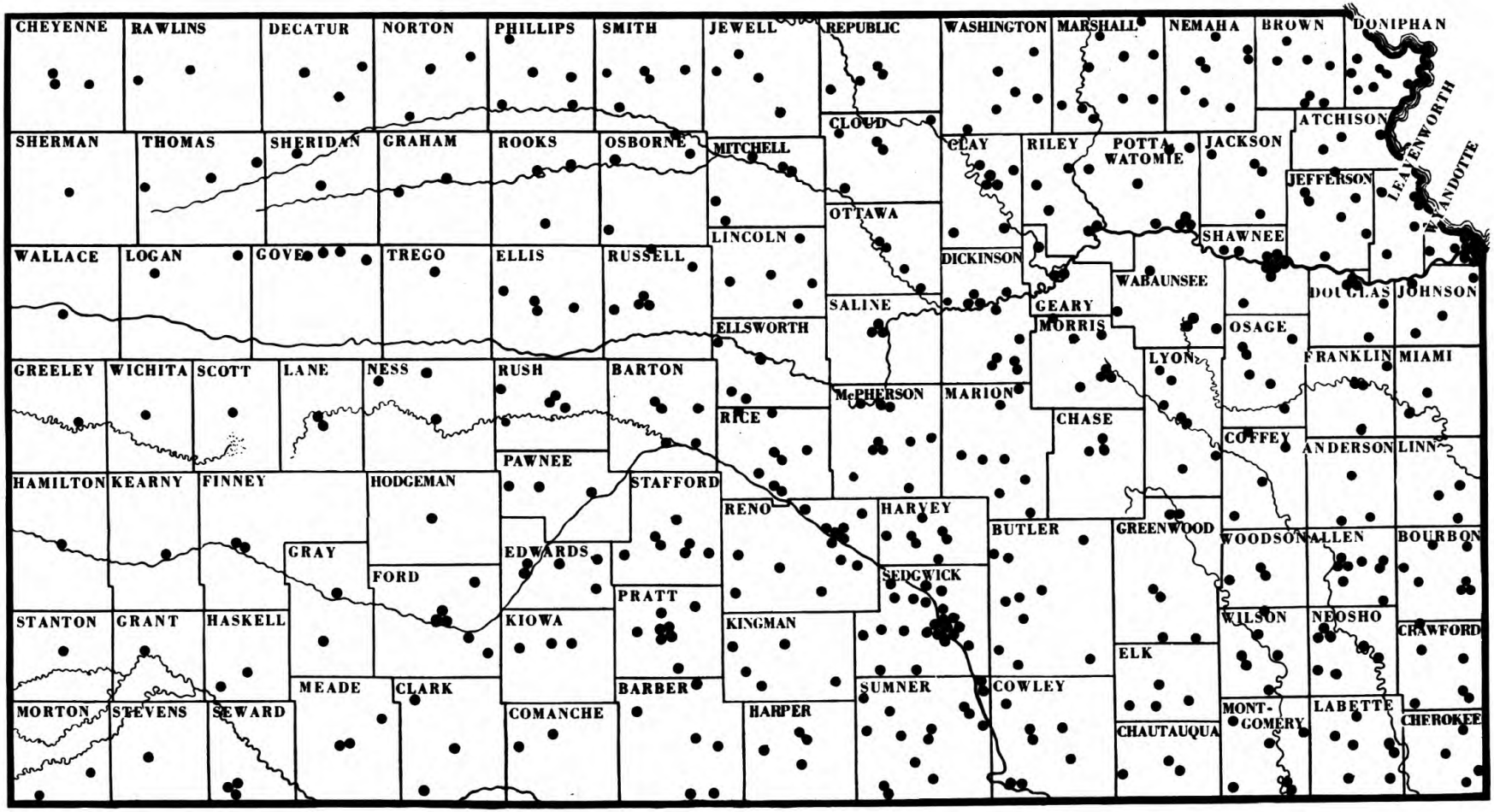

Fig. 1. Frozen food locker plants known to be in operation in Kansas, November 1, 1948.[1]

[1]Data obtained from Dr. G. A. Filinger, Secretary of Kansas Frozen Food Locker Association.

bilities of increasing the number of lockers in the plant are limited in most areas.

Otto and Phelps[11] made a study of the locker industry in Kansas in 1946 in which they compared the percent of plants offering certain services in 1941 and 1945. A comparison of the percent of plants offering certain services in 1941, 1945 and 1947 is made in Table 2.

Table 2. Estimated percent of locker plants in Kansas offering specified services.

Service	Percent of plants offering service		
	1941[1]	1945[1]	1947[2]
Slaughter	42	22	33
Cutting, wrapping and freezing	82	93	92
Grinding	61	82	92
Making sausage	44	58	48
Curing meat	22	23	38
Rendering lard	36	24	42

[1]M. L. Otto and E. B. Phelps, "The Locker Plant Industry in Kansas." A Mimeographed report. Kansas State College, June, 1946.

[2]Data obtained by personal interview with 51 randomly selected locker plant operators.

The data for 1941 and 1945 were obtained by mail questionnaire to all locker plants in Kansas. The data for 1947 were obtained by personal interview with a 12 percent random sample of locker plants in Kansas stratified as to size of plant, geographical location and type of ownership.

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[11]Otto and Phelps, op. cit.

A smaller percentage of plants offered slaughter facilities in 1945 than in either 1941 or 1947. This was probably caused by wartime O.P.A. regulations and labor shortages which made it very difficult for the small slaughter plant to operate. The percentage providing slaughter facilities in 1947 was still not up to the level of 1941. Many of the new plants had their lockers rented and had their processing facilities operating, but did not yet have their slaughter facilities completed.

McKenzie's[12] study showed that 27 percent of locker plants in Kansas had slaughter facilities on September 1, 1946. The percentage of locker plants offering slaughter services increased steadily from 1945 to 1947 and it is the observation of this writer that if data were available for 1948 they would show a further increase.

The percentage of plants making sausage in 1947 was down from 1945, possibly because of new plants not offering this service. The percentage of plants curing meat and rendering lard showed significant increases over 1945.

Table 2 shows that 8 percent of the plants do not offer cutting, wrapping, and freezing service. This is not of great importance if these plants are branch plants of main plants which offer these services or if these services can be obtained elsewhere in the city or community. If this is not the case, these plants are missing an opportunity to be of service to their

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[12]McKenzie, op. cit.

community as well as a chance for increased profits.

When individual plants consider increasing the number of services provided for their patrons, they should take into consideration the need for such services. If they are provided satisfactorily elsewhere in the city or community, the plant may not be able to carry out these services efficiently. If there is a demand from their patrons for such services, they should be considered seriously. Factors to be considered are cost of installation, state and city regulations, adequate space, probable volume of business and availability of labor. If slaughtering or rendering is being considered, state and city regulations are especially important. Building a smoke house would create fire hazards if not properly located and constructed. Each individual plant will probably have different conditions to be taken into consideration.

Conclusion

The locker industry entered Kansas in 1928 when two plants were established. No further records are available until 1935, when there were 23 plants operating in Kansas by the end of that year. The industry continued to expand steadily. By 1941 there were 181 plants operating in Kansas. During the war years and especially during meat rationing, a great demand developed for lockers by both rural and urban patrons. Many new plants were built in spite of shortages of labor, material, and equipment. During 1946 and 1947 when materials began to become more avail-

able, a great boom occurred in the number of locker plants. By the end of 1946 there was at least one locker plant in every county of Kansas. During 1947 there was a 27 percent increase in the number of locker plants. Since that time there has been a leveling off of expansion in number of locker plants. It appears that any further expansion of the industry under present conditions must take place largely in size of plant and/or services rendered to patrons.

The percentage of plants providing slaughter service, grinding, meat curing, and lard rendering have increased from 1945 to 1947. The percentage of plants cutting, wrapping and freezing meat dropped one percent and the percentage of those making sausage dropped 10 percent from 1945 to 1947. There is still room for expansion in services provided for the patron. Each individual plant should consider its particular problems and possibilities and act accordingly when considering the possibility of providing more services for their patrons.

SURVEY OF FROZEN FOOD LOCKER PATRONS

Introduction

This section presents the main part of this study. Several preliminary factors which could influence the use of lockers for storing meat are discussed first. The four factors on which emphasis is being placed in this study are then analyzed to determine the effect of each on the quantity of meat stored in frozen food lockers. These four major factors are (1) size of

family; (2) number of lockers rented; (3) the number of years a locker has been rented; and (4) the distance patrons live from the locker plant.

The influence of locker plants on meat consumption is indicated by a comparison of the per capita amount of meat stored in lockers by families of locker patrons and estimated per capita meat consumption by all people in Kansas. To determine the full effect of locker plants on meat consumption, it would be desirable to classify locker patrons as to size of income. However, such income data were not available.

Cornell Agricultural Experiment Station made a study of urban patrons in Syracuse, Ithaca, and Trumansburg, New York, during a two-week summer period in 1948.

> Some families in all income groups use frozen foods, and purchases are directly related to income. . . . Families with high incomes spent from 10 to 25 times as much for frozen foods as did those with low incomes.[13]

Although this is a comparison of income and purchases of frozen food, it indicates that low income families as well as medium and high income families can be expected to make some use of locker facilities.

A report issued by the Farm Credit Administration indicates that lockers can place meat within the means of some low income families who otherwise could not afford it.

> The principal appeal to urban consumers has been economy rather than convenience or improved living standards.

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[13]"All Income Groups Use Frozen Foods", Locker Operator, 10: 6, January, 1949, 46.

> This item of savings depends upon: (1) The amount of meat or other food consumed, or the extent to which a locker is used; (2) whether meats are purchased at wholesale or farm prices; and (3) whether purchases are made at times when such prices are low and consumed when market prices are high.[14]

Place of Residence

Otto and Phelps[15] estimated that 78.6 percent of locker patrons in Kansas in 1945 were farmers. Mann[16] estimated that 73 percent of all patrons in the United States in 1947 were farm patrons. Since Kansas is largely a rural state, it would be expected that Kansas would average as high or higher than the average for the United States. In the survey from which data were taken for this study, only 53.7 percent of the questionnaires returned were from rural patrons. This would indicate that the raw data from the survey are weighted too heavily with urban patrons. Therefore, the data were adjusted to the basis of 75 percent rural and 25 percent urban patrons, whenever possible, which seems to be as accurate an estimate as can be made without more complete information.

Of the urban patrons in the survey, 29.3 percent owned a farm, and 49.6 percent of these received meat from their farms for storage in lockers. To put it in another way, at least 14.5

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[14] L. B. Mann, Refrigerated Food Lockers, A New Cooperative Service. Farm Credit Administration Circular No. C-107, May, 1938, 30 p.

[15] Otto and Phelps, op. cit.

[16] L. B. Mann, The Locker Plant--A Factor in Marketing. Taken from an address given at the Annual Convention of the Association of Southern Agricultural Workers, Washington, D. C., February 13, 1948.

percent of the urban patrons have access to a supply of meat direct from the farm. Probably other urban patrons have connections through which they can buy meat at farm prices.

Locker plants make it possible for urban people to take advantage of these connections. When they have connections for securing meat at farm prices, urban patrons tend to have the same possibilities as rural patrons in making efficient use of lockers.

Preference for Form of Meat

Locker patrons were asked to express their preference as to fresh or frozen meat. The results are shown in Table 3.

Table 3. Percent of families of patrons that prefer meat in specified forms.[1]

Form of meat preferred	Percent of families		
	Rural	Urban	Total
Fresh	21.8	28.6	24.9
Frozen	16.6	15.3	16.0
No preference	61.6	56.1	59.1
Total	100.0	100.0	100.0

[1]Data obtained by mail survey of randomly selected locker patrons.

About 59 percent of the patrons stated no preference between fresh and frozen meat. Of those who stated a preference, approximately 50 percent more preferred fresh meat than preferred frozen meat. There is a tendency for more rural patrons than urban patrons to prefer frozen meat. However, the difference is in-

significant. There is a tendency for a larger proportion of the urban patrons than of rural patrons to prefer fresh meat. Size of family seems to make very little difference in preferences for fresh or frozen meat.

Since more locker patrons prefer fresh than frozen meat and a majority of all patrons have no preference, it is apparent that locker plants have not gained their popularity through improving the palatability of meat. The fact that 25 percent of all patrons prefer fresh meat would indicate that lockers offer a service which overcomes the undesirableness of frozen meat in relation to fresh meat to some people. Frozen meat is probably not undesirable to these patrons, but less desirable than fresh meat.

Advantages and Criticisms of Locker Service

Patron reaction to locker plant services should provide a guide to the locker industry in improving its services to the public. Locker patrons were asked to list both the advantages and criticisms or disadvantages of using cold storage lockers for storage of food. The advantages and criticisms listed should provide a means for determining how successful the locker industry has been in meeting the needs of the public. The advantages and criticisms listed by the patrons are given in Tables 4 and 5, respectively.

Ten percent of both rural and urban patrons listed no advantages. In contrast to this 61 percent of the rural patrons

Table 4. Number of patrons that listed specified advantages of renting lockers.[1]

Advantage	Number of patrons		
	Rural	Urban	Total
Cash saving over buying meat at retail...	64	157	221
Provides facilities for freezing and storing berries, fruits, vegetables poultry and game for future use.....	57	83	140
A greater variety of food is available for use.....	23	115	138
A supply of fresh food available at all times.....	70	30	100
A higher quality meat is available.....	25	60	85
A supply of meat available at all times..	38	45	83
Provides a proper storage place for meat.	52	29	81
General convenience.....	41	36	77
Eliminates work of home butchering, processing and canning.....	48	19	67
Satisfaction of using home produced foods	50	11	61
Preservation of foods in a fresh state...	44	15	59
Freezing reduces the danger of waste or spoilage of meat.....	41	9	50
Makes it possible to butcher at any time of the year.....	22	4	26
Frozen meat more palatable.....	18	4	22
Labor saving.....	21	0	21
Know what kind and quality of product you are getting.....	9	8	17
Increased consumption of meat, fruits and vegetables.....	5	2	7
Conserves flavor of food.....	5	0	5
None listed.....	48	40	88

[1]Obtained from mail survey of randomly selected locker patrons.

Table 5. Number of patrons that listed specified criticisms of locker plant services.[1]

Criticism	Number of patrons		
	Rural	Urban	Total
Expensive	32	22	54
Meat lost or taken from locker	33	18	51
Distance from home to plant	32	9	41
Hours which locker is open are not convenient	19	18	37
Less convenient than buying meat at butcher shop	7	17	24
Careless butchering and cutting by plant butcher	14	7	21
Frozen meat less palatable	6	11	17
Lockers are not kept clean	8	7	15
Other people have access to locker	8	6	14
Irregular or too high temperatures	11	3	14
Inexperienced and irresponsible operator or employees	5	8	13
Meat not properly wrapped	11	1	12
Slowness of getting meat processed and placed in locker	9	3	12
Miscellaneous criticisms	27	17	44
None listed	282	143	425

[1]Obtained from mail survey of randomly selected locker patrons.

and 36 percent of the urban patrons listed no criticisms. Rural patrons listed 641 advantages to 222 criticisms, or 2.9 advantages for each criticism. Urban patrons listed 634 advantages to 147 criticisms, or 4.3 advantages for each criticism. Taking all patrons as a group, there were 3.4 advantages listed for each criticism.

The cash saving or economy made possible by locker storage was the advantage listed most often by urban patrons while the availability of a greater variety of food was next in importance to them. Rural patrons listed the availability of a supply of

fresh food at all times most often, while the cash saving made possible by lockers was second. Facilities provided for freezing and storing berries, fruits, vegetables, poultry, and game was third in importance to both rural and urban patrons. A higher quality meat being available was fourth for urban patrons and a supply of meat being available at all times was fifth. Rural patrons listed several advantages which were of about equal importance. Storage of meat, convenience, elimination of home butchering and processing and satisfaction of using home produced food were some of the advantages listed.

When criticisms of locker storage by locker patrons are compared with the advantages, an interesting situation arises. The cash saving over buying meat at retail was the advantage listed most often by all patrons, yet the criticism listed most often was that locker service was expensive. This contradiction may be explained as follows: Locker patrons may make a saving by buying meat at wholesale or farm prices, but they may lose much of this saving through paying locker rentals and processing costs.

Another important criticism is the disappearance of meat from the locker. This has always been a problem of the locker industry. Anything the plant manager can do to overcome this criticism by education of patrons, by keeping accurate records or by other means, will be of great help to the locker industry.

In many cases the problem is due to the fact that people do not realize the amount of weight loss from the live animal to packaged meat in the locker. Table 6 shows the number of pounds of edible meat which can be expected from live animals

of given weights.

Table 6. Approximate yields of edible meat of livestock carcasses in pounds.[1]

Type of carcass	Live weight	Dressed weight	Packaged weight
Beef	750	410	325
Pork	225	180	130
Veal	200	110	90
Lamb	90	45	35

[1]G. A. Filinger and D. L. Mackintosh, Preserving Foods in Frozen Food Lockers, Kansas Agricultural Experiment Station Circular 217, September, 1945.

Average weights in this table are based on well finished animals with close trimming and partial boning. Packaged weights would be slightly higher with the amount of trimming and boning done by most locker plants, but these data serve to illustrate the great loss in weight from the live animal to packaged meat.

The distance from home to the locker plant was listed as a criticism by rural patrons the same number of times as expensiveness. This is one criticism that the patron can probably do more about than the locker operator. This may be overcome to some extent by planning trips to town so that they are coordinated with the needs for food from the locker. A home freezer unit may be the answer for some patrons. With a home unit patrons can take home a large enough supply of food to last for several days, and frequent trips to the locker are not necessary.

Several rural and urban patrons thought the hours which the locker plant was open were inconvenient. This problem is

one for each individual locker operator to work out, keeping in mind the needs of his patrons.

Some criticisms reflected poor locker management and operation, but others are due to the fact that many patrons expect too much from the locker plant. If locker patrons could learn more about the operation and problems of the locker plant, and if locker operators would try to be of service to the patron many of the criticisms would be overcome. As indicated earlier, there is a great need for locker patron education as to what may be expected from their locker plant.

Additional Services Desired

Locker patrons were also asked to list additional services which they would like to have provided by the locker plants they patronize. This is summarized in Table 7.

Meat curing is the processing service listed most often. In a preceding section it was indicated that this service is being rapidly expanded in locker plants of Kansas. Slaughtering was also listed several times. Other processing services were listed only a few times.

The service listed most often is more convenient hours. This is something to be worked out between the locker operator and his patrons.

There was a multitude of other services listed by one or only a few patrons. However, it may not be practical for a locker plant to attempt to satisfy all the desires of every patron.

Table 7. Number of patrons that list additional services that should be provided by frozen food locker plants they patronize.[1]

Additional service	Number of patrons		
	Rural	Urban	Total
Slaughtering and processing services:			
Meat curing	14	6	20
Slaughtering	10	4	14
Meat processing facilities	2	2	4
Smoking	3	1	4
Sharp freezer	1	3	4
Improved slaughtering and processing services	1	2	3
Provide facilities for customer to do his own processing	3	0	3
Rendering	1	1	2
Other miscellaneous services	7	2	9
General services:			
Stay open later in evenings and/or all or part of Sunday	22	21	43
Keep an accurate record of all food going in and out of locker	10	6	16
Satisfactory key system. Employees and public should not have access to keys	6	7	13
System so it will not be necessary to go into cold room for food.	4	4	8
Fruit and vegetables for sale in bulk	3	5	8
Bulk storage space	4	2	6
Wholesale meat for sale	1	4	5
System of placing food in locker so food desired can be located easily	3	0	3
More lockers	2	1	3
Provide information on proper way of using locker	2	1	3
Miscellaneous services	12	5	17

[1]Obtained from mail survey of randomly selected patrons.

Major Factors Influencing the Quantity of Meat Stored in Lockers

Introduction. The relationship of four factors to the quantity of meat stored in lockers was analyzed. These four factors were (1) size of family; (2) number of lockers rented; (3) the number of years a locker has been rented and (4) distance patron lives from the locker plant. Table 8 shows the mean and standard deviation of measurements of each of these factors and of the quantity of meat stored in lockers per patron.

Table 8. Means and standard deviations of factors studied for rural, urban and all locker patrons in Kansas, 1947.[1]

Factor	Rural		Urban		Total	
	Mean	Standard deviation	Mean	Standard deviation	Adjusted mean[2]	Standard deviation
Size of family	3.88	1.72	3.30	1.36	3.74	1.59
Number of lockers rented	1.52	.73	1.27	.56	1.46	.67
Number of years a locker has been rented	4.67	2.97	4.05	2.63	4.52	2.84
Distance from locker plant	6.87	4.56	2.02	2.93	5.66	4.58
Total pounds of meat stored in lockers	661.62	382.12	414.64	319.99	599.88	375.27

[1]Calculated from data obtained by mail survey of randomly selected locker patrons in Kansas.

[2]Adjusted on the basis of 75 percent rural and 25 percent urban patrons.

Rural patrons stored 50.3 percent more meat in lockers per patron than did urban patrons. This probably means that each

rural patron gives the locker plant about 50 percent more processing volume than does the urban patron. Based on the estimate which has been made that approximately 75 percent of the locker patrons in the state are rural patrons, rural patrons provide 81.8 percent of the meat processing done by locker plants in Kansas.

The standard deviation for meat stored in lockers per patron shows there is a wide variability in the quantity of meat stored in lockers, both for rural and urban patrons. There are many individual urban patrons who provide more business for the locker plant than do other individual rural patrons. As a group, however, rural patrons store more meat in lockers per patron than do urban patrons as a group.

Locker patrons were asked to indicate the number of each type of livestock slaughtered for locker storage and the number of pounds of dressed meat purchased for locker storage. In order to convert number of livestock slaughtered to pounds of meat stored in lockers, it was necessary to use a conversion factor for each class of livestock. The following weights were used for that purpose: all cattle, 400 pounds; hogs, 160 pounds; sheep and lambs, 45 pounds; chickens, 2.5 pounds and turkeys, 12.5 pounds. After some calculations had been made on this basis, it was discovered that the conversion figure for all cattle was too high for cattle and calves slaughtered in small slaughter plants in Kansas, which are representative of slaughter plants connected with locker plants. Therefore, the conversion factor for all cattle was changed to 345 pounds for cattle and 195 pounds

for calves. These figures were obtained by applying average dressing percentage to the average liveweight of animals slaughtered in small slaughter plants in Kansas.[17] The conversion factors used for other classes of livestock were satisfactory.

After the conversion factor was applied to the number of each class of livestock slaughtered, the result was added to pounds of dressed meat purchased during the year for locker storage to obtain the number of pounds of meat placed in lockers during 1947.

The means and standard deviations for total meat stored in lockers as shown in Table 8 were calculated before the error in the conversion factor for cattle was discovered. Since the error does not alter the general conclusions drawn from Table 8, no correction was made due to limitations of time and cost. The mean for total pounds of meat stored in lockers shown in Table 8 may be compared with the total pounds of meat stored in lockers per patron shown in Table 9 to get an indication of the amount of the error caused by using the incorrect conversion factor for cattle.

Regression lines were calculated which show the regression of total quantity of meat stored in lockers on each factor studied. The correlation coefficient of each was significant except for distance from locker plant. Therefore, the regression of meat stored in lockers on distance from locker plant is not

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[17]Data obtained from H. L. Collins, Federal Agricultural Statistician for Kansas.

shown.

The regression lines shown in Figs. 2, 3 and 4 were calculated from data taken from each individual schedule. After this work had been completed, it was discovered, as indicated earlier, that the figure used for converting number of cattle slaughtered to pounds of dressed meat was too high for cattle slaughtered at locker slaughter plants. Correction for this error was not made in the regression lines due to limitations of time and cost. Corrections have been made in all other data presented in this manuscript except where indicated. It was felt that this error was not of great importance in so far as the regression lines are concerned for the following reasons: (1) Although the correlation coefficients are significant because of the large number of degrees of freedom, they were not large enough to justify the use of the regression lines in making predictions concerning individual patrons. Therefore, all the regression lines show is a significant relationship in the quantity of meat stored in relation to the factor being studied; and (2) The regression lines used show approximately the same relationship that would be shown by the corrected regression lines. It should be kept in mind, however, that the corrected trend lines would be lower and of slightly less slope than those shown. The mid-point of each regression line shown would be lowered by approximately 70 pounds for rural patrons and 32 pounds for urban patrons using the corrected data.

A regression line for all patrons is not shown in any one of the graphs. An analysis of covariance was made for each

comparison made. In each case there was a highly significant difference in the adjusted means of rural and urban patrons. Therefore, data for the two groups could not be thrown together and a regression line calculated for all patrons with statistical justification.

Table 9. Average number of pounds of specified types of meat stored in lockers per patron and per locker and percent each type of meat is of total.[1]

Type of meat	Rural		Urban	
	Pounds	Percent	Pounds	Percent
		Per patron		
Beef	339.84	57.4	247.18	64.6
Pork	204.79	34.6	84.86	22.2
Lamb	.87	0.2	2.23	0.6
Poultry	45.65	7.7	47.87	12.5
Fish	.37	0.1	.23	0.1
Total	591.52	100.0	382.37	100.0
		Per locker		
Beef	226.07	57.4	195.30	64.6
Pork	136.23	34.6	67.05	22.2
Lamb	.58	0.2	1.76	0.6
Poultry	30.43	7.7	37.82	12.5
Fish	.25	0.1	.18	0.1
Total	393.56	100.0	302.11	100.0

[1]Calculated from data obtained by mail survey of randomly selected locker patrons.

Table 9 shows that rural patrons store considerably more meat in lockers than do urban patrons. Rural patrons store relatively less beef and poultry and more pork than do urban patrons. The bulk of the meat stored in lockers by all patrons is beef. Lamb and fish are stored in insignificant quantities.

Size of Family. The most important factor influencing the

quantity of meat stored in lockers according to this study is the size of family. This might be expected since as size of family increases the family would be expected to consume more meat.

For this study the number of people eating one or more meals per day regularly at each patron's table is referred to as size of family. In most cases it will be the actual size of family, but it may also include hired help who consume meat from the locker and would exclude those members of the family who do not eat their meals at the home.

Table 10. Number and percent of patrons that had specified number of people eating one or more meals per day regularly at their table during 1947.[1]

Number of people eating one or more meals per day regularly at table of patrons.	Rural		Urban		Total[2]
	No.	Percent	No.	Percent	Percent
1 or 2	115	25.0	132	34.0	26.9
3	101	21.9	103	26.5	22.9
4	115	24.9	87	22.4	24.4
5	59	12.8	41	10.6	12.3
6	42	9.1	12	3.1	7.8
7	12	2.6	8	2.1	2.5
8 or more	17	3.7	5	1.3	3.2
Total	461	100.0	388	100.0	100.0

[1]Data obtained from mail survey of randomly selected locker patrons in Kansas.

[2]Calculated on the basis of 75 percent rural and 25 percent urban patrons.

Table 10 shows more clearly the variation in size of family and the difference in average size of family of rural and urban patrons which was indicated in Table 8.

A chi-square test was run on the data in Table 10 to deter-

mine if there was a significant difference between the size of families of rural and urban patrons. A chi-square of 26.23 with 6 degrees of freedom was obtained. This value of chi-square is well beyond the one percent probability level ($P_{.01} = 16.81$). This leaves little doubt but that rural patrons have larger families than urban patrons.

Table 11. Average number of lockers rented per patron having a specified size of family.[1]

Size of family	Average number of lockers rented per patron		
	Rural	Urban	Total[2]
1 or 2	1.28	1.20	1.26
3	1.43	1.28	1.39
4	1.62	1.25	1.53
5	1.57	1.40	1.53
6	1.56	1.67	1.59
7 or more	1.97	1.31	1.80
Total	1.52	1.27	1.46

[1]Data obtained from mail survey of randomly selected locker patrons in Kansas.

[2]Adjusted on the basis of 75 percent rural and 25 percent urban patrons.

The average number of lockers rented per patron having a specified size of family is shown in Table 11. Rural patrons with four, five or six in the family tend to rent about the same number of lockers, while those with seven or more in the family show an increase up to almost two lockers per patron. As the size of urban families increase, the number of lockers rented increases until seven or more is reached, when there is a sharp decrease. When rural and urban families are considered together, the number of lockers rented increases as size of family increases.

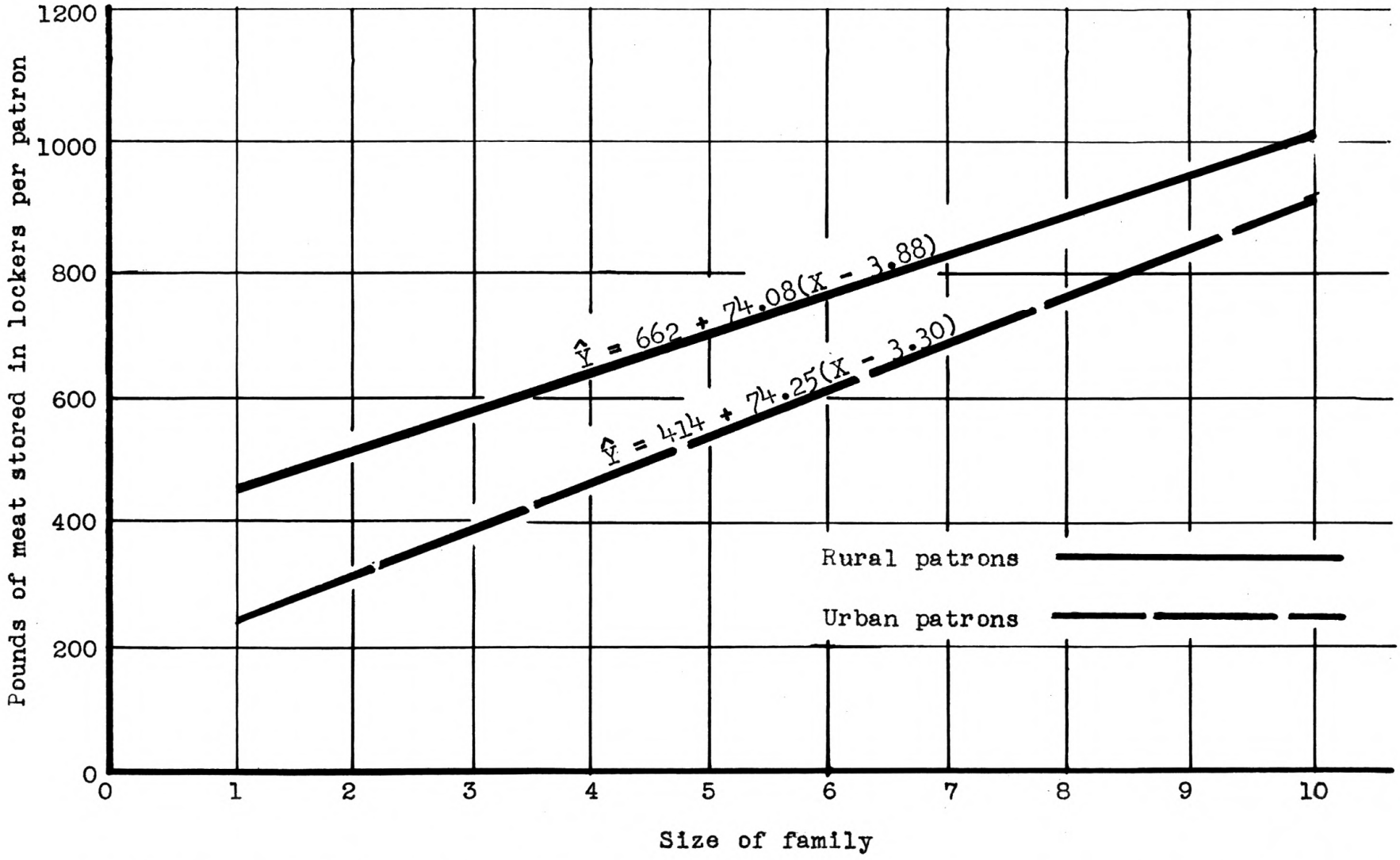

Fig. 2. Regression of pounds of meat stored in lockers per patron on size of family.

However, families of four, five and six tend to rent approximately the same number of lockers per family.

The regression of pounds of meat stored in lockers per patron on size of family for rural and urban patrons is shown in Fig. 2. A positive correlation coefficient of .334 was obtained for rural patrons and .316 for urban patrons. These are statistically significant beyond the one percent level because of the large number in the sample. However, the low correlation coefficients indicate large variations in individual measurements and exclude the possibility of making predictions for individual families from the regression line.

An analysis of covariance does not show a significant difference in the slope of the two regression lines, so it is assumed that rural and urban patrons react in the same manner with respect to pounds of meat stored in lockers as size of family increases.

Number of Lockers Rented. The number and percent of patrons who rent a specified number of lockers is shown in Table 12.

Rural patrons tend to rent a greater number of lockers than do urban patrons. When those who rent four lockers or more are combined as one group and the chi-square test is applied, there is a highly significant difference between rural and urban patrons. (Chi-square = 43.43, 3 D. F., $P << .01$) Chi-square at the one percent level with three degrees of freedom is equal to 11.34. The significance is probably due to the large percentage of urban patrons who rent only one locker.

A close relationship between the quantity of meat a patron

Table 12. Number and percent of patrons who rented a specified number of lockers during 1947.[1]

Number of lockers	Rural		Urban		Total[2]
	No.	Percent	No.	Percent	Percent
1	260	56.4	307	77.3	61.1
2	177	38.4	76	19.1	34.1
3	20	4.4	11	2.8	4.0
4	2	0.4	2	0.5	0.4
More than 4	2	0.4	1	0.3	0.4
Total	461	100.0	397	100.0	100.0

[1]Data obtained by mail survey of randomly selected locker patrons in Kansas.

[2]Calculated on the basis of 75 percent rural and 25 percent urban patrons.

stored in lockers and the number of lockers rented would be expected. This relationship is shown in Fig. 3. A positive correlation coefficient of .264 was obtained for rural patrons and .369 for urban patrons. These coefficients are highly significant statistically because of the large number of degrees of freedom, but are too low to justify the use of the regression lines for prediction purposes for individual families. The low correlation coefficients are again caused by the wide variability in the quantity of meat stored in lockers by different patrons during a year's time. Some patrons store only meat in lockers and others store varying amounts of fruit, vegetables, and other foods in their lockers. This accounts for some of the variability, but some is due also to differences in efficiency with which lockers are used. Some patrons have a fast turnover of food in the locker, while others have a much slower turnover. It also must be realized that a patron may rent extra lockers

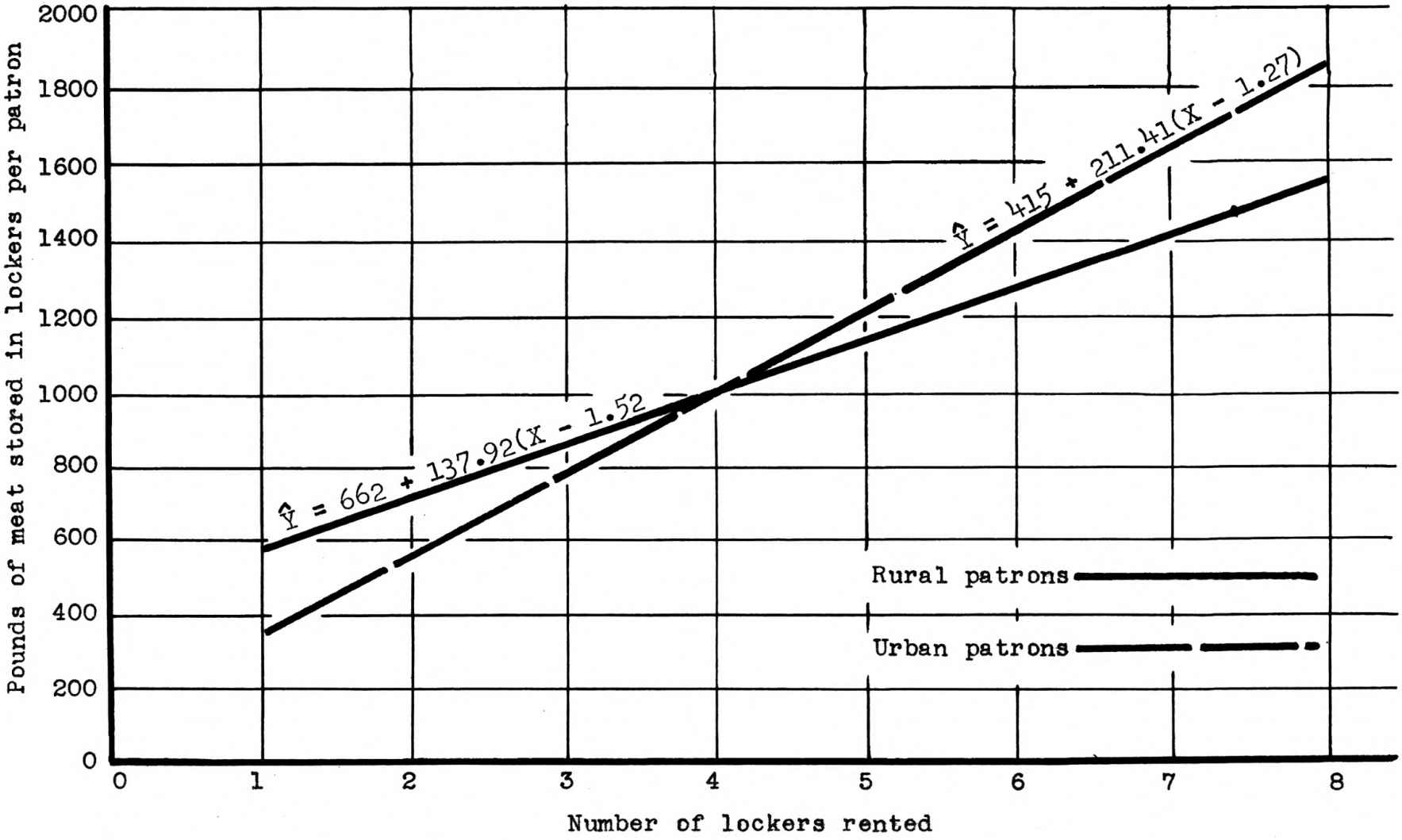

Fig. 3. Regression of pounds of meat stored in lockers per patron on number of lockers rented.

just after having an animal slaughtered. The data in Table 12 show the number of lockers rented at the time the questionnaire was answered.

Although rural patrons store a significantly greater quantity of meat in lockers than do urban patrons, Fig. 3 shows that urban patrons who rent four or more lockers tend to store more meat in lockers than do corresponding rural patrons. However, only two urban patrons included in this study rented four lockers, and one urban patron rented five. As shown by Table 10, the great bulk of both rural and urban patrons rent three or less lockers. The regression lines were extended to eight lockers because one rural patron rented eight lockers.

An analysis of covariance of this data does not show a significant difference in the slope of the two regression lines, so it is assumed that rural and urban patrons react in the same manner with respect to pounds of meat stored as they increase the number of lockers rented.

Number of Years a Locker Has Been Rented. Since the greatest expansion in the locker industry occurred during the war years and the peak of expansion was reached shortly after the end of the war, it was not surprising to find that the majority of locker patrons have rented a locker only a few years. The number and percent of patrons that have rented lockers a specified number of years is shown in Table 13.

A chi-square test was run on the data in Table 13 to determine if there was a significant difference in the number of years rural and urban patrons have rented lockers. A chi-square

of 26.54 was obtained with 10 degrees of freedom. The probability of obtaining a greater value of chi-square is less than .01($P_{.01}$ = 23.21). This leaves little doubt but that rural patrons have rented lockers longer than have urban patrons.

Table 13. Number of patrons that have rented frozen food lockers a specified number of years.[1]

Years lockers have been rented (to the nearest whole year)	Rural		Urban		Total[2]
	No.	Percent	No.	Percent	Percent
1 or less	36	7.8	39	9.9	8.3
2	59	12.9	94	24.0	15.3
3	107	23.4	79	20.2	22.6
4	69	15.1	50	12.8	14.6
5	57	12.4	53	13.5	12.7
6	37	8.1	18	4.6	7.3
7	15	3.3	12	3.1	3.2
8	24	5.2	18	4.6	5.1
9	9	2.0	4	1.0	1.8
10	30	6.5	19	4.8	6.2
11 or more	15	3.3	6	1.5	2.9
Total	458	100.0	392	100.0	100.0

[1]Data obtained by mail survey of randomly selected locker patrons in Kansas.

[2]Calculated on the basis of 75 percent rural and 25 percent urban patrons.

The correlation between number of years a locker has been rented and the quantity of meat stored in lockers is not as close as it was for size of family and number of lockers rented. The regression of pounds of meat stored in lockers on number of years a locker has been rented is shown in Fig. 4. The correlation coefficients obtained for rural and urban patrons were statistically significant beyond the one percent level. A correlation coefficient of .139 was obtained for rural patrons and .202 for

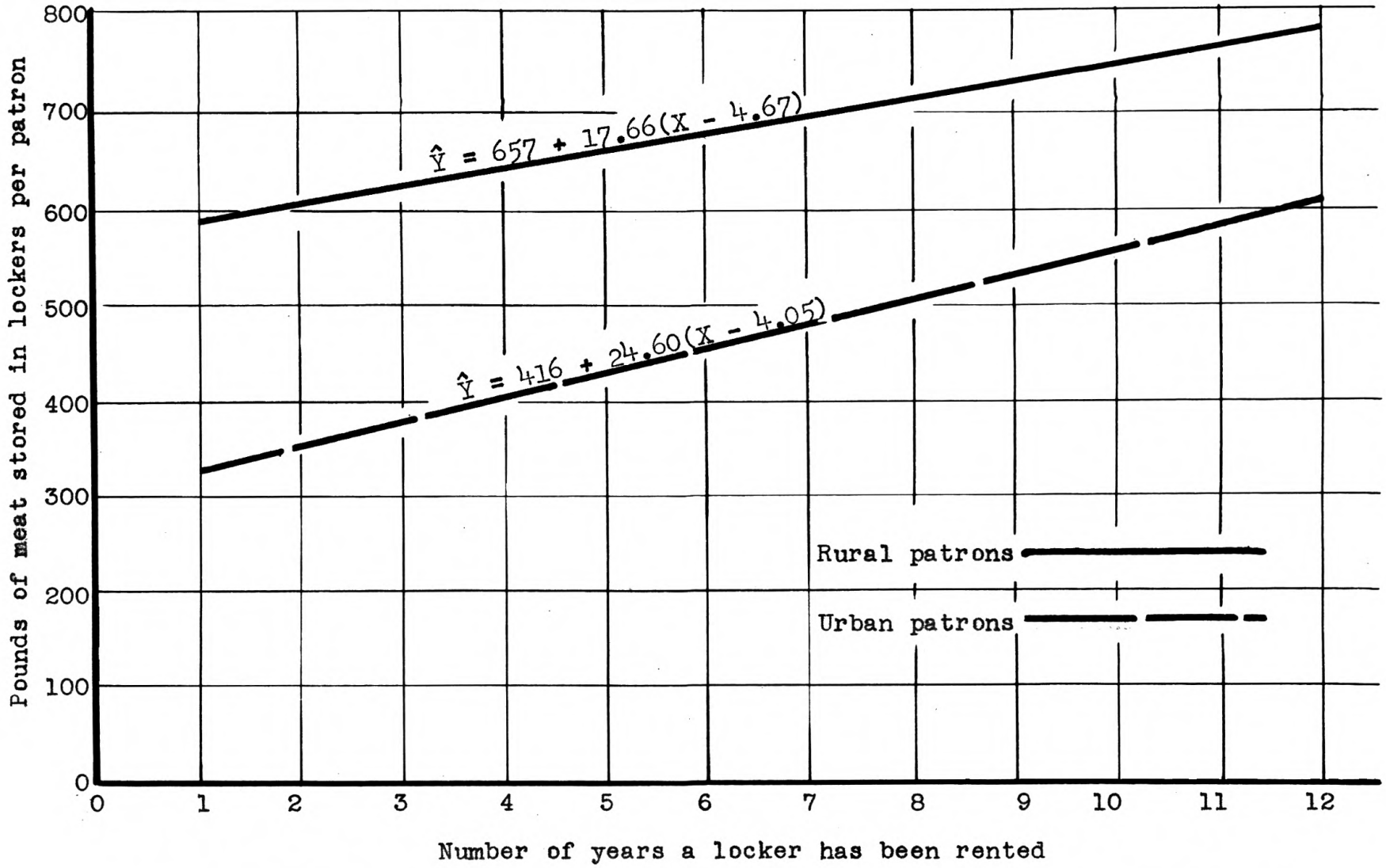

Fig. 4. Regression of pounds of meat stored in lockers per patron on number of years a locker has been rented.

urban patrons, both being positive. Although very small, again they are statistically significant because of the large number of degrees of freedom. Because of the wide variability in individual measurements, the regression lines cannot be used for prediction purposes for individual patrons.

One explanation for the significant positive correlation between years a locker has been rented and number of pounds of meat stored in lockers is that those who make the greatest use of lockers are the steadiest customers of a locker plant. Another factor which may influence the amount of meat stored is the positive correlation between size of family and the number of years a locker has been rented. It has been shown that as size of family increases the number of pounds of meat stored in lockers will tend to increase.

An analysis of covariance was made on these data, and again the difference in slope of the two regression lines was found to be nonsignificant. It is assumed that rural and urban patrons react in the same manner with respect to pounds of meat stored as the number of years a locker has been rented increases.

Distance from Locker Plant. Distance from the locker plant was the only factor studied which did not show a significant relationship with the total pounds of meat stored in lockers. This indicates that those who live a long distance from locker plants store as much meat in lockers as those who live close, other conditions being the same.

Table 14 shows that about 80 percent of the locker patrons

live within 10 miles of the locker plant at which they store meat.

There is no apparent relationship between distance from locker plant and the number of lockers rented.

Table 14. Number and percent of patrons that lived specified distances from locker plants at which they stored meat during 1947.[1]

Distance from locker plant	Rural		Urban		Total[2]
	No.	Percent	No.	Percent	Percent
In same town	--	--	369	92.5	20.6
Less than 5 miles	166	35.9	1	0.2	27.9
5.0 to 9.9 miles	183	39.5	12	3.0	31.4
10.0 to 14.9 miles	83	17.9	7	1.8	14.3
15.0 to 19.9 miles	23	5.0	6	1.5	4.2
20.0 miles and over	8	1.7	4	1.0	1.6
Total	463	100.0	399	100.0	100.0

[1]Data obtained by mail survey and randomly selected locker patrons in Kansas.

[2]Calculated on the basis of 75 percent rural and 25 percent urban patrons.

Per Capita Meat Consumption by Locker Patrons

Patrons were not asked to indicate the quantity of meat consumed during 1947. An attempt was made to estimate the quantity of meat consumed by using data concerning the quantity of meat stored in lockers during the year. Patrons were asked to indicate the number of people eating regularly at their table. By dividing total pounds of meat stored during the year by number of persons eating regularly at patrons' tables, per capita meat consumption from lockers was calculated.

Two general assumptions were made at this point. (1) The per capita quantity of meat stored in lockers during a year is an

accurate estimate of per capita consumption of meat from lockers by those persons during that same year. (2) The ratio of per capita consumption of meat in Kansas during 1947 to per capita consumption of meat in the United States during 1947 was the same as in the first quarter in 1944. The first assumption is necessary in order to convert meat stored in lockers to meat consumed from the locker. The accuracy of this assumption depends upon the relative sizes of inventories of meat in the locker at the beginning and end of the year. There are no data available on this.

It is a matter of speculation as to the effect of the end of meat rationing in the latter part of 1946 and rising meat prices thereafter on the amount of meat going into and coming out of lockers in 1947. It is the writer's opinion that the inventories at the beginning and end of the year were approximately equal.

The second assumption is necessary in order to make an estimate of per capita consumption of meat by all people in Kansas in 1947. The only recent data available on per capita meat consumption in Kansas are for the first quarter of 1944.

Rather than to use 1944 figures, it was thought best to adjust the Kansas per capita consumption to a 1947 base by using the same proportionate increase or decrease as for United States per capita consumption.

Estimates of per capita consumption of meat from lockers by families of locker patrons and estimates of per capita meat consumption of all people in Kansas for 1947 are shown in Table 15.

Table 15. Comparison of per capita consumption of meat by all people in Kansas and per capita locker storage by families of locker patrons during 1947.

Item	Pounds consumed or stored per capita					
	Beef and veal	Pork	Lamb	Sub-total	Poultry and fish	Total
U. S. per capita consumption[1]	79.9	70.0	5.3	155.2		
Estimated Kansas per capita consumption	76.1[3]	66.7[3]	5.1[3]	147.9[2]		
Per capita storage by rural patrons[4]	85.8	54.4	0.2	140.4	12.1	152.5
Per capita storage by urban patrons[4]	74.0	26.4	0.8	101.2	14.7	115.9
Per capita storage by all patrons (adjusted)[4]	82.9	47.4	0.3	130.6	12.8	143.4

[1]Livestock Market News, July, 1948, Page 89.
[2]Oxford Business Surveys, O.P.A. Report, Civilian Meat Distribution, February 21, 1947.
[3]Estimates which are in same proportion to U. S. per capita consumption for each type of meat as Kansas total per capita consumption is to U. S. total per capita consumption.
[4]Data obtained by mail survey of randomly selected locker patrons in Kansas.

In answering the survey questionnaire, locker patrons generally did not differentiate between beef and veal; therefore, they are added together in all cases in Table 15. Poultry, fish, and other minor sources of meat are not included in United States and Kansas per capita consumption data. Therefore the figures in the column showing sub-totals are the comparable figures. Per capita consumption from lockers of poultry, fish and other meats are added to show per capita consumption of all meat from lockers.

Consumption of meat from lockers per person was 17.3 pounds

less than the estimated per capita consumption of meat in Kansas by all persons. Table 15 shows that per capita consumption from lockers by rural patrons was much higher than for urban patrons. It was indicated in an earlier section that urban patrons were probably oversampled for this survey. Correction is made for this error on the basis of 75 percent rural and 25 percent urban patrons for per capita storage by all patrons.

No allowance has been made for meat which families of locker patrons consumed which had not been stored in lockers. Estimates of this for Kansas have never been made. Minnesota made a study of meat consumption by locker patrons in 1939.[18] Data from this study indicated that approximately 25 percent of the meat consumed by locker patrons was not stored in lockers.

If meat consumption per capita by families of locker patrons is calculated on this basis, estimated per capita meat consumption would be 163.4 pounds. This is 15.5 pounds more than estimated per capita consumption by all persons in Kansas.

The data in Table 15 provide very substantial support to the hypothesis that locker plants have increased the meat consumption of locker patrons. Data in Table 16 lend further support to this hypothesis. An increase in consumption of all types of meat is indicated.

Both Tables 15 and 16 give strong indication of a trend toward the consumption of more beef in relation to pork. There

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[18] A. A. Dowell and others. Minnesota Cold Storage Locker Plants, Minnesota Agricultural Experiment Station, Bulletin 345, January, 1940. 39 p.

Table 16. Number of frozen food locker patrons that reported specified percentage changes in the consumption of beef, veal, pork, lamb and mutton, and poultry following the rental of frozen food lockers, as reported by 862 locker patrons, 1947.[1]

Rate of change	Beef			Veal			Pork			Lamb and mutton			Poultry		
	R	U	T	R	U	T	R	U	T	R	U	T	R	U	T
	Number			Number			Number			Number			Number		
No change	237	255	492	440	368	808	300	297	597	439	364	803	329	305	634
Increase--percent:															
Less than 25	66	62	128	1	2	3	54	32	86	2	4	6	42	33	75
25 to 49	47	22	69	1	0	1	21	8	29	1	1	2	21	7	28
50 to 74	46	10	56	0	0	0	20	4	24	0	0	0	16	7	23
75 to 99	7	1	8	0	1	1	0	0	0	1	0	1	2	2	4
100 and over	3	3	6	1	0	1	2	2	4	0	1	1	1	3	4
Total reporting increase	169	98	267	3	3	6	97	46	143	4	6	10	82	52	134
Decrease--percent:															
Less than 25	2	1	3	0	0	0	1	11	12	0	1	1	2	2	4
25 to 49	0	0	0	0	0	0	4	1	5	0	0	0	1	0	1
50 to 74	0	1	1	0	0	0	8	3	11	0	0	0	4	1	5
75 to 99	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0
100 and over	0	0	0	1	2	3	0	0	0	1	0	1	0	0	0
Total reporting decrease	2	2	4	1	2	3	14	15	29	1	1	2	7	3	10
Grand Total	408	355	763	444	373	817	411	358	769	444	371	815	418	360	778
No answer	55	44	99	19	26	45	52	41	93	19	28	47	45	39	84

[1]Data obtained by mail survey of randomly selected locker patrons in Kansas.

are no data available on the relative proportion of the different types of meat consumed in Kansas. Therefore, the proportion of the different kinds of meat consumed from lockers in Kansas can only be compared with the proportion of the different kinds consumed in the United States as a whole. The ratio of beef to pork consumed from lockers as shown by Table 15 is 1.75 compared with 1.14 for United States consumption. There are no data to show how much pork was cured and not stored in lockers. However, the opinion has been expressed that the majority of the pork cured in Kansas is stored in lockers.[19] Therefore, the above figures would not be changed to any great extent.

Table 16 shows this trend even more strongly.

An increase in the consumption of beef since renting a locker was indicated by 267 patrons, compared with 143 patrons who indicated an increase in pork consumption. Only four patrons indicated a decrease in beef consumption, while 29 patrons indicated a decrease in pork consumption. No change in beef consumption was indicated by 492 patrons, while 597 patrons said their pork consumption was not changed.

While still of minor importance in Kansas lamb and mutton consumption has increased. Table 15 shows a per capita lamb and mutton consumption from lockers of 0.4 of a pound. Urban patrons consume much more lamb relatively than do rural patrons. Table 16 indicates a slight increase in lamb consumption.

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[19]Interview with David Mackintosh, Specialist in meats, Kansas State College.

Conclusion

Available information indicates that approximately 75 percent of all locker patrons in Kansas are farmers. The survey from which data were taken for this study was weighted too heavily with urban patrons. Therefore, it was necessary to adjust the data accordingly.

Many urban patrons have access to a supply of meat directly from farms which they own. Many others purchase meat from farms at farm prices. Locker plants provide proper storage for this meat, and make it possible to take advantage of these connections in securing meat at a saving. Those who do not purchase meat direct from farms can still make a saving by purchasing large quantities of meat at wholesale prices and storing it in their locker.

Farmers can butcher or have their livestock slaughtered at any season of the year and store it safely in lockers. This makes it possible to have the equivalent of fresh meat available for consumption at all times of the year.

Locker patrons listed many criticisms of locker service, but the advantages far outweighed the criticisms. High processing rates and locker rentals, disappearance of meat from lockers, and distance to the locker plant were the criticisms listed most often.

Many additional services which patrons would like to have offered were listed on the questionnaire returned by locker patrons. More convenient hours was the one listed most often.

The majority of all locker patrons stated no preference between fresh and frozen meat. Of those patrons stating a preference, about 50 percent more said they preferred fresh meat than said they preferred frozen meat.

Four factors which affect the quantity of meat stored in lockers by locker patrons were analyzed. These were size of family, number of lockers rented, number of years a locker has been rented and distance the patron lives from the locker plant. Regression lines and correlation coefficients were calculated which show the effect of each of these factors on the total quantity of meat stored in lockers by rural and urban patrons. The correlation coefficients for each factor, except distance from locker plant, were statistically highly significant, but were too low to justify the use of the regression lines in making predictions for individual patrons. The regression lines show only a significant relationship. The correlation coefficient for distance from locker plant on total quantity of meat stored in lockers was not significant. The total quantity of meat stored in lockers increases as size of family, number of lockers rented and number of years a locker has been rented increases. There is a large amount of variation in quantity of meat stored in lockers, which accounts for the low correlation coefficients.

An analysis of covariance showed a significant difference in adjusted means of the quantity of meat stored in lockers by rural and urban patrons in comparison with each of the factors studied. Therefore, it was not possible to show an average regression line which would show anything of value. Rural and

urban patrons were therefore considered as two different populations. There was not a significant difference in the slopes of the regression lines for rural and urban patrons, so it is assumed that they react in the same manner to each factor studied.

To get a complete picture of the effect of locker service on the consumption of meat, there should be some information on incomes of locker patrons. This is not available, so it was necessary to disregard this important factor in this study.

An estimate of per capita consumption by families of locker patrons was made from per capita storage of meat in lockers. The only recent period on which information was available on per capita consumption of meat in Kansas was for the first quarter of 1944. This information was only on consumption of all meat, excluding poultry, fish and other minor meats, and did not break this down for each class of livestock.

Estimated per capita consumption of meat in Kansas during 1947 was 147.9 pounds. Estimated per capita storage of meat in lockers in Kansas during this period was 130.6 pounds for all patrons. When meat consumed which was not stored in lockers is added to the latter figure, it is very probable that meat consumption by locker patrons is greater than average consumption by all people.

Rural patrons store much more meat in lockers per capita than do urban patrons. Rural patrons store a greater proportion of pork in relation to beef than do urban patrons. Urban patrons store more lamb than do rural patrons, but the quantity of lamb

stored in lockers is insignificant in relation to other classes of meat.

Locker patrons were asked to indicate the degree and direction in which their meat consumption had changed for each class of livestock since renting a locker. Answers to this question indicate that consumption of all types of meat has increased, but beef consumption has increased in relation to pork. This lends strength to the conclusions which were made from data regarding per capita storage of meat in lockers.

The locker industry has undoubtedly increased the consumption of meat in Kansas. It has been demonstrated that the locker industry has rendered a service to the people of Kansas. As patrons learn more about the services offered by the locker industry, they may tend to make even greater use of lockers.

SURVEY OF FORMER LOCKER PATRONS

Introduction

In the previous section an analysis was made of the factors which affect the quantity of meat stored in lockers or the extent to which locker patrons make use of lockers. In this section, factors which may cause or influence locker patrons to discontinue the use of lockers will be examined. First, former patrons will be compared with present locker patrons on three of the factors studied in the previous section. These are size of family, length of time former patrons had rented lockers before discontinuing their use and distance they live from a locker plant.

No information was obtained from former patrons concerning the number of lockers they had rented. Specific reasons for giving up lockers as given by the former patrons will then be studied.

This phase of the study may show some limitations of locker service, and indicate certain conditions under which experience has shown it is not feasible to make use of the services offered by the locker industry. It may also give some indication to the locker industry of the direction in which further expansion should take place in order to better serve their patrons.

Information for this section was obtained by a mail survey of 564 former patrons of locker plants. The names were obtained from 51 locker plants which were visited personally. The former patrons were patrons at the same locker plants as the patrons in the preceding section.

Distance from Locker Plant

A comparison of the distance which locker patrons and former locker patrons live from a locker plant is shown in Table 17. Probably the most noticeable difference shown by these data is the proportion of rural and urban residence. The majority of locker patrons are rural patrons or farmers, but over twice as many urban patrons as rural patrons have given up their locker. This would seem to indicate that the ratio of rural to urban patrons is becoming larger. However, another factor which determines this is the ratio of new locker patrons which are rural and urban. A survey by the Farm Credit Administration in 1947 indicated that the proportion of urban patrons was increasing

Table 17. Number and percent of patrons and former patrons that lived specified distances from locker plants in 1947.

Distance from nearest locker plant	Rural				Urban			
	Patrons[1]		Former patrons[2]		Patrons[1]		Former patrons[2]	
	No.	Percent	No.	Percent	No.	Percent	No.	Percent
In same town	--	--	--	--	369	92.5	49	87.5
Less than 5 miles	166	35.9	12	50.0	1	0.2	3	5.4
5.0 to 9.9 miles	183	39.5	9	37.5	12	3.0	1	1.8
10.0 to 19.9 miles	106	22.9	3	12.5	13	3.3	3	5.3
20.0 miles and over	8	1.7	0	0	4	1.0	0	0
Total	463	100.0	24	100.0	399	100.0	56	100.0

[1]Data obtained by mail survey of randomly selected locker patrons in Kansas.

[2]Data obtained by mail survey of randomly selected former locker patrons in Kansas.

in the United States.[20] It is the observation of the writer through interviews with locker operators and others in the locker industry in Kansas that if there has been any change at all in Kansas, it has been toward a greater proportion of rural patrons. However, this observation may be biased due to the fact that only operators of locker plants which had been in operation during the entire year of 1947 were interviewed. The effect of new plants in large cities may be underestimated. However, this study indicates that farmers are more stable renters of lockers than are urban patrons.

Within the rural and urban groups, a statistically significant difference in the distance which patrons and former patrons live from the locker plant is not indicated when the chi-square

[20]Mann, L. B., op. cit.

test is applied. The hypothesis tested was that patrons and former patrons within each group were drawn from the same population. The probability of a greater value of chi-square being obtained in the rural group is .25 and .16 for the urban group.

The only significant fact found here is that a significantly greater proportion of urban patrons have given up their locker than have rural patrons.

Size of Family

Table 18 gives a comparison of the size of family of locker patrons and former locker patrons. The chi-square test was applied to rural patrons and former patrons and to urban patrons and former patrons. The probability of a greater value of chi-

Table 18. Number and percent of patrons and former patrons of locker plants in Kansas that had a specified number of people eating one or more meals per day regularly at their table during 1947.

Number of people eating one or more meals per day regularly at patron's table	Rural				Urban			
	Patrons[1]		Former patrons[2]		Patrons[1]		Former patrons[2]	
	No.	Percent	No.	Percent	No.	Percent	No.	Percent
2 or less	115	25.0	8	33.3	132	34.0	16	29.6
3	101	21.9	6	25.0	103	26.6	16	29.6
4	115	24.9	6	25.0	87	22.4	13	24.1
5 or more	130	28.2	4	16.7	66	17.0	9	16.7
Total	461	100.0	24	100.0	388	100.0	54	100.0

[1]Data obtained by mail survey of randomly selected locker patrons in Kansas.

[2]Data obtained by mail survey of randomly selected former locker patrons in Kansas.

square being obtained for the rural group was approximately .60 and .90 for the urban group. The hypothesis that patrons and former patrons of each group are from the same population is not rejected. It is very improbable that size of family is a factor in causing locker patrons to discontinue the use of lockers except perhaps in isolated cases.

Number of Years a Locker Had Been Rented

A comparison of the number of years a locker had been rented by patrons and former patrons of locker plants in Kansas at the time the mail surveys were taken is shown in Table 19.

Table 19. Number and percent of patrons and former patrons of locker plants in Kansas that had rented lockers a specified number of years.

Years locker had been rented (to nearest whole year)	Rural				Urban			
	Patrons[1]		Former patrons[2]		Patrons[1]		Former patrons[2]	
	No.	Percent	No.	Percent	No.	Percent	No.	Percent
1 or less	36	7.9	7	30.4	39	9.9	19	39.6
2	59	12.9	7	30.4	94	24.0	13	27.1
3 or 4	176	38.4	3	13.1	129	32.9	7	14.6
5 or more	187	40.8	6	26.1	130	33.2	9	18.7
Total	458	100.0	23	100.0	392	100.0	48	100.0

[1]Data obtained by mail survey of randomly selected locker patrons in Kansas.

[2]Data obtained by mail survey of randomly selected former locker patrons in Kansas.

A chi-square test on data in Table 19 shows a highly significant difference in the number of years which patrons and former patrons had rented lockers for both the rural and urban groups.

A visual examination of the table will show that whereas most of the former patrons had rented lockers only one or two years, a large majority of patrons had rented lockers three years or longer.

The length of time a locker has been rented is probably not an important factor in causing patrons to discontinue the use of lockers. It probably means that it takes most patrons one or two years to determine whether or not a locker is economically feasible for them. Therefore, the importance of this factor in causing patrons to give up the use of lockers is questionable.

Reasons for Discontinuing Renting Lockers

So far in this discussion only one factor seems to have been important in causing people to discontinue the use of lockers. This was place of residence. A much greater proportion of city patrons have discontinued the use of lockers than have rural patrons. This still does not answer the question as to why individual patrons gave up their locker.

In the questionnaire to former patrons, they were asked to state their reason for discontinuing the use of lockers. The answers to this question are summarized in Table 20. The reason given most often was the lack of a supply of food to place in their locker. Most of those giving this reason were city patrons as would be expected.

The cost of locker service was another important reason. If a patron did not make efficient use of his locker, the cost of

locker service would probably make the use of lockers uneconomical because locker rental would be more than the savings which could be realized on small amounts of meat or other food.

Table 20. Reasons given by 80 former patrons of locker plants in Kansas for discontinuing the renting of lockers.[1]

Reasons	Number of former locker patrons		
	Rural	Urban	Total
No longer had a supply of food to put in locker	3	14	17
Processing and/or locker rental rates too high	7	6	13
Inconvenience	3	8	11
Purchased a home freezer unit	3	7	10
Loss of meat from locker	6	4	10
High cost of meat and other food	0	6	6
Changing conditions made locker uneconomical	3	3	6
Prefer non-frozen meat	0	6	6
Deterioration in quality of meat while in locker	2	2	4
Distance from home to locker	3	1	4
Dissatisfaction with processing services	3	0	3
Availability of meat after rationing ended	0	2	2
Intermittent renter	2	0	2
Miscellaneous reasons	2	3	5
No reason given	1	4	5

[1]Data obtained by mail survey of randomly selected former locker patrons in Kansas.

It is perhaps surprising to find inconvenience so high on the list. Former patrons evidently felt the savings they could realize from lockers did not pay for the inconvenience of going to the locker plant.

The loss or disappearance of meat from lockers was an important reason in causing patrons to give up lockers. If

individual locker plants get a bad reputation in this respect, it probably will reduce their business considerably.

The purchase of a home freezer unit was also an important reason for giving up lockers. This is an important factor from the standpoint of the locker operator. The factor of home freezers will be discussed in the next section, so will be by-passed at this time.

There were several other reasons given of apparently decreasing importance.

Conditions Under Which Lockers Would Again be Rented

Former patrons were asked to indicate the conditions under which they would again rent lockers. The answers to this question are summarized in Table 21.

As might be expected from the reasons given for discontinuing renting lockers, the condition listed most often was if they again had a supply of food to put in a locker. Also, the importance of home freezers is again demonstrated. Evidently 12 former patrons will not rent lockers as long as they can have a home freezer. Other reasons correspond closely with the reasons given for discontinuing the use of lockers.

It is interesting to note that five rural patrons and four urban patrons said they would not rent lockers again under any condition. Eighteen other patrons did not answer the question.

Table 21. Conditions under which former patrons of locker plants in Kansas would again rent lockers, as reported by 80 former locker patrons.[1]

Condition	Number of former patrons		
	Rural	Urban	Total
If a supply of food were again available to put in locker	5	9	14
If they did not have a home freezer	3	9	12
If meat should become scarce again	1	8	9
More reliable service from the locker plant	4	2	6
Lower rental rates	1	4	5
Lower meat prices	0	3	3
When conditions are such that locker is again economical	0	3	3
If locker plant is established nearer home.	1	1	2
Miscellaneous reasons	4	0	4
Would not rent again under any condition	5	4	9
None listed	3	15	18

[1]Data obtained by mail survey of randomly selected former locker patrons in Kansas.

Conclusion

Former locker patrons and locker patrons were compared with respect to distance which they live from a locker plant, size of family and number of years a locker had been rented in an attempt to find some factor which tends to cause patrons to discontinue renting lockers. The only significant factors found were place of residence and number of years a locker has been rented.

A much greater proportion of urban patrons had given up their lockers than rural patrons. Since this is true, it seems probable that the ratio of rural to urban patrons is increasing. However, this also depends on the ratio of rural to urban patrons among new locker patrons. A survey by the Farm Credit Administra-

tion in 1947 indicates that the ratio of rural to urban patrons is decreasing in the United States. The trend is apparently in the opposite direction in Kansas.

A statistically significant difference was found in the number of years a locker had been rented by locker patrons and former locker patrons within both rural and urban groups. However, this is probably more of an effect than a cause, so it is given little importance in this analysis.

Size of family is evidently not a factor in causing locker patrons to discontinue the use of lockers.

The reasons given by former patrons for discontinuing renting lockers indicates that the principal reason for a greater proportion of urban patrons giving up their locker is that they do not have a supply of meat and other foods to put in lockers.

Other important reasons for discontinuing renting lockers included inconvenience, loss of meat from lockers, cost of locker service and the purchase of home freezer units.

The conditions under which a locker would again be rented correspond closely to the reasons given for discontinuing renting lockers.

SURVEY OF USERS OF HOME FREEZER UNITS

Introduction

The home freezer industry is of recent origin. Home freezers have been on the market for several years, but not many were purchased prior to 1946. However, sales have increased considerably

since 1946.

Since a home freezer is a locker in the home, they can play an important part in the future development of the locker industry. They may be a substitute for the locker plant in several ways. They provide a convenient method of cold storage for food. There is probably a greater flexibility in their use than for lockers because they are in the home and are accessible at any time.

The extent to which the home freezer has replaced the locker and its effect on the locker industry will be discussed. Possibilities of cooperation for the mutual benefit of the two industries will be indicated.

Because of the very recent development of the home freezer industry and changing conditions within the locker industry, the relationship between the two industries is probably not stable as yet, but the present relationship and possibilities for the future will be pointed out.

Data on users of home freezers were obtained from a mail questionnaire sent to 637 home freezer users in Kansas. Of these, 221 usable questionnaires were returned. The names of home freezer owners were obtained from county agents, home demonstration agents, locker plant operators, and a small number from home freezer dealers. A large majority of the names were obtained from county agents and home demonstration agents.

The questionnaire was designed to obtain information for the year 1947. Actually only 21 percent of the home freezer users who returned questionnaires had used a home freezer during the

entire year of 1947. In order to make data on the quantity of meat stored in home freezers and/or lockers by home freezer users comparable to data on the quantity of meat stored in lockers by locker patrons who did not have a home freezer, which was presented in a preceding section, only those who used a home freezer during the entire year of 1947 were used in this comparison. Since there is such a small number of home freezer users meeting this requirement, no statistical analysis of these data was made.

Data from all questionnaires were used for other purposes.

Extent to Which Home Freezers Are Being Used

Number of Years Home Freezers Have Been Used. Home freezers are a comparatively new addition to the list of modern appliances for the home. They had been used very little until the last war when people were looking for a way to store a supply of meat and other scarce perishable foods. However, there were not many made during the war, so they did not become of much importance until after the war. There has been a very rapid expansion in the number of home freezers in use since that time. Table 22 shows the year in which home freezers were purchased by 218 home freezer users who answered that particular question.

A rapid increase in the use of home freezers in recent years is indicated by this table. It was shown in a previous section that the locker industry made a very rapid expansion during this same period. The increase in the cold storage of food by individual families in both lockers and home freezers has been very great. The preservation of food by cold storage by individ-

ual families has become firmly rooted in Kansas.

Table 22. Number of owners that purchased home freezers during specified years.[1]

Year in which purchased	Rural	Urban	Total
First half of 1948	46	24	70
1947	71	35	106
1946	20	11	31
1945	2	0	2
1944	1	0	1
1943	2	3	5
1942	1	0	1
1941	1	0	1
1940	1	0	1
Total	145	73	218

[1]Data obtained by mail survey of home freezer users in Kansas.

Table 22 should not be interpreted as indicating that two-thirds of all home freezer users live on farms. Since most of the names of home freezer users were obtained from county agents and home demonstration agents, it is probable that the proportion of users living on farms is greater in this sample than in the actual population. There is no accurate check on this.

Size of Home Freezer. Home freezers are available in many different sizes. The size varies from about 4 cu. ft. to the large walk-in types which have a volume as great as 200 cu. ft. The walk-in home freezer amounts to a small room having freezing temperature. The 200 cu. ft. size is extremely rare. Most of the walk-in type have a much smaller volume.

Table 23 shows that the smaller sizes are the most popular. Those having a volume of 30 cu. ft. and over are probably of

the walk-in type.

Table 23. Number of home freezer users that have home freezers of specified sizes.[1]

Size of home freezer	Number of users		
	Rural	Urban	Total
Less than 5 cu. ft.	11	17	28
5.0 to 9.9 cu. ft.	37	34	71
10.0 to 14.9 cu. ft.	50	15	65
15.0 to 19.9 cu. ft.	34	6	40
20.0 to 29.9 cu. ft.	5	0	5
30.0 cu. ft. and over	6	1	7
Total	143	73	216

[1]Data obtained by mail survey of home freezer users in Kansas.

Advantages and Disadvantages of Home Freezers in in Comparison to Lockers

Introduction. Home freezer units have some advantages and some disadvantages in relation to lockers at locker plants. If this were not true, there would either be no lockers or no home freezers used. Home freezer users were asked to list the advantages and disadvantages of home freezers in relation to lockers. It would be expected that home freezer users would find more advantages than disadvantages for a home freezer, or they would not be using one.

Advantages. The advantages listed by home freezer users are shown in Table 24.

This table shows that convenience is the most important advantage of home freezers. General convenience was the advantage listed most often, but many other advantages listed indicated

convenience along certain lines. Accessibility is very important. This allows a greater and more efficient use to be made of the home freezer than is possible with lockers which are not as accessible.

Table 24. Number of home freezer users that reported specified advantages of a home freezer in comparison to lockers.[1]

Advantage	Number of users		
	Rural	Urban	Total
General convenience	31	33	64
Food is immediately available when it is wanted	44	10	54
Saves extra trips to market or locker plant	42	9	51
Preservation of fresh or perishable foods, including baked foods	29	17	46
Can put small quantities of food into freezer any time desired, instead of waiting to make a trip to locker	32	4	36
Saving of food by preventing waste. Put left-overs in freezer	18	4	22
Unit is readily accessible at all times	12	8	20
Economical	8	10	18
Can always have a variety of food on hand.	11	2	13
Can have better quality food	9	4	13
Saves time	7	3	10
Does away with mix-up in food and disappearance of food from locker	5	1	6
Saves labor	5	1	6
No odors	3	3	6
Can make more use of home freezer than can of locker	5	0	5
Satisfaction of processing and wrapping meat the way desired	3	1	4
More uniform temperature than in locker plant	2	0	2
Miscellaneous advantages	6	4	10
None listed	8	10	18

[1]Data obtained by mail survey of home freezer users in Kansas.

Disadvantages. The disadvantages of home freezers as listed

by home freezer users are shown in Table 25.

Table 25. Number of home freezer users that reported specified disadvantages of a home freezer in comparison to lockers.[1]

Disadvantage	Number of users		
	Rural	Urban	Total
Possibility of power failure or breakdown.	12	6	18
Expensive to operate.....	5	5	10
High initial cost.....	3	4	7
Inconvenience of defrosting.....	3	0	3
Takes up space in home.....	0	2	2
Makes noise.....	1	1	2
Other miscellaneous disadvantages.....	5	2	7
None listed.....	121	56	177

[1]Data obtained by mail survey of home freezer users in Kansas.

A comparison of Tables 24 and 25 shows that advantages far outnumber disadvantages of home freezers as far as home freezer users are concerned. The possibility of power failure or breakdown of the unit was listed most often as a disadvantage. This does become very important when electrical power goes off during storms. This is not an infrequent occurrence in some localities. The cost of purchasing and operating a home freezer unit is another important consideration. Other disadvantages listed were minor in nature and were mostly minor inconveniences of home freezers.

Comparison of Locker Patrons and Users of Home Freezers

Introduction. It would be well to know if there are any general factors which tend to cause some families to use lockers

and others to use home freezers. Size of family and distance from locker plant will be analyzed in this study to see if there is a significant difference between locker patrons and home freezer users in these respects.

The quantity of meat stored by locker patrons and home freezer users will also be compared.

Size of Family. The size of family could be a factor in causing some families to prefer a home freezer to a locker or in using a combination of the two. As size of family increases, the quantity of meat consumed by the family increases.

Table 26. Number and percent of locker patrons and home freezer users having families of specified sizes.[1]

Size of family	Rural				Urban			
	Locker patrons		Home Freezer Users		Locker patrons		Home Freezer Users	
	No.	Percent	No.	Percent	No.	Percent	No.	Percent
1 or 2	115	25.0	22	15.3	132	34.0	24	32.4
3	101	21.9	32	22.4	103	26.6	13	17.6
4	115	24.9	35	24.5	87	22.4	11	14.9
5	59	12.8	24	16.8	41	10.6	20	27.0
6 or more	71	15.4	30	21.0	25	6.4	6	8.1
Total	461	100.0	143	100.0	388	100.0	74	100.0

[1]Data obtained by mail survey of home freezer users in Kansas.

Table 26 gives a comparison of size of family of both rural and urban locker patrons and home freezer users. The chi-square test was applied to the data in this table for both rural and urban groups. A chi-square of 7.71 with 4 degrees of freedom was obtained for the rural group. This is approximately at the .10

level of significance, so it is assumed that there is not a significant difference in size of family of rural locker patrons and rural home freezer users.

A chi-square of 16.74 with 4 degrees of freedom was obtained for the urban group. This is beyond the .01 level of significance, and indicates a highly significant difference in size of family of urban locker patrons and home freezer users.

A visual examination of Table 26 shows that relatively more urban families having three or less in the family rent lockers than use home freezers, while relatively fewer urban families having four or more in the family rent lockers. The same general difference exists in the rural group, but it is not as pronounced. Familes of three and four make up almost the same percentage of locker patrons and home freezer users in the rural group.

Data for rural and urban groups cannot be justifiably thrown together, because there is a highly significant difference between rural and urban families for both locker patrons and home freezer users. Since they very probably form two entirely different populations in the respect of size of family, they must be studied separately.

Distance from Locker Plant. It seems probable that distance from locker plant would be a factor in causing some families to purchase home freezers. It would seem that families who live long distances from locker plants would be more inclined to purchase home freezers than others who live relatively close to locker plants.

Table 27. Number and percent of locker patrons and home freezer users who live specified distances from locker plants.

Distance from locker plant	Rural families				Urban families			
	Locker Patrons		Home freezer users		Locker patrons		Home freezer users	
	No.	Percent	No.	Percent	No.	Percent	No.	Percent
Same town	--	--	--	--	369	92.5	67	90.5
Other towns	--	--	--	--	30	7.5	7	9.5
Less than 5 miles	166	35.9	41	28.1	--	--	--	--
5 to 9.9 miles	183	39.5	67	45.9	--	--	--	--
10 to 14.9 miles	83	17.9	22	15.1	--	--	--	--
15 miles or more	31	6.7	16	10.9	--	--	--	--
Total	463	100.0	146	100.0	399	100.0	74	100.0

Table 27 compares the distance which locker patrons and home freezer users live from a locker plant. The chi-square test was applied to the data in this table for both rural and urban groups. A chi-square of 6.21 with 3 degrees of freedom was obtained for rural families. This is at the .10 level of significance, so it is assumed that rural locker patrons and home freezer users are from a common population in this respect. A chi-square of .32 with one degree of freedom was obtained for urban families. This is at the .59 level of significance. Therefore, urban locker patrons and home freezer users are assumed to be from a common population in this respect.

Statistical analysis does not bear out the previous statement to the effect that distance from locker plant would have an influence in the decision of families to purchase home freezers. This analysis indicates that families living close to locker plants are no less inclined to use home freezer units than those living long distances from locker plants.

Quantity of Meat Placed in Cold Storage. The quantity of meat a family consumes may be a factor in determining whether or not a home freezer is purchased and used with or without a locker. On the other hand, after a home freezer is purchased and/or a locker rented, the quantity of meat consumed may be influenced by that fact. Therefore, the quantity of meat a family consumes may be a cause or effect, depending upon individual circumstances.

Table 28. Average number of pounds of meat placed in cold storage by locker patrons, home freezer users who also rent lockers and home freezer users who do not rent lockers.

Class of meat	Locker patrons[1]		Locker patrons[2] and home freezer users		Home freezer users[2]	
	Rural	Urban	Rural	Urban	Rural	Urban
Beef and veal	340	247	520	379	426	210
Pork	205	85	219	78	129	121
Lamb	1	2	11	--	4	--
Poultry	46	48	82	63	68	70
Fish and game	--	--	17	--	14	59
Total	592	382	849	520	641	460

[1]Data obtained by mail survey of randomly selected locker patrons in Kansas.
[2]Data obtained by mail survey of home freezer users in Kansas.

Table 28 indicates the relationship which exists among families who rent lockers and do not use home freezers, families who rent lockers and also use a home freezer and families who use only a home freezer in regard to the quantity of meat stored in lockers and/or home freezers.

Data in this table should not be taken as conclusive evidence because data on home freezers both in combination and not

in combination with lockers are inadequate. Only home freezer users who had used a home freezer during the entire year of 1947 were used for this comparison in order that the data would be comparable with data on locker patrons, which were for the entire year of 1947. Data for families who use both lockers and home freezers are from 13 rural families and 7 urban families and data for home freezer users only are from 14 rural and 6 urban families. Data for locker patrons are from 463 rural families and 399 urban families.

Table 28 indicates that both rural and urban families who use both lockers and a home freezer store considerably more meat than do families who use only lockers or a home freezer. It is difficult to distinguish between cause and effect in this case. They store considerably more beef than families who use only lockers or a home freezer. The table indicates that among rural families, those who use both lockers and a home freezer and those who use only lockers store about the same quantity of pork, while those who use home freezers alone store considerably less. In the urban group families who use both lockers and a home freezer and those who use only lockers store about the same quantity of pork, but those who use only home freezers store more.

The table indicates that families who use only a home freezer store more total meat than do those who use only a locker. The difference is not very great, so should not be taken as too strong an indication.

Effect of Home Freezers on the Locker Industry

Decrease in Number of Lockers Rented. The great fear of the locker industry when home freezers were first introduced was that they would replace the locker as a means for families to store their own meat and other foods. Without doubt the home freezer has taken away some locker renters.

Table 29. Number of home freezer users that reported the use made of frozen food lockers.[1]

Whether renting locker or not	Number of users		
	Rural	Urban	Total
Rents locker at locker plant	60	29	89
Do not rent lockers at locker plant	87	45	132

[1]Data obtained by mail survey of home freezer users in Kansas.

Table 29 indicates that approximately 40 percent of both rural and urban families using a home freezer unit also rent a locker. Some of those who do not rent a locker did not rent lockers before, so the decrease in the use of lockers because of home freezers is not so great as indicated by Table 29. Home freezer users usually need additional storage space when a beef or hog is slaughtered, and some keep a locker for this purpose. Many home freezers are used primarily for storage of fruits and vegetables, baked foods, and left-overs and the locker used for the storage of the bulk of the meat. A supply of meat which will last for several days is brought home from the locker each visit, thereby reducing the number of trips to the locker plant.

Processing Service Rendered by Locker Plants. Home freezers may be an added source of revenue to locker plants in some respects. Many home freezer users depend upon the locker plant for slaughtering and processing services. This may increase the volume of processing sufficiently to offset the loss in locker rentals.

The Farm Credit Administration has made a study of the effect of home freezers on locker plants.

> It would appear that locker plants have a real opportunity of expanding their processing volume, particularly with meat and to some extent poultry through the servicing of home units. Here it would seem is another way by which locker plants can broaden the market for locally produced livestock and poultry.
>
> A study made by Cornell University of the effect of a large saturation of home freezer units upon a central locker plant showed that processing volume of the locker plant approximately doubled and that 40 percent of this volume came from home-unit users.[21]

The use made of processing services at locker plants by home freezer users in Kansas is indicated by Table 30. This table indicates that almost half of the home freezer users have all meat processing done at locker plants and a small additional number have part of the processing done at locker plants.

Most home freezers do not have a separate sharp freeze compartment. Out of 214 home freezer users giving information on the services provided by their home freezer unit, 112 said their freezer did not have a sharp freeze compartment. The sharp freeze compartment is very small on most units that have it, so it is impossible to sharp freeze a very large quantity

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[21] L. B. Mann, op, cit.

at any one time.

Table 30. Number of home freezer users that have meat cut, wrapped, and sharp frozen at specified places.

Where service has been done	Number of patrons		
	Rural	Urban	Total
Cutting:			
At home	38	9	47
At locker plant	45	28	73
Both home and locker plant	8	0	8
Elsewhere	4	9	13
Elsewhere and locker plant	2	0	2
Wrapping:			
At home	39	12	51
At locker plant	43	28	71
Both home and locker plant	9	0	9
Elsewhere	4	6	10
Elsewhere and locker plant	2	0	2
Freezing:			
At home	41	18	59
At locker plant	42	28	70
Both home and locker plant	12	0	12
Elsewhere	1	0	1
Elsewhere and locker plant	1	0	1
Total	97	46	143
No answer	2	3	5

[1]Data obtained by mail survey of home freezer users in Kansas.

Cooperation Between Home Freezer and Locker Industries. When the home freezer was first introduced, many in the locker industry felt uneasy. This feeling prevailed in the industry for some time. However, when the possibilities of working together for mutual benefit were realized, this feeling within the locker industry subsided.

Now, many locker plants sell home freezer units and many

locker plants have home freezer units available to rent. The locker plant then has the opportunity of providing processing services for these patrons. Locker plants that sell frozen foods may also provide these patrons with much of the food that goes into the freezer.

Many of the companies manufacturing home freezer units are pushing the idea of using the home freezer in conjunction with lockers at locker plants.

At one time these two industries appeared to be directly opposed to each other; now there is a definite integration of the two industries.

Conclusion

The home freezer industry is of recent origin. It has experienced a great expansion since the last war. Many in the locker industry feared it would have ill effects on the locker industry, but their fears have not been fully borne out.

Home freezers are available in a large variety of sizes. They vary from a small box of approximately four cubic feet to the large walk-in type. The smaller and medium sizes are in greater demand than the large sizes.

The home freezer serves the same primary purpose as the locker; i.e., the storage of perishable foods under freezing temperatures. However, it has advantages and disadvantages in comparison with a locker. Its primary advantage is greater convenience because of the fact that it is in the home and is accessible at any time while the locker is some distance away

from the home. Its principal disadvantages are the possibility of power failure or breakdown and the expense of purchasing and operating a unit. Another disadvantage is the fact that most units are not large enough to store all the meat when an animal is slaughtered. Most of them are not satisfactory for sharp freezing. These are the reasons the locker plant can still play an important role for home freezer users.

Home freezer users frequently rent lockers to store surplus meat for which they do not have room in their home freezer. If the bulk of their meat is stored in lockers, the home freezer can be used for storing small amounts of fruits, vegetables, baked foods, left-overs, etc.

Home freezer users can also make profitable use of the processing services rendered by locker plants. Studies made by Cornell University indicate that volume of food processing by a central locker plant has increased when the area was saturated with home freezer units. Increased income from processing may more than offset the loss in locker rentals.

A comparison of locker patrons and home freezer users indicates a nonsignificant difference in size of family of rural families and a significant difference in size of family of urban families. The same general difference exists in both groups, but it is more pronounced in the urban group. Relatively more small families rent lockers than use home freezers, while relatively fewer large families rent lockers than use home freezers.

A significant difference was not found in the distance

which locker patrons and home freezer users live from a locker plant.

Families that use both lockers and a home freezer apparently store more meat than families that use only lockers or a home freezer. However, data for home freezer users is not adequate to be used as conclusive evidence.

The locker and home freezer industries are now beginning to cooperate with one another for the mutual benefit of both. Many producers of home freezers are striving to promote the use of home freezers in conjunction with lockers and many locker plants are selling or renting out home freezer units.

CONCLUSIONS

The locker industry had its beginning in Kansas in 1912 when the Carey Ice and Cold Storage Company in Hutchinson rented spare storage space to farmers so they could store their own meat in the plant. The locker industry has come a long way since that humble beginning. It has had its major development in the years just preceding World War II, during the war, and after. The greatest expansion in number of plants was immediately after the close of World War II when building materials again were available. This expansion in numbers has tended to level off recently, and any further expansion of the industry will probably be made principally in quantity and quality of services offered and in size of individual locker plants already operating.

Approximately 75 percent of all locker patrons in Kansas are farmers. Locker plants make it possible for urban patrons to purchase livestock at farm prices and have them slaughtered for locker storage and later consumption, or to buy large quantities of dressed meat at wholesale prices. Farmers may slaughter their livestock at any time of the year and place the meat in lockers for safe storage. Lockers make it possible for all patrons to enjoy meat at lower prices and to have a supply of a variety of the equivalent of fresh meat available at all times.

High processing rates and locker rentals, disappearance of meat from lockers and distance to the locker plant were the principal disadvantages of locker plants.

More convenient hours and curing were the principal additional services desired by locker patrons.

The majority of locker patrons expressed no preference between fresh and frozen meat.

Major emphasis was placed on the effect of size of family, number of lockers rented, number of years a locker has been rented and distance the patron lives from the locker plant on the quantity of meat stored in lockers. Each of these factors except distance from locker plant had a significant effect on the quantity of meat stored in lockers. The correlation was positive in each case. However, the correlation was not close enough to justify the use of the regression lines for prediction of the quantity of meat to be stored by individual patrons. The regression lines only show a significant relationship between these factors and the quantity of meat stored in lockers.

This study indicated that rural patrons stored approximately 592 pounds of meat in lockers per patron and 394 pounds per locker in 1947. Urban patrons stored approximately 382 pounds per patron and 302 pounds per locker in 1947.

The effect of locker plants on the consumption of meat by locker patrons was indicated by a comparison of the quantity of meat stored in lockers per capita of families of locker patrons with estimated per capita consumption of meat by all people in Kansas. This study indicated that lockers have increased the consumption of meat by locker patrons. This conclusion is further strengthened by the reports of the locker patrons themselves on the change in consumption of meat since renting a locker. It was also indicated that beef consumption has increased relative to pork consumption. It was indicated that consumption of all types of meat has increased.

This study indicated that a greater percentage of urban locker patrons have discontinued the use of lockers than rural patrons. Unless the percentage of new patrons who live in urban areas is sufficiently large to offset this relative loss of urban patrons, the ratio of rural to urban patrons is increasing. By observation it seems that this ratio is increasing in Kansas.

There was not a significant difference between patrons and former patrons in respect to size of family and distance which they live from a locker plant. There was a significant difference between patrons and former patrons in the number of years a locker had been rented, but this was not given much importance. This

was considered to be an effect rather than a cuase. It probably means that it takes most patrons one or two years to determine if a locker is economically feasible for them.

Former patrons indicated that the most important reason for no longer renting a locker was a lack of food to store in the locker. Inconvenience, disappearance of meat from lockers, cost of locker service and the purchase of a home freezer were other important reasons.

Home freezers have not produced the harmful effects on the locker industry that many in the locker industry first feared. Although home freezers may reduce the number of lockers rented at a locker plant, they may increase the volume of processing. A locker plant which does no processing or offers only limited processing services may be hurt by home freezers, but a plant offering complete processing services stands to benefit in the long run.

The advantages of home freezers are principally those of convenience and accessibility. Their principal disadvantages are the possibility of power failure or breakdown and expense of purchasing and operating a unit.

Since most units are not large enough to store all the meat when an animal is slaughtered, many home freezer users rent a locker to store this excess meat. This combined with processing of food for the home freezer provides locker plants with considerable business from home freezer users.

There is a significant difference indicated in size of

family of urban locker patrons and home freezer users. Relatively more large urban families use home freezers than rent lockers. The difference in size of rural families follows the same general pattern as for urban families, but the difference is not statistically significant.

There was not a significant difference indicated in distance which locker patrons and home freezer users live from a locker plant.

Locker plants and, more recently, home freezers have become of great importance to rural people, and to a lesser degree, the urban people of Kansas for the safe storage of meat and other food. As the number and quality of services offered by locker plants increase and as the possibility of further cooperation between the locker industry and the home freezer industry is seen and realized, the people of Kansas stand to benefit.

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APPENDIX

KANSAS AGRICULTURAL EXPERIMENT STATION
FROZEN FOOD LOCKER STUDY

To Renters of a Locker Who Do Not Have a Home Freezer

1. Do you live on a farm? . . . . . Yes ( )
No ( )

2. How far do you live from the locker plant? . . . . . _____ miles

3. (a) If you live in town, do you own a farm? . . . . . Yes ( )
No ( )

(b) If the answer to the above question is "yes", do you get products from your farm for locker storage? Meats? . . . Yes ( )
No ( )

Fruits? . . . Yes ( )
No ( )

Vegetables? . . . Yes ( )
No ( )

4. How many years have you rented a locker? . . . . . _____

5. How many lockers are you renting now? . . . . . _____

6. How many people eat one or more meals per day regularly at your table? . . . . . _____

7. What form of meat does your family prefer? . . . . . (Check one) Fresh ( )
Frozen ( )
No preference ( )

8. What are the chief advantages, if any, of locker plants to you?

_____

_____

9. What are your principal criticisms, if any, of locker plant services?

_____

_____

10. What services would you like the plant to provide that are not now available?

_____

_____

11. (a) Do you plan to buy a home freezer unit? . . . . . Yes ( )
No ( )

(b) If yes, when? (This year, or what year) . . . . . _____

12. (a) Do you plan to build a home freezer unit? . . . . . Yes ( )
No ( )

(b) If "yes", when? (This year, or what year) . . . . . _____

13. Slaughtering:

How many animals did you slaughter or have slaughtered in 1947 for locker storage?

Beef _____ Sheep & Lambs _____

Calves _____ Poultry _____

Hogs _____

(More on reverse side)

14. Who did the actual slaughtering of your livestock? (Check appropriate space for each type of livestock)

	Cattle	Hogs	Lambs	Poultry
Slaughtered yourself	( )	( )	( )	( )
Slaughtered by locker plant.	( )	( )	( )	( )
Slaughtered by others.	( )	( )	( )	( )

15. Has there been any shift in the time or season of slaughtering since locker storage has been used?

_____

_____

If you bought no dressed meat in 1947, disregard questions 16, 17, and 18.

16. How many pounds of dressed meat were bought for locker storage in 1947?

Beef _____ Lamb _____

Veal _____ Poultry _____

Pork _____ Fish _____

17. From whom was the dressed meat purchased for locker storage in 1947?

Farmers ( )
Locker Plant ( )
Retail Meat Market ( )
Other (state whom) ( )

18. What were the principal types of cuts of meat purchased for locker storage? (For example, under pork you may show: whole carcass, half carcass, front quarter, hind quarter, loins, hams, shoulder, etc.)

Beef _____

Pork _____

Lamb _____

Veal _____

19. How has locker storage affected the total amount of meat consumed by your family?

(a) Eat more since renting locker (give approximate percent increase) _____%

(b) Eat less since renting locker (give approximate percent decrease) _____%

(c) No difference since renting locker _____

20. If consumption of meat has changed due to use of locker, indicate percentage increase or decrease in consumption for items listed below.

	Percent Increase	Percent Decrease
Beef	_____%	_____%
Pork	_____%	_____%
Veal	_____%	_____%
Lamb & Mutton	_____%	_____%
Poultry	_____%	_____%

KANSAS AGRICULTURAL EXPERIMENT STATION
FROZEN FOOD LOCKER STUDY

To Users of Home Freezers Who May or May Not Also Rent a Locker

1. Do you live on a farm? . . . . . Yes (__)
No (__)

2. How far do you live from a locker plant? . . . . . _____miles

3. (a) If you live in town, do you own a farm?. . . . . Yes (__)
No (__)

(b) If the answer to the above question is "yes", do you get products from your farm for locker storage? Meat. . . . . Yes (__)
No (__)

Fruits. . . . . Yes (__)
No (__)

Vegetables. . . . . Yes (__)
No (__)

4. Do you rent a locker at a locker plant?. . . . . Yes (__)
No (__)

5. If so, how many years have you rented a locker?. . . . . _____

6. When did you get your home freezer?. . . . . _____
(month and year)

7. Is your home freezer home made?. . . . . Yes (__)
No (__)

Commercially made? . . . . . Yes (__)
No (__)

8. What is its size? (Give size in cu. ft. of its interior). . . _____cu. ft.

9. Does it have (a) only a storage compartment? . . . . . Yes (__)
No (__)

(b) separate sharp freeze compartment and storage compartment? . . . . Yes (__)
No (__)

10. What was the cost of your home freezer . . . . . $_____

11. How many people eat one or more meals per day regularly at your table? . . . . . _____

12. Is your home freezer unit of proper size for your purpose? . . . . . Yes (__)
No (__)

If not, what size would you prefer? _____

13. Based on your experiences, what advantages are there in having a home freezer unit? _____

_____

Disadvantages? _____

_____

14. If you rent a locker, do you plan to continue doing so?. . . . . Yes (__)
No (__)
Undecided (__)

Why? _____

_____

15. Where are the following services performed? (Check)

	At home	Locker plant	Elsewhere (Specify)
Cutting	( )	( )	( )
Wrapping	( )	( )	( )
Sharp freezing	( )	( )	( )

16. Estimate the number of pounds of meat you stored in 1947 in your home freezer, of if you also rented a locker, in your home freezer and locker combined.

Beef_____lbs.
Veal_____lbs.
Pork_____lbs.
Lamb_____lbs.
Poultry_____lbs.
Fish & game_____lbs.

17. How many pounds of dressed meat were bought for storage in your home freezer (and in locker, if one was rented) in 1947?

Beef_____lbs.
Veal_____lbs.
Pork_____lbs.
Lamb_____lbs.
Poultry_____lbs.
Fish & game_____lbs.

18. From whom was the meat purchased for storage in your home freezer (and in locker, if one was rented) in 1947? (Check)

Farmers ( )
Locker plant ( )
Retail meat market ( )
Others (state whom)_____

19. What were the principal types of cuts of meat purchased for storage? (For example, under pork you may show: whole carcass, half-carcass, loins, hams, shoulder, etc.)

Beef_____
Veal_____
Pork_____
Lamb_____

20. How has the storage of meat in your home freezer (and in locker, if one was rented) affected the total amount of meat consumed by your family?

(a) Eat more since using home freezer (and locker) (give approximate percent increase) _____%

(b) Eat less since using home freezer (and locker) (give approximate percent decrease) _____%

(c) No difference since using home freezer (and locker) _____

21. Indicate percentage increase or decrease in consumption for items listed below.

	Percent Increase	Percent Decrease
Beef	_____%	_____%
Veal	_____%	_____%
Pork	_____%	_____%
Lamb and mutton	_____%	_____%
Poultry	_____%	_____%

22. What form of meat does your family prefer? (Check one). . . . . Fresh ( )
Frozen ( )
No Preference ( )

KANSAS AGRICULTURAL EXPERIMENT STATION
FROZEN FOOD LOCKER STUDY

To Former Patrons of Locker Plants Who No Longer Rent Lockers

1. Do you live on a farm? . . . . . Yes (__)
   No (__)

2. How far do you live from a locker plant? . . . . . _____ miles

3. During what period did you rent a locker? . . . From _____ (date) to _____ (date)

4. What were your principal reasons for renting a locker at the time you were renting one? _____

5. List the reasons for discontinuing renting a locker. _____

6. Under what conditions would you again rent a locker? _____

7. Do you have a home freezer unit? . . . . . Yes (__)
   No (__)

   If so, what is its size in cu. ft.? . . . . . _____

   Cost? . . . . . $_____

8. If you have a home freezer unit, what advantages are there in its use over that of renting a locker at the locker plant? _____

   Disadvantages? _____

9. If you have a home freezer unit, where are the following services performed? (Check)

	At home	Locker plant	Elsewhere
Cutting	(__)	(__)	(__)
Wrapping	(__)	(__)	(__)
Sharp Freezing	(__)	(__)	(__)

10. What form of meat does your family prefer? (Check one) . . . . . Fresh (__)
    Frozen (__)
    No preference (__)

11. How many people eat one or more meals per day regularly at your table? _____