THE POTENTIAL PRODUCTION OF COMMERCIAL VEGETABLES IN THE ARKANSAS RIVER BOTTOM IN OKLAHOMA

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Foreword

The Oklahoma Planning and Resources Board is interested in the possibilities for the further development of the vegetable processing industry in the State, and this study was made possible by the Board. The individual vegetable crops considered are limited primarily to those adapted to processing.

CHAPTER I. INTRODUCTION

Purpose

The purpose of this study is to determine the potential production of vegetables in the area studied with emphasis placed on vegetables for processing. The major hypothesis that has been postulated is that certain regions in Oklahoma are capable of an increased vegetable production and such is economically feasible. Corollary to this are two minor hypotheses: An increase in the acreage of commercial truck crops would be advantageous to the organization of the farms in this area; better market outlets will result in increased return to the producer and increased commercial vegetable acreage.

Location of the Study

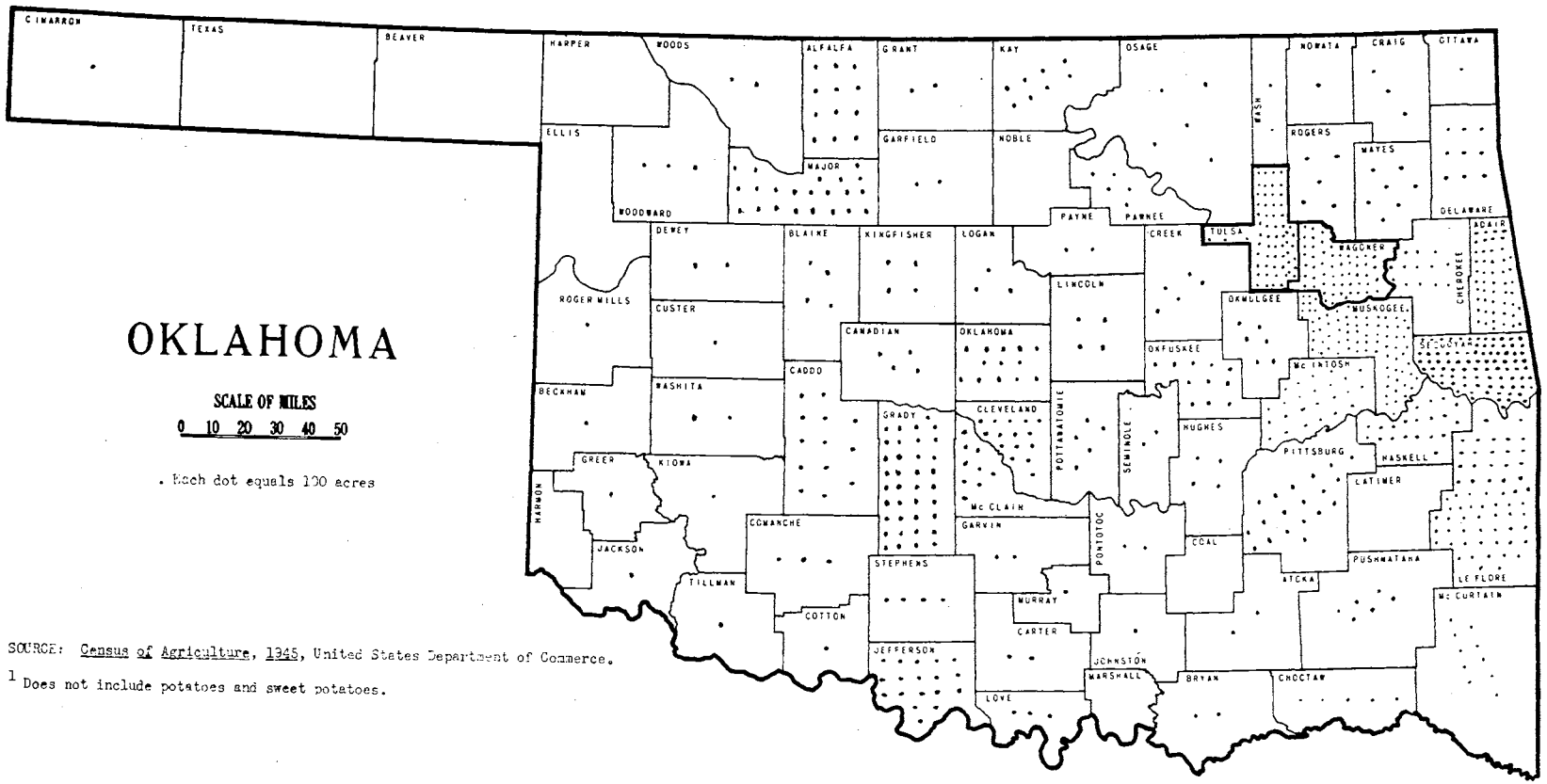
The location of this study is in a portion of the Arkansas River bottom in Tulsa and Wagoner counties, Oklahoma. These two counties are situated approximately in the center of the northeast sector of the State (Figure 1).

This area was chosen for this study because it is a part of the present most intensive region of vegetable production in Oklahoma, the Arkansas River bottom. That part of this bottom which is located in the eastern part of the State seems to have the greatest possibilities for a large vegetable industry because of its favorable soil and climate.

Source of Data

A large part of the information for this study was obtained from 70 schedules taken on a sample basis from farms in the area studies. Other information was secured from interviews with buyers, market managers, and

FIGURE 1. LOCATION OF TULSA AND WAGONER COUNTIES AND COMMERCIAL VEGETABLE[1] ACREAGE IN OKLAHOMA, BY COUNTIES, 1944



SOURCE: Census of Agriculture, 1945, United States Department of Commerce.

[1] Does not include potatoes and sweet potatoes.

processors located in or adjacent to the area studied; and from others connected or familiar with the vegetable industry in Oklahoma.

The Statistical Laboratory, Iowa State College, drew the random sample which was used as the basis for the taking of schedules. Schedules were taken only on the farm headquarters which were located in the segments of land which fell in the sample (Figure 2). This method, rather than a physical inventory of each segment, was used in order to obtain data on farm organization as well as an overall picture of agriculture in the area. The sampling rate was one out of six.

Consumption of Vegetables

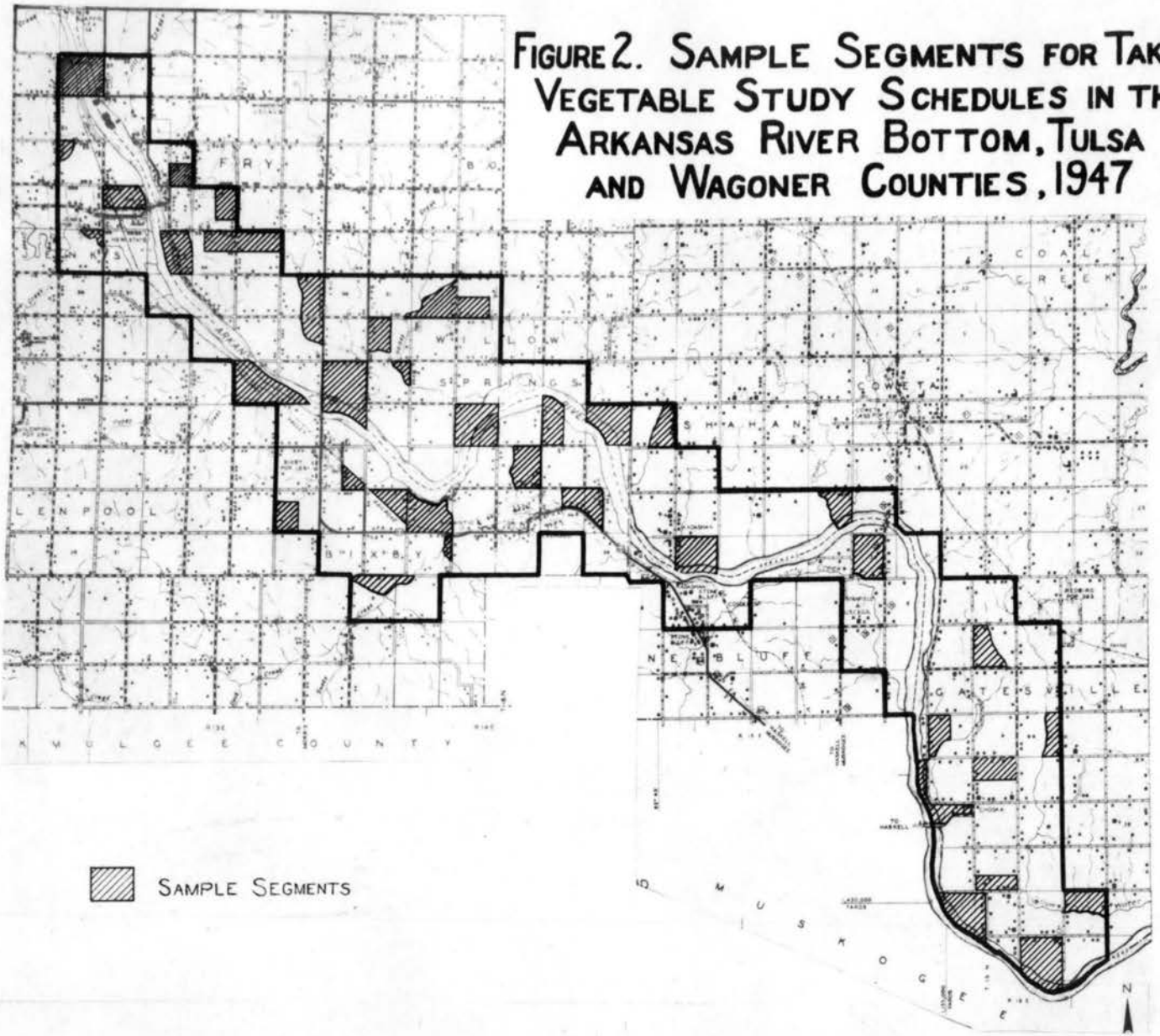
The total consumption of canned and frozen vegetables in the United States has been increasing. During the period 1909 to 1940, the per capita consumption of vegetables and fruits increased 39 percent; more by far than any other food group. Among the vegetables for which per capita gains have been recorded during the last decade are asparagus, sweet corn, spinach, tomatoes and tomato products.

Those familiar with the vegetable industry expect the long time trend in consumption of canned and frozen vegetables to continue upwards for many years. This will in turn call for a continued increase in production. Technological advancement can and will provide for part of this, but it is probable that some increase in the acreage devoted to vegetable crops will also be necessary along with improvements in marketing.

History

The commercial production of vegetables in Oklahoma is located in certain regions where the soil is especially well suited to vegetable crops. These regions are largely restricted to the river bottomlands in the eastern one-half of the State, most productive of which is the Arkansas

FIGURE 2. SAMPLE SEGMENTS FOR TAKING VEGETABLE STUDY SCHEDULES IN THE ARKANSAS RIVER BOTTOM, TULSA AND WAGONER COUNTIES, 1947



River bottom. The soil in this bottom is fertile, friable, and for the most part a deep, fine sandy loam of good structure.

Vegetables (exclusive of potatoes and sweet potatoes) marketed in Oklahoma in 1944 were valued at a little less than seven million dollars. Vegetables have never formed a very large part of the agricultural income in the State, but their importance has increased gradually since 1924 (Table 1).

Table 1. Cash Receipts From Farm Marketings of Vegetable Crops In Oklahoma, 1924-1944[1]

Year	Total of All Crops	Vegetable Crops	
		Fresh Market	Processing
	(1,000 Dollars)	(1,000 Dollars)	(1,000 Dollars)
1924	248,905	1,146	9
1925	252,764	1,412	61
1926	182,788	1,368	24
1927	211,985	1,979	22
1928	191,488	1,426	41
1929	201,514	1,565	50
1930	87,453	992	66
1931	63,441	781	44
1932	58,105	540	25
1933	78,404	722	30
1934	74,761	766	20
1935	70,666	1,311	42
1936	53,566	1,063	235
1937	89,834	1,152	154
1938	72,547	1,078	165
1939	75,462	1,155	120
1940	90,007	1,053	330
1941	120,344	1,390	350
1942	155,985	2,144	2,298
1943	121,636	4,054	2,031
1944	197,972	3,929	2,960

SOURCE: Cash Receipts from Farming, United States Department of Agriculture.

[1] Does not include potatoes and sweet potatoes.

Although the 1944 value amounts to only 3.5 percent of the total cash receipts from agricultural products, they are very important in the areas where they are grown as well as the entire economy of the State, because of the high per acre value of these crops.[1]

Vegetables grown for processing show a sudden increase in total value beginning in 1942 (Table 1).

A short history of vegetable acreage in Tulsa and Wagoner counties is presented in Table 2. Although the demand created by World War II partially accounted for the increase in 1944 acreages, much of this increase can be attributed to a marked improvement in marketing facilities, an increase in the number of outlets in the form of processing plants, and a continuation of the upward trend as more farm operators came to recognize the opportunity offered by vegetable crops.

Table 2. Acreages of Selected Commercial Vegetable Crops in Tulsa and Wagoner Counties, Oklahoma, 1919-1944

Year	Sweet Corn		Tomatoes		Snap Beans		All Vegetables [1]	
	Tulsa	Wagoner	Tulsa	Wagoner	Tulsa	Wagoner	Tulsa	Wagoner
	(Acres)		(Acres)		(Acres)		(Acres)	
1919	19	1	25	7	5	1	177	32
1924	219	6	167	10	-	-	1,516	159
1929	267	12	217	15	114	9	1,744	169
1934	661	22	249	13	253	8	3,234	334
1939	784	458	280	15	158	107	3,384	1,040
1944	2,353	1,149	670	461	328	192	6,119	5,441

SOURCE: Census of Agriculture, 1920, 1925, 1930, 1935, 1940 and 1945, Department of Commerce.

[1] Does not include potatoes.

[1] Oklahoma Agricultural and Mechanical College, Extension Service, Marketing Fruits and Vegetables in Oklahoma, p. 4.

CHAPTER II. FARM TYPES AND ORGANIZATION

This chapter is intended to determine the possibilities for inclusion of a large vegetable acreage in the organization of the farms in the area. As a starting point, the major and minor[1] land use, and the type, size and organization of farms in the area were determined by the use of data secured in the sample. The detailed organization of these farms is presented in the tables at the end of this chapter.

Factors in the selection of enterprises are presented and discussed with particular attention given to the inclusion of a large acreage of vegetable crops.

Major Land Use

On the farms included in the sample 69 percent of the land was cropland, 27 percent was pasture, and the remaining 4 percent was in farmsteads, roads and waste. Sixty-one percent of the pasture was plowable and 39 percent was woodland.

Data on overflow land and poorly drained land were included on the schedule, but there was a tendency among some operators, particularly tenants, to report only the number of acres in a tract of land which they actually cultivated or pastured. Therefore, waste land or pasture land not used by the tenant was not reported in many cases; thus, the figures and percentages for waste and poorly drained land are believed to be lower than actually is the case. A survey made in 1946 indicated that 45 percent of the bottom land[2] in Tulsa County and 36 percent of the bottom land in Wagoner

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[1] Major land use refers to the general types, such as cropland, pasture, waste, etc. Minor land use refers to the individual crops grown.

[2] Includes creek bottom land, and excludes urban areas.

County was in need of drainage and was feasible for drainage.[3] Only a negligible amount of land in Tulsa County and 2 percent of the land in Wagoner County was not feasible for drainage.

Twenty-eight farms out of a total of 70 sampled in the study reported land subject to overflow, which amounted to 19 percent of the total acreage in the sample.

Minor Land Use

Vegetables accounted for almost 23 percent of the total crop acreage in the sample. Sweet corn was by far the leading vegetable crop, and spinach ranked second (Table 3). Sweet corn production was heaviest in the western part of the area and spinach production was heaviest in the eastern part of the area. Spinach acreage as shown in Table 3 is lower than it has been in recent years in the area, due largely to comparatively unfavorable prices existing for the last two crop years.

Field corn was the largest crop in the sample, accounting for 31 percent of the total cultivated acreage, and it was the most widely grown crop, being reported on 49 of the 70 farms in the sample. Cotton and alfalfa were the two other leading crops, and oats, wheat and grain sorghums made up the other field crops.

The trend of vegetable crop acreage in this area has been upward since 1919 (Figure 3). Undoubtedly, World War II had a great deal of influence on the large 1944 acreage. However, it was about this time that the first vegetable processing plants were brought into this area. It is believed this new market would have caused a large increase in vegetable crop acreage at this time even without the influence of the war.

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[3] United States Department of Agriculture, Soil Conservation Service, Reconnaissance Drainage Survey Data, 1946--Oklahoma.

Table 3. Minor Land Use on 70 Farms Which Fell In A Sample of A Portion of The Arkansas River Bottom, 1947

	Farms Reporting	Total Acreage	Percentage of Total Crop Acreage	Percentage of Total Vegetable Acreage
	(Number)	(Acres)	(Percent)	(Percent)
All Vegetables	36	1,167	22.8	100.0
Sweet corn	24	511	10.0	43.8
Tomatoes	10	39	.8	3.3
Spinach, spring	8	212	4.1	18.2
Spinach, fall 1	8	192	3.7	16.5
Other vegetables	34	213	4.2	18.2
Field corn	49	1,588	31.0	-
Cotton	28	1,047	20.4	-
Alfalfa	30	785	15.2	-
Other field crops	24	542	10.6	-
Total	70	5,129	100.0	100.0

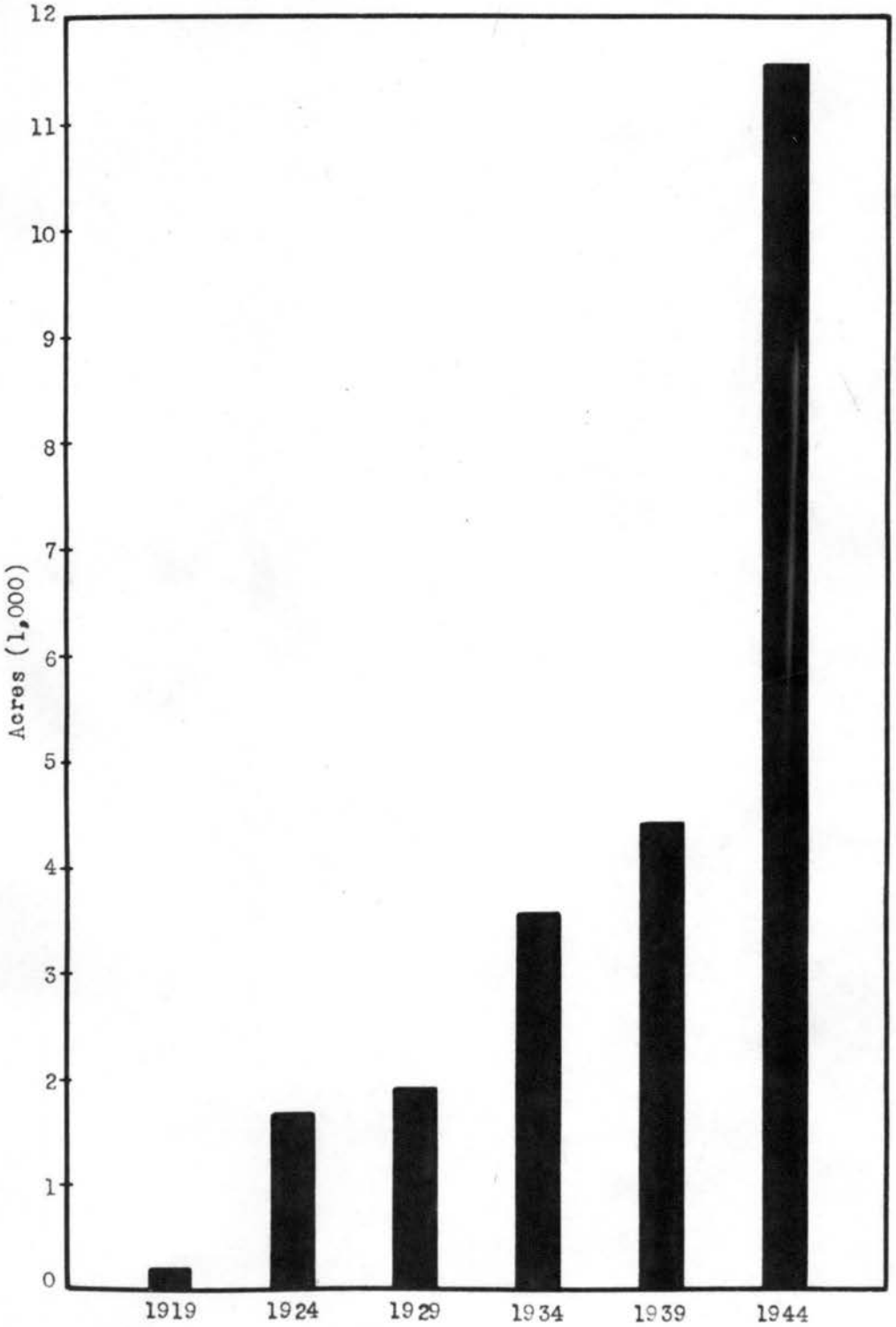
SOURCE: Vegetable Study Schedules.

[1] Data on fall spinach is for the 1946 crop

The Oklahoma Agricultural Experiment Station, in recommending that the present organization of a 155 acre farm in eastern Oklahoma bottom lands include 55 acres of commercial vegetables, explained that this represents the trend of large vegetable acreages on individual farms. It was felt that an acreage larger than this would result in production which would glut the market outlets existing at that time.[4]

[4] Oklahoma Agricultural and Mechanical College, Oklahoma Agricultural Experiment Station, Production Adjustments to Improve Farming Opportunities in the Major Cotton Areas of Eastern Oklahoma, pp. 7-9.

Figure 3. Acreage of All Vegetables[1] Harvested for Sale In Tulsa and Wagoner Counties, 1919-1944



SOURCE: CENSUS OF AGRICULTURE, 1945, United States Department of Commerce.

[1] Does not include potatoes and sweet potatoes.

Farm Types

The 70 farms falling in the sample were classified both according to type and to size (Table 4). The criteria used for judging the type of farm are similar to those used in the Census of Agriculture. The type of farm was determined by the organization and probable resulting distribution of income. If it appeared that the value of products sold from one source of income was more than 50 percent of the total value of all farm products sold, then the farm was classified as the type corresponding to that source of income. Farms for which it appeared that the value of products from any one source of income did not exceed 50 percent of the total value of all farm products sold were classified as general farms. The general types of farms, which were the most prevalent, were further divided into those which included vegetable crops in their organization and those which excluded vegetable crops from their organization. The general farms and vegetable farms will be discussed in detail since, according to the survey and as will be shown, the present production and the greatest potential production of vegetables is associated with these two types of farms in the area.

General farms. The general farms in the sample account for 64 percent of the total number of farms, 76 percent of the total land area, and 79 percent of the crop land (Table 7). The operators of the general farms, unlike the operators of the residential and retirement farms, are there to make money; their factors of production can be relatively easily shifted to the growing of vegetable crops. On fruit farms or livestock farms this is not true--on most of these latter two types of farms observed, the shift would not be economically feasible. Therefore, the general farm is the type in which the greatest potentiality for an increase in vegetable production lies.

Table 4. Classification of 70 Sample Farms[1] In the Arkansas River Bottom, 1947, By Size and Type

Size In Acres	Type of Farm						Total	
	General Including Vegetables	General Excluding Vegetables	Vegetable Farms	Livestock Farms	Fruit Farms	Residence and Retirement	Number	Percentage
	(Number)	(Number)	(Number)	(Number)	(Number)	(Number)	(Number)	(Percent)
Under 10	-	-	-	-	-	4	4	5.7
10 - 29	1	1	-	-	-	3	5	7.1
30 - 49	4	1	2	1	-	3	11	15.7
50 - 69	3	2	1	-	1	-	7	10.0
70 - 99	4	3	2	1	-	-	10	14.3
100 - 139	6	1	1	2	1	-	11	15.7
140 - 179	5	3	-	1	-	-	9	12.9
180 - 219	2	-	-	-	-	-	2	2.9
220 - 259	3	2	1	-	-	-	6	8.6
260 - 379	3	1	1	-	-	-	5	7.1
Total Number	31	14	8	5	2	10	70	100.0
Total Percentage	44.3	20.0	11.4	7.1	2.9	14.3	100.0	

SOURCE: Vegetable Study Schedules.

[1] Sample selected from Tulsa and Wagoner counties, Oklahoma.

On the 45 farms which were classified as general, over 90 percent of the land area was accounted for by farms of 80 acres or larger (Table 13). The modal size was 70-179 acres. Eighty-eight percent of the vegetable acreage in this group was on farms of 80 acres or more.

The large general farms (180 acres or more) had a smaller percentage of their crop acreage in vegetable crops and more in alfalfa. The smaller farms (less than 70 acres) had as large a percentage of their acreage in vegetables as the medium-size farms, but they grew more field corn and less of the other crops.

The average number of milk cows was largest on the medium-size farms. The average number of hogs and brood sows per farm increased as the size of the farm increased. This may be due largely to the fact that the field corn acreage also increases with the size of the farms and most of the field corn grown in this area is marketed through hogs.

Workstock numbers were slightly larger on the medium-size farms, but tractor numbers increased moderately with the size of the farm.

Tenure of operators was approximately the same on all sizes, being approximately 40 percent owners and 60 percent tenants. However, 75 percent of the owners on the larger farms rented land in addition to that which they owned. This indicates that the size of these farms is flexible and subject to quick change.

The number of family members working on the farm was about the same on the medium- and large-size general farms. However, the number of family members working on the small-size farms was smaller. It seems that the larger families were located on the medium- and large-size farms.

The number of full time hired hands increased directly with the size of the farms.

General farms which included vegetable crops in their organization (Table 14) were the modal type of farm and accounted for 53 percent of the total land area in the sample, 56 percent of the crop land, 46 percent of the vegetable acreage, and 44 percent of the total number of farms included in the study. The operators of these farms already have some knowledge of vegetable production, thus forming a nucleus to which other farms and other vegetable crops may be added. This makes the problem of inaugurating a program of large scale vegetable production much easier than would be the case if there were only a limited number of producers to start with.

The general farms which excluded vegetable crops from their organization grew a little less than their proportional share of field corn and cotton as compared with the other types of farms; but grew twice their proportional share of alfalfa and three times that of other field crops[5] (Table 15).

Those general farms excluding vegetable crops had more milk cows per farm, but fewer hogs and brood sows. The difference in milk cow numbers is attributed to the difference in labor requirements. Two labor intensive enterprises such as milk cows and vegetable crops obviously would not make a good combination. This is further demonstrated by the fact that only 75 percent of the vegetable farms in the sample reported having milk cows, and the average number of milk cows was less than one on this type of farm.

Hogs apparently fitted well into the organization of both types of general farms. Although a higher percentage of general farms excluding vegetable crops reported having hogs, the average number per farm was much smaller than that of the general farm which included vegetable crops.

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[5] Includes oats, wheat and grain sorghums.

As a whole, the two general types of farms seem to be equally diversified; those which excluded vegetable crops being slightly more diversified in livestock enterprises, and those which included vegetables being a little more diversified in crops.

Workstock were reported on 42 percent of the general farms including vegetable crops and on 64 percent of those excluding vegetable crops. The average number of workstock per farm on the farms excluding vegetable crops was twice the number on those farms producing vegetable crops.

Tractors were found on 74 percent of the general farms including vegetable crops and on 64 percent of those excluding vegetable crops. The average number per farm was the same on both general types.

This indicates that those farms which exclude vegetables from their organization tend to be somewhat slower in adopting advantageous changes in farm organization. This is a factor that may influence the possibilities of expanded vegetable production and will be considered in another section. However, it has been recommended that two head of workstock, in addition to a two-row tractor, be included in the farm organization in this area, principally for use in planting and first cultivation of vegetable crops.[6] Most tractors found in the area were of the two-row type. When larger or smaller tractors were found, it was usually in addition to a two-row tractor.

Vegetable farms. Vegetable farms in the sample accounted for 11.4 percent of the total number of farms, 12.8 percent of the total land area, and 15.4 percent of the crop land, and the acreage in vegetables on those farms accounted for 54 percent of the total land used for vegetable production as sampled in the survey (Table 7). Field corn and alfalfa were the

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[6] Oklahoma Agricultural and Mechanical College, Oklahoma Agricultural Experiment Station, Op. cit., p. 3.

principal crops other than vegetables in the organization of these farms. Cotton was not grown on any vegetable farm in the sample in 1947, but was grown on two of the eight farms in this classification in 1946. The absence of this crop is probably due to the demanding labor requirements of cotton production during certain times of the year, which would make it a competitive enterprise in the organization of a vegetable farm. This contention is further supported by many operators in the area, who specified that cotton chopping conflicted with their vegetable enterprises.

Very few livestock and poultry were found on the vegetable farms, and when found they were in small numbers. Milk cows were present most frequently; chickens were reported on 50 percent of the vegetable farms, while hogs and beef cattle appeared on only 25 percent of these farms.

Workstock were reported on only 50 percent of the vegetable farms, and averaged a little more than one head per farm.

Tractors were reported on 87 percent of the vegetable farms and averaged 1.6 tractors per farm. This was almost twice the average number on the general farms. Although the average acreage of crop land was greater on vegetable farms than on general farms, the difference was not sufficient to account for the difference in the average number of tractors. Therefore, it seems likely that an increase in vegetable acreage would call for an increase in the number of tractors and other farm machinery.

Full time hired hands were reported on 50 percent of the vegetable farms and averaged 0.7 per farm. These figures are more than double those for general farms, indicating the difference in labor requirements on the two types of farms.

Most operators did not keep records on seasonal labor requirements, nor could they give a reasonably accurate estimate, therefore, figures or

comparisons are not available. An indication of the labor intensiveness of vegetable crops is given by one vegetable farm of 90 acres, which reported a labor bill of $10,000 for 1946. Labor was paid at a rate of from $4.00 to $5.00 per day, therefore this farm used over 2,000 man-days of hired labor.

Tenancy of vegetable farm operators, 62.5 percent owners and 37.5 percent tenants, was the opposite of figures for general farms. Eighty percent of the owners rented land in addition to that which they owned, indicating that the size of owner operated vegetable farms is quite flexible.

All vegetable farm operators in the sample were white.

Selection of Enterprises

Diversification. The advantages of a diversified farming system are well summed up by Holmes who points out that diversification is necessary in order to realize the maximum utilization of resources. It results in the saving of material, the saving of labor, utilization of land, and the insurance of income.[7]

With reference to the vegetable grower, the same writer goes on to say:

> ...the truck farmer will find it desirable to combine crops which carry a maximum demand for labor at different seasons of the year rather than during the same season, in order that he may spread his labor over as large a period as possible.[8]

With more specific reference to vegetable enterprises Paul Work points out:

> In general, a reasonable degree of diversity in cropping and in planting times is desirable or even necessary. Diversification provides for reasonable spreading of risks of crop failure, of low prices, or of other marketing hazards; it also provides good distribution of costs, especially of labor, and of returns. In the north

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[7] C. L. Holmes, Economics of Farm Organization and Management, pp. 281-282.

[8] Ibid., p. 284.

> a single crop such as cabbage may be grown in three or four plantings to sell from June to January. A crop succession of asparagus, peas, cabbage, tomatoes, and squash furnishes a good distribution of labor and income. Risks may be spread between crops that are hardy and tender, as onions and tomatoes; between those that are drouth resistant or not, as watermelons and lettuce; that makes heavy or light labor demands, as market peas and sweet potatoes; that cater to staple or luxury classes of trade, as potatoes and muskmelons. The object is to offset each serious risk by an enterprise in which that risk is light. [9]

Supplementary enterprises are also important in the problem of selection of enterprises. Holmes defines these as:

> ...those which do not compete for the use of the factors of production, but which fit in well with each other in the use of the labor and equipment, because their seasonal demands for these things do not coincide; or they do not compete for the use of the land because they are not adapted to the same kinds of soil and surface conditions. [10]

Supplementary enterprises are necessary to the individual farm organization in this area particularly because of the varying soil and surface conditions existing on the same farm. Although the bottom soil in this area is mostly a fine or very fine sand or sandy loam, well adapted to vegetable crops, it is spotted with silty clays that are best adapted to crops other than vegetables.[11] Corn, alfalfa and cotton are best suited to these clay soils,[12] and where drainage is adequate, alfalfa is the chief crop.

Field corn is by far the most extensively grown crop in this area at the present. It is well adapted to the soil and climate and, together with hogs, fits well into a diversified system. Also, its seasonal labor

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[9] Paul Work, Vegetable Production and Marketing, p. 36.

[10] C. L. Holmes, Op. cit., p. 283.

[11] United States Department of Agriculture, Bureau of Plant Industry, Soil Survey, Tulsa County, Oklahoma, pp. 28, 31.

[12] Ibid., p. 28.

requirements are light and do not interfere to a great extent with those of the vegetable crops adapted to this area.

Alfalfa is similarly well adapted to this area, and although its peak labor requirements occur at the same time as those of many vegetable crops, it is believed that custom harvesting of this crop could be hired by most operators more profitably than would be the case if they purchased their own machinery. This would be true at least in the operation of baling. Custom baling is a common practice on many farms at present, especially the farms with comparatively small alfalfa acreages. The number of balers available for custom work seems to be adequate. Several operators spend the entire baling season in putting up their own hay or in doing custom work for others.

Cotton, although well adapted to the soil and climate, competes to some extent with the labor requirements of some vegetable crops. Cotton chopping was cited by several growers in the sample as conflicting with peak labor periods for some of their vegetables. This, combined with the fact that none of the vegetable farms in the sample included cotton in their organization, indicates that cotton might not fit well into a farm organization which included a large percentage of vegetable crops. The development of farm machinery which would decrease the labor intensiveness of the cotton enterprise might make it more favorable as a part of the farm organization in this area. Here again, the cost of such machinery might make it impractical for operators with small cotton acreages.

A recommended system. A recent experiment station study had this to say about a farming system for the Arkansas River bottoms:

> Specialized commercial vegetable enterprises have been introduced and alfalfa hay production has been concentrated on these soils (Eastern Oklahoma bottom lands). An efficient farming system

> should include a maximum acreage of these crops, with other enterprises furnishing a desirable balance. There would be 155 acres of land; 135 acres in cropland. Power would be supplied by a 2-row tractor and 3 head of workstock, the workstock to be used principally in planting and first cultivation of vegetable crops. The organizations and resulting incomes presented for bottomland farms would be much larger than are usual now and larger than many farmers could hope to attain. They are examples of possibilities under favorable conditions and represent the trend of concentration of large vegetable acreages on individual farms. [13]

Table 5 gives the detailed breakdown of crop acreages. The 55 acres of commercial vegetables would be the major enterprise in this organization. The acreages of individual crops undoubtedly would vary considerably between farms, due largely to soil differences between areas and between farms, as well as local economic conditions. The Choska bottoms in Wagoner County seems to be particularly adapted to spinach production, and farms in that section will likely continue this crop as a major one in their vegetable crop organization. Likewise, the Bixby area is particularly favorable to the production of sweet corn, and has a good market for this product.

The 55 acres of vegetable crops which is recommended by the aforementioned study is as much as would be suggested at present, although it is not the upper limit of possibilities. Future possibilities will increase with an increase in market outlets. The present outlets should be able to handle the production resulting from the suggested acreage, provided crops are planned carefully and diversified sufficiently, so that too large amounts do not mature at one time.

Seasonal labor requirements. The problems of enterprise selection which the farmer faces are influenced by the seasonal nature of the farming business which prevents much technical division of labor and by the fact that

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[13] Oklahoma Agricultural and Mechanical College, Oklahoma Agricultural Experiment Station, Op. cit., p. 7.

Table 5. Organization of Desirable Farming Systems on Botton Land Farms in Eastern Oklahoma, Under Two Assumed Cotton Price Situations

	World Level Price	Parity Price
	(Acres)	(Acres)
Total land in farm	155	155
Native pasture	14	14
Farmstead roads, etc.	6	6
Cropland	135	135
Cotton	30	19
Corn	25	31
Soybeans (turned under)	(10)	(10)
Alfalfa hay	25	30
Rye grass and lespedeza pasture	(15)	(15)
Watermelons	10	10
Sweet corn	15	15
Spinach	20	20
Snap beans	10	10
	(Number)	(Number)
Livestock		
Dairy cows	3	3
Other cattle	3	3
Hens	100	159
Sows	2	3
Workstock	2	2

SOURCE: Oklahoma Agricultural and Mechanical College, Oklahoma Agricultural Experiment Station, Production Adjustments to Improve Farming Opportunities in the Major Cotton Areas of Eastern Oklahoma.

the number of laborers which can be supervised by one man is limited since the business is necessarily scattered over a wide area of land.[14]

Since vegetable crops are labor intensive, this factor must receive a great deal of consideration in the selection of enterprises. Holmes places labor relatively high in any case: "...it would seem that labor is in fact the chief absorbent of the manager's attention, and the most limiting of all the technical factors."[15]

The average seasonal per acre labor requirement in man hours for some of the crops in this area are presented in Table 6. From this table it can be seen which crops would be competitive with one another and which would be supplementary to one another in regard to labor.

Since most crops mature in the summer months and the harvest period is when the peak labor requirements occur, it is important then that some spring and some fall maturing crop be included in the organization of the individual farm. Three crops, not listed in Table 6, which meet this requirement and which can be grown in Oklahoma are asparagus, blackeye peas, and lima beans. They will be discussed in a later section.

Per acre returns for vegetables and competing crops. A comparison of returns from some of the crops grown in this area was compiled by the Oklahoma Agricultural Experiment Station.[16] Alfalfa hay was found to return the most per acre and spinach was a close second (Figure 4). Cotton gave the least per acre return. Of course, returns do not necessarily determine the choice of enterprises, but are only one of the considerations.

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[14] C. L. Holmes, Op. cit., p. 280.

[15] Ibid., p. 214.

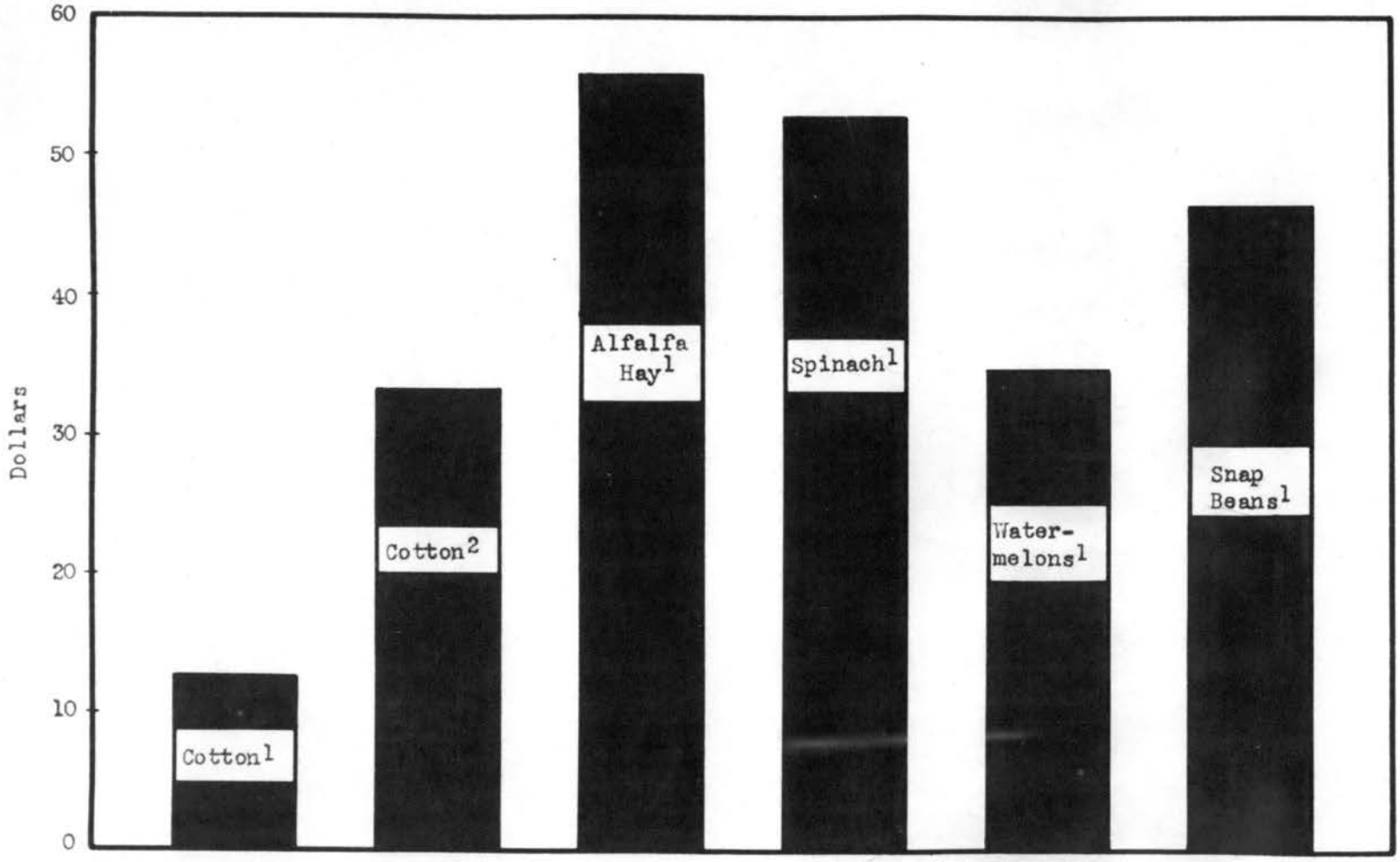
[16] Oklahoma Agricultural and Mechanical College, Oklahoma Agricultural Experiment Station, Production Adjustments to Improve Farming Opportunities in the Major Cotton Areas of Eastern Oklahoma, Appendix Table 2.

Table 6. Average Seasonal Per Acre Labor Requirements in Man Hours for Selected Crops in the Principal Vegetable Producing Areas in Oklahoma

	Total	January	February	March	April	May	June	July	August	September	October	November	December
Corn	20.3	1.7	1.7	1.6	2.0	3.0	3.8	2.1	-	2.0	2.4	-	-
Cotton	50.5	1.2	1.2	.9	1.2	5.9	6.5	5.6	-	5.4	13.5	6.0	5.1
Alfalfa	15.9	-	-	-	-	3.5	4.4	3.0	2.0	1.0	-	-	-
Sweet potatoes	106.5	1.0	1.5	3.5	5.5	20.0	17.0	2.0	-	10.0	40.0	6.0	-
Snap beans:													
Spring	100.0	2.0	3.0	3.0	2.0	20.0	50.0	20.0	-	-	-	-	-
Fall	75.0	-	-	-	-	-	2.0	3.0	10.0	40.0	20.0	-	-
Spinach:													
Spring	57.0	2.0	3.5	6.5	26.0	19.0	-	-	-	-	-	-	-
Fall	47.0	-	-	-	-	-	-	2.0	3.0	4.0	30.0	15.0	3.0
Tomatoes	106.0	1.0	4.0	4.0	9.0	15.0	20.0	20.0	25.0	10.0	-	-	-
Sweet corn	36.0	.7	7.0	5.7	5.7	3.3	3.3	5.6	-	-	-	-	-
Cabbage	95.3	3.0	13.0	20.0	15.0	25.0	24.0	5.0	-	-	-	1.0	1.0
Cucumbers	154.0	1.0	7.0	14.0	18.0	18.0	40.0	52.0	4.0	-	-	-	-
Canteloupes	110.0	2.0	9.0	9.0	10.0	17.0	18.0	30.0	15.0	-	-	-	-
Watermelons	41.4	.3	4.4	4.3	4.3	6.0	4.7	9.9	6.0	-	-	-	-

SOURCE: Unpublished data, Department of Agricultural Economics, Oklahoma Agricultural and Mechanical College.

Figure 4. Relative Per Acre Returns for Cotton, Alfalfa Hay, Spinach Watermelons and Snap Beans, Bottom Land Soils, Eastern Oklahoma



SOURCE: Appendix Table 1.

[1] Competitive price prevailing.

[2] Parity price prevailing.

Size of Farms

The size of the farm recommended by the experiment station for this area, 155 acres, may seem a little large considering the intensive type of farming that is also recommended. Land use planning reports[17] for the counties along the Arkansas River in the eastern part of the State suggested that bottom land farms contain only 80 to 100 acres of land, and only 5 to 10 acres of this was to be in commercial vegetables. Holmes points out that: "...broadly speaking, the size of business depends fundamentally upon the relative ability of the manager."[18] The type of farmer found in this area is one of the highest. His ability is reflected by the farmsteads in the area. Most houses are fairly new and well kept, and many have electricity and running water. As might be expected, owner operators as a whole have the better farmsteads.

It is felt, therefore, that 155 acres will not be too much for the majority of farm operators found on the bottom land of this area.

Summary

The production of vegetables could be increased substantially in the area sampled, and to do so would be a benefit to the farm operators. A large percentage of the farm operators are already producing vegetable crops to some extent, thus simplifying an increase in production. However, there are some operators who for a variety of reasons would not produce vegetables. Some of these operators are prejudiced, some are not in business on the farm, and some could not include vegetable enterprises since it would not be economically or physically feasible.

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[17] Most of these reports were prepared about 1940.

[18] O. L. Holmes, Op. cit., p. 220.

Increased vegetable production in the area would require an increase in machinery and labor as evidenced by the difference in the amount now in use on the different types of farms. The operator's time on a farm with a large vegetable acreage would be consumed largely by the supervision of labor. This would be a challenge to the entrepreneurial ability of the operator, and also would likely be a factor in the size of farm operated. The differences in managerial ability and proficiency, in addition to the physical and other economic factors involved, as among farm operators on the different farms in the area, likely account for a part of the prejudice reported relative to vegetable production as it now exists.

Table 7. Organization of 70 Sample Farms In the Arkansas River Bottom By Type of Farm, 1947, Crops [1]

Farm Type	Farms		Land			Cropland			Vegetable Crops		
	Number	Percentage of Total	Acreage	Percentage of Total	Average Per Farm	Acreage	Pecentage of Total	Average Per Farm	Farms Reporting	Acreage	Percentage of Total
	(Number)	(Percent)	(Acres)	(Percent)	(Number)	(Acres)	(Percent)	(Number)	(Number)	(Acres)	(Percent)
General including vegetable crops	31	44.3	4,157	53.4	134	2,996	56.0	97	28	533	45.7
General excluding vegetable crops	14	20.0	1,745	22.6	125	1,230	23.0	88	-	-	-
Vegetable farms	8	11.4	992	12.8	124	826	15.4	103	8	634	54.3
Livestock farms	5	7.1	504	6.5	101	99	1.9	20	-	-	-
Fruit farms	2	2.9	180	2.3	90	155	2.9	77	-	-	-
Residential and retirement farms	10	14.3	190	2.4	19	43	.8	4	-	-	-
Total	70	100.0	7,768	100.0	111	5,349	100.0	76	36	1,167	100.0

Farm Type	Field Corn			Cotton			Alfalfa			Other Field Crops		
	Farms Reporting	Acreage	Percentage of Total	Farms Reporting	Acreage	Percentage of Total	Farms Reporting	Acreage	Percentage of Total	Farms Reporting	Acreage	Percentage of Total
	(Number)	(Acres)	(Percent)	(Number)	(Acres)	(Percent)	(Number)	(Acres)	(Percent)	(Number)	(Acres)	(Percent)
General including vegetable crops	26	970	61.1	20	859	82.0	15	376	47.9	12	162	29.9
General excluding vegetable crops	13	336	21.2	8	188	18.0	6	318	40.5	8	328	60.5
Vegetable farms	5	227	14.3	-	-	-	5	52	6.6	2	21	3.9
Livestock farms	2	39	2.4	-	-	-	1	25	3.2	2	31	5.7
Fruit farms	-	-	-	-	-	-	-	-	-	-	-	-
Residential and retirement farms	3	16	1.0	-	-	-	3	14	1.8	-	-	-
Total	49	1,588	100.0	28	1,047	100.0	30	785	100.0	24	542	100.0

SOURCE: Vegetable Study Schedules.

[1] Sample selected from Tulsa and Wagoner counties, Oklahoma.

Table 8. Organization of 70 Sample Farms[1] In the Arkansas River Bottom By Type of Farm, 1947 Livestock

Farm Type	Number of Farms	Milk Cows: Farms Reporting	Milk Cows: Number	Milk Cows: Average Per Farm	Brood Sows: Farms Reporting	Brood Sows: Number	Brood Sows: Average Per Farm	Other Hogs: Farms Reporting	Other Hogs: Number	Other Hogs: Average Per Farm
	(Number)		(Number)			(Number)			(Number)	
General including vegetable crops	31	24	71	2.3	16	68	2.2	16	529	17.0
General excluding vegetable crops	14	13	45	3.2	8	19	1.4	10	130	9.0
Vegetable farms	8	6	7	.9	1	1	.1	2	8	1.0
Livestock farms	5	3	45	9.0	3	22	4.4	3	66	13.2
Fruit farms	2	1	1	.5	-	-	-	-	-	-
Residential and retirement farms	10	5	11	.9	1	5	.5	2	26	2.6
Total	70	52	180	2.6	29	115	1.6	33	759	10.8

Farm Type	Hens and Pullets: Farms Reporting	Hens and Pullets: Number	Hens and Pullets: Average Per Farm	Chickens Raised: Farms Reporting	Chickens Raised: Number	Chickens Raised: Average Per Farm	Beef Cattle: Farms Reporting	Beef Cattle: Number	Beef Cattle: Average Per Farm	Workstock: Farms Reporting	Workstock: Number	Workstock: Average Per Farm
	(Number)	(Number)			(Number)			(Number)			(Number)	
General including vegetable crops	24	1,259	41	21	1,513	49	4	57	1.8	15	25	.8
General excluding vegetable crops	13	607	43	7	341	24	2	16	1.1	9	23	1.6
Vegetable farms	4	189	24	2	175	22	2	2	.3	4	9	1.1
Livestock farms	3	325	65	2	400	80	4	152	30.4	2	3	.6
Fruit farms	1	20	10	-	-	-	-	-	-	1	1	.5
Residential and retirement farms	5	138	14	4	129	13	-	-	-	1	1	.1
Total	50	2,538	36	36	2,558	37	12	227	3.2	30	62	.9

SOURCE: Vegetable Study Schedules.

[1] Sample selected from Tulsa and Wagoner counties, Oklahoma.

Table 9. Organization of 70 Sample Farms[1] In The Arkansas River Bottom By Type of Farm, 1947, Miscellaneous

Farm Type	Number of Farms	Tractors: Farms Reporting	Tractors: Number	Tractors: Average Per Farm	Owners 2: Number	Owners 2: Percentage	Number of Part-Owners	Tenants: Number	Tenants: Percentage	Race of Operators: White Number	White Percentage	Negro Number	Negro Percentage	Indian Number	Indian Percentage
	(Number)		(Number)		(Number)	(Percent)	(Number)	(Number)	(Percent)	(Number)	(Percent)	(Number)	(Percent)	(Number)	(Percent)
General including vegetable crops	31	23	29	.9	11	35.5	5	20	64.5	29	-	2	-	-	-
General excluding vegetable crops	14	9	13	.9	7	50.0	1	6	42.9	12	-	1	-	1	-
Vegetable farms	8	7	15	1.6	5	62.5	4	3	37.5	8	-	-	-	-	-
Livestock farms	5	2	2	.4	5	100.0	-	-	-	5	-	-	-	-	-
Fruit farms	2	2	2	1.0	2	100.0	-	-	-	2	-	-	-	-	-
Residential and retirement farms	10	2	2	.2	9	90.0	-	1	10.0	10	-	-	-	-	-
Total	70	45	61	.9	39	55.7	10	30	42.9	66	94.3	3	4.3	1	1.4

Farm Type	Number of Farms	Number in Families	Average Number Per Family	Number Working on Farms	Hired Hands 3: Farms Reporting	Hired Hands 3: Number	Hired Hands 3: Average Per Farm	Total Working On Farm 4	Average Number Working on Farm
	(Number)	(Number)	(Number)	(Number)		(Number)		(Number)	(Number)
General including vegetable crops	31	139	4.48	59	7	9	.3	66	2.13
General excluding vegetable crops	14	46	3.29	17	4	5	.3	19	1.36
Vegetable farms	8	34	4.25	12	4	6	.7	18	2.25
Livestock farms	5	13	2.60	5	1	2	.4	5	1.00
Fruit farms	2	8	4.00	4	2	3	1.5	7	3.50
Residential and retirement farms	10	27	2.70	11	-	-	-	11	1.10
Total	70	267	3.81	108	18	25	.4	126	1.80

SOURCE: Vegetable Study Schedules.

[1] Sample selected from Tulsa and Wagoner counties, Oklahoma.

[2] Includes part-owners.

[3] Full-time hired hands.

[4] Includes full-time hired hands.

Table 10. Organization of 70 Sample Farms[1] In the Arkansas River Bottom By Size of Farm, 1947 Crops

Acres	Number of Farms	Acreage in Farms	Percentage Total Acreage in Farms	Average Size	Vegetable Crops: Farms Reporting	Vegetable Crops: Acreage	Vegetable Crops: Percentage Total Acreage	Field Corn: Farms Reporting	Field Corn: Acreage	Field Corn: Percentage Total Acreage
	(Number)	(Acres)	(Percent)	(Acres)	(Number)	(Acres)	(Percent)	(Number)	(Acres)	(Percent)
Under 10	4	23	.3	5.8	-	-	-	2	9	.6
10 - 29	5	89	1.1	17.8	1	10	.9	1	8	.5
30 - 49	11	421	5.4	38.8	6	84	7.2	5	33	2.1
50 - 69	7	400	5.1	57.1	3	96	8.2	4	119	7.5
70 - 99	10	811	10.4	81.1	6	183	15.7	9	216	13.6
100 - 139	11	1,293	16.6	117.5	7	231	19.8	7	256	16.1
140 - 179	9	1,428	18.5	158.7	5	90	7.7	8	314	19.7
180 - 219	2	402	5.2	201.0	1	20	1.7	2	111	7.0
220 - 259	6	1,440	18.5	240.0	4	217	18.6	6	233	14.7
260 - 379	5	1,461	18.9	292.2	3	236	20.2	5	289	18.2
Total	70	7,768	100.0	111.0	36	1,167	100.0	49	1,588	100.0

Acres	Number of Farms	Acreage in Farms	Cotton: Farms Reporting	Cotton: Acreage	Cotton: Percentage Total Acreage	Alfalfa: Farms Reporting	Alfalfa: Acreage	Alfalfa: Percentage Total Acreage	Other Field Crops: Farms Reporting	Other Field Crops: Acreage	Other Field Crops: Percentage Total Acreage
	(Number)	(Acres)	(Number)	(Acres)	(Percent)	(Number)	(Acres)	(Percent)	(Number)	(Acres)	(Percent)
Under 10	4	23	-	-	-	1	3	.4	-	-	-
10 - 29	5	89	1	10	1.0	1	5	.6	1	4	.7
30 - 49	11	421	4	39	3.7	2	13	1.7	1	14	2.4
50 - 69	7	400	1	18	1.7	4	65	8.3	-	-	-
70 - 99	10	811	5	108	10.3	5	70	8.9	3	13	2.3
100 - 139	11	1,293	4	165	15.8	4	105	13.4	4	117	20.4
140 - 179	9	1,428	7	227	21.7	3	48	6.1	5	202	35.2
180 - 219	2	402	-	-	-	2	108	13.7	2	66	11.5
220 - 259	6	1,440	4	310	29.6	4	91	11.6	3	108	18.8
260 - 379	5	1,461	2	170	16.2	4	277	35.3	2	50	8.7
Total	70	7,768	28	1,047	100.0	30	785	100.0	21	574	100.0

SOURCE: Vegetable Study Schedules.

[1] Sample selected from Tulsa and Wagoner counties, Oklahoma.

Table 11. Organization of 70 Sample Farms[1] in the Arkansas River Bottom By Size of Farm, 1947, Livestock

Acres	Number of Farms	Milk Cows: Farms Reporting	Milk Cows: Number	Milk Cows: Average Per Farm	Brood Sows: Farms Reporting	Brood Sows: Number	Brood Sows: Average Per Farm	Other Hogs: Farms Reporting	Other Hogs: Number	Other Hogs: Average Per Farm	Hens and Pullets: Farms Reporting	Hens and Pullets: Number	Hens and Pullets: Average Per Farm
	(Number)		(Number)			(Number)			(Number)			(Number)	
Under 10	4	-	-	-	-	-	-	1	2	.5	2	50	12.5
10 - 29	5	3	8	1.6	1	1	.2	-	-	-	1	25	5.0
30 - 49	11	8	11	1.0	2	6	.5	4	42	3.8	6	295	26.8
50 - 69	7	5	6	1.0	3	3	.5	3	27	3.9	5	271	38.7
70 - 99	10	9	44	4.4	3	9	.9	4	47	4.7	7	288	28.8
100 - 139	11	9	52	4.7	5	9	.9	6	70	6.4	11	906	82.4
140 - 179	9	8	26	3.0	7	54	3.8	7	141	15.6	7	295	32.8
180 - 219	2	1	10	5.0	2	20	10.0	2	190	95.0	2	150	75.0
220 - 259	6	5	16	2.7	2	5	.8	3	38	6.3	4	317	52.8
260 - 379	5	4	7	1.4	4	28	5.6	3	202	40.4	5	241	40.8
Total	70	52	180	2.6	29	115	1.6	33	759	10.8	50	2,538	36.2

Acres	Number of Farms	Chickens Raised: Farms Reporting	Chickens Raised: Number	Chickens Raised: Average Per Farm	Beef Cattle: Farms Reporting	Beef Cattle: Number	Beef Cattle: Average Per Farm	Workstock: Farms Reporting	Workstock: Number	Workstock: Average Per Farm
	(Number)		(Number)			(Number)			(Number)	
Under 10	4	1	30	7.2	-	-	-	-	-	-
10 - 29	5	1	15	3.0	-	-	-	3	5	1.0
30 - 49	11	4	118	10.7	1	23	2.0	5	10	1.0
50 - 69	7	4	350	50.0	1	3	.5	2	3	.4
70 - 99	10	6	404	40.4	-	-	-	5	13	1.3
100 - 139	11	9	952	84.7	4	105	9.5	7	13	1.2
140 - 179	9	5	310	34.4	3	57	6.3	3	7	.8
180 - 219	2	2	150	75.0	1	30	15.0	1	3	1.5
220 - 259	6	2	73	12.2	-	-	-	2	4	.7
260 - 379	5	2	176	35.2	1	8	1.6	2	4	.8
Total	70	36	2,558	36.5	11	226	3.2	30	62	.9

SOURCE: Vegetable Study Schedules.

[1] Sample selected from Tulsa and Wagoner counties, Oklahoma.

Table 12. Organization of 70 Sample Farms[1] in the Arkansas River Bottom By Size of Farm, 1947, Miscellaneous

Acres	Number of Farms	Tractors: Farms Reporting	Tractors: Number	Tractors: Average Per Farm	Owners[2]: Number	Owners[2]: Percentage	Number of Part-Owners	Tenants: Number	Tenants: Percentage	Race of Operators: White: Number	White: Percentage	Negro: Number	Negro: Percentage	Indian: Number	Indian: Percentage
	(Number)		(Number)		(Number)	(Percent)	(Number)	(Number)	(Percent)	(Number)	(Percent)	(Number)	(Percent)	(Number)	(Percent)
Under 10	4	1	1	.5	4	100.0	-	-	-	4	-	-	-	-	-
10 - 29	5	-	-	-	3	60.0	-	2	40.0	5	-	-	-	-	-
30 - 49	11	2	2	.2	7	63.6	1	4	36.4	10	-	1	-	-	-
50 - 69	7	5	5	.7	5	71.4	2	2	28.6	6	-	1	-	-	-
70 - 99	10	7	9	.9	6	60.0	1	4	40.0	9	-	1	-	-	-
100 - 139	11	11	15	1.4	5	45.5	-	6	54.5	11	-	-	-	-	-
140 - 179	9	7	7	.8	4	44.4	2	5	55.6	8	-	-	-	1	-
180 - 219	2	2	2	1.0	1	50.0	1	1	50.0	2	-	-	-	-	-
220 - 259	6	5	8	1.3	1	16.7	1	4	66.7	6	-	-	-	-	-
260 - 379	5	5	12	2.4	3	60.0	2	2	40.0	5	-	-	-	-	-
Total	70	45	61	.9	39	55.7	10	30	42.9	66	94.3	3	4.3	1	1.4

Acres	Number of Farms	Number in Families	Average Number Per Family	Number Working Farms	Hired Hands 3: Farms Reporting	Hired Hands 3: Number	Hired Hands 3: Average Per Farm	Total Working on Farms 4	Average Number Working on Farm 4
	(Number)	(Number)	(Number)	(Number)	(Number)	(Number)	(Number)	(Number)	(Number)
Under 10	4	13	3.3	4	-	-	-	4	1.0
10 - 29	5	14	2.8	6	-	-	-	6	1.2
30 - 49	11	38	3.5	17	1	1	.1	18	1.6
50 - 69	7	18	2.6	7	1	1	.1	8	1.1
70 - 99	10	38	3.8	16	3	4	.4	20	2.0
100 - 139	11	52	4.7	22	3	5	.5	27	2.5
140 - 179	9	40	4.4	14	2	3	.3	17	1.9
180 - 219	2	7	3.5	4	2	3	1.5	7	3.5
220 - 259	6	27	4.5	9	3	4	.7	13	2.2
260 - 379	5	20	4.0	9	3	4	.8	13	2.6
Total	70	267	3.8	108	18	25	.4	133	1.9

SOURCE: Vegetable Study Schedules.

[1] Sample selected from Tulsa and Wagoner counties, Oklahoma

[2] Includes part-owners.

[3] Full-time hired hands.

[4] Includes full-time hired hands.

Table 13. Organization of All General Farms Included in A Sample of 70 Farms[1] In the Arkansas River Bottom, 1947, By Size Groups

Size	Number of Farms	Total Land In Farm	Crop-land	Pasture	Percentage of Total: Total Land	Percentage of Total: Crop-land	Percentage of Total: Pasture	Average Acreage Per Farm: Total	Average Acreage Per Farm: Crop-land	Average Acreage Per Farm: Pasture	Total Crop Acreage, 1947: Vegetable Crops 2	Total Crop Acreage, 1947: Field Corn	Total Crop Acreage, 1947: Cotton	Total Crop Acreage, 1947: Alfalfa	Total Crop Acreage, 1947: Other Crops	Total Crop Acreage, 1947: Total	Percentage Acreage of Each Crop: Vegetable Crops 2	Percentage Acreage of Each Crop: Field Corn	Percentage Acreage of Each Crop: Cotton	Percentage Acreage of Each Crop: Alfalfa	Percentage Acreage of Each Crop: Other Crops	Percentage Acreage of Each Crop: Total
(Acres)	(Number)	(Acres)	(Acres)	(Acres)	(Percent)			(Acres)			(Acres)						(Percent)					
10- 69	12	513	413	71	8.7	9.8	4.8	42.7	34.4	5.9	77	153	67	54	18	369	20.9	41.5	18.1	14.6	4.9	100.0
70-179	22	2,646	1,897	676	44.8	44.9	46.0	120.3	86.2	30.7	399	604	500	194	244	1,941	20.6	31.1	25.8	10.0	12.5	100.0
180-379	11	2,753	1,916	724	46.5	45.3	49.2	250.3	174.2	65.8	173	549	480	446	228	1,876	9.2	29.2	25.6	23.7	12.3	100.0
Total	45	5,912	4,226	1,471	100.0	100.0	100.0	131.4	93.9	32.7	649	1,306	1,047	694	490	4,186	15.5	31.2	25.0	16.6	11.7	100.0

Size	Number of Farms	Average Crop Acreage Per Farm: Vegetable Crops 2	Field Corn	Cotton	Alfalfa	Other Crops	Total	Total Number of Livestock: Milk Cows	Brood Sows	Hogs	Hens and Pullets	Chickens: Raised	Work-stock	Beef Cattle	Sheep	Average Number of Livestock Per Farm: Milk Cows	Brood Sows	Hogs	Hens and Pullets	Chickens: Raised	Work-stock	Sheep	Beef Cattle
(Acres)	(Number)	(Acres)						(Number)								(Number)							
10- 69	12	6.4	12.8	5.6	4.5	1.5	30.7	13	4	30	478	408	12	30	3	1.1	.3	2.5	39.8	34.0	1.0	2.5	.3
70-179	22	18.1	27.5	22.7	8.8	11.1	88.3	72	30	199	704	996	27	0	29	3.3	1.4	9.0	32.0	45.3	1.2	0	1.3
180-379	11	15.7	49.9	43.6	40.5	20.7	170.5	31	53	450	684	399	9	0	38	2.8	4.8	39.1	62.2	36.3	.9	0	3.5
Total	45	14.4	29.0	23.3	15.4	10.9	93.0	116	87	659	1,866	1,803	48	30	70	2.6	1.9	14.6	41.5	40.1	1.1	.7	1.6

Size	Number of Farms	Mechanization and Labor: Number of Tractors	Number in Family	Number Working on Farm 3	Number of Hired Hands	Average Per Farm: Number of Tractors	Number in Family	Number Working on Farm 3	Number of Hired Hands	Tenure of Operators: Owners 4	Part-Owners	Tenants	Percentage Tenure of Operators: Owners 4	Part-Owners	Tenants
(Acres)	(Number)			(Number)				(Number)			(Number)			(Percent)	
10- 69	12	5	40	16	0	.5	3.3	1.3	0	5	1	7	41.7	8.3	58.3
70-179	22	22	98	40	6	1.0	4.5	1.8	.3	9	2	13	40.9	9.1	59.1
180-379	11	17	47	20	8	1.5	4.3	1.8	.7	4	3	6	40.0	30.0	60.0
Total	45	42	185	76	14	.9	4.1	1.7	.3	18	6	26	40.9	13.6	59.1

SOURCE: Vegetable Study Schedules.

[1] Sample Selected from Tulsa and Wagoner counties, Oklahoma

[2] Does not include 1947 fall spinach.

[3] Does not include hired hands.

[4] Includes part-owners.

Table 14. Organization of General Farms, Including Vegetable Crop Production, Included in A Sample of 70 Farms[1] In the Arkansas River Bottom, 1947, By Size Groups

Size	Number of Farms	All Land In Farms	Crop-land	Pasture land	Percentage of Total: All Land	Percentage of Total: Crop-land	Percentage of Total: Pasture land	Average Acreage Per Farm: All Land	Average Acreage Per Farm: Crop-land	Average Acreage Per Farm: Pasture land	Total Crop Acreage, 1947: Vegetable Crops 2	Total Crop Acreage, 1947: Field Corn	Total Crop Acreage, 1947: Cotton	Total Crop Acreage, 1947: Alfalfa	Total Crop Acreage, 1947: Other Crops	Total Crop Acreage, 1947: Total	Percentage Acreage of Each Crop: Vegetable Crops 2	Percentage Acreage of Each Crop: Field Corn	Percentage Acreage of Each Crop: Cotton	Percentage Acreage of Each Crop: Alfalfa	Percentage Acreage of Each Crop: Other Crops	Percentage Acreage of Each Crop: Total
(Acres)	(Number)	(Acres)	(Acres)	(Acres)	(Percent)			(Acres)			(Acres)						(Percent)					
10 - 69	8	338	264	56	8.1	8.8	5.4	42.3	33.0	7.0	77	66	39	54	14	250	30.8	26.4	15.6	21.6	5.6	100.0
70 - 179	15	1,816	1,510	465	43.7	45.7	44.7	121.1	87.3	30.8	399	391	400	139	45	1,374	29.0	28.5	29.1	10.1	3.3	100.0
180 - 379	8	2,003	1,422	516	48.2	47.5	49.9	250.4	177.8	64.5	173	513	420	183	103	1,392	12.4	36.9	30.2	13.1	7.4	100.0
Total	31	4,157	2,996	1,035	100.0	100.0	100.0	134.1	96.6	33.3	649	970	859	376	162	3,016	21.5	32.2	28.5	12.5	5.3	100.0

Size	Number of Farms	Average Crop Acreage Per Farm: Vegetable Crops 2	Field: Corn	Field: Cotton	Field: Alfalfa	Other: Crops	Other: Total	Total Number of Livestock: Milk Cows	Total Number of Livestock: Brood Sows	Total Number of Livestock: Hogs	Total Number of Livestock: Hens and Pullets	Total Number of Livestock: Chickens Raised	Total Number of Livestock: Work-stock	Total Number of Livestock: Sheep	Total Number of Livestock: Beef Cattle	Average Number of Livestock Per Farm: Milk Cows	Average Number of Livestock Per Farm: Brood Sows	Average Number of Livestock Per Farm: Hogs	Average Number of Livestock Per Farm: Hens and Pullets	Average Number of Livestock Per Farm: Chickens Raised	Average Number of Livestock Per Farm: Work-stock	Average Number of Livestock Per Farm: Sheep	Average Number of Livestock Per Farm: Beef Cattle
(Acres)	(Number)	(Acres)						(Number)															
10 - 69	8	9.6	8.3	4.9	6.8	1.8	31.2	7	2	22	256	368	5	30	0	.87	.25	2.75	32.00	46.00	.62	3.75	0
70 - 179	15	26.6	26.1	26.7	9.3	5.0	91.6	35	18	106	397	721	11	0	19	2.33	1.20	7.06	26.46	48.06	.73	0	1.26
180 - 379	8	21.6	64.1	52.5	22.9	12.9	174.0	29	48	401	606	373	9	0	58	3.62	6.00	50.12	75.75	4.66	1.12	0	4.75
Total	31	20.9	31.3	27.7	12.1	5.2	97.3	71	68	529	1,259	1,462	25	30	57	2.29	2.19	17.06	40.61	47.16	8.06	1.00	1.83

Size	Number of Farms	Mechanization and Labor: Number of Tractors	Number in Family	Number Working on Farm 3	Number of Hired Hands	Average Per Farm: Number of Tractors	Number in Family	Number Working on Farm 3	Number of Hired Hands	Tenure of Operators: Owners 4	Part-Owners	Tenants	Percentage Tenure of Operators: Owners 4	Part-Owners	Tenants
(Acres)	(Number)	(Number)				(Number)				(Number)			(Percent)		
10 - 69	8	2	28	10	0	.25	3.50	1.25	0	3	1	5	37.5	12.5	62.5
70 - 179	15	15	74	33	4	1.00	4.93	2.20	.26	5	2	10	33.3	13.3	66.6
180 - 379	8	12	37	16	5	1.50	4.62	2.00	.62	3	2	5	37.5	25.0	62.5
Total	31	29	139	59	9	.93	4.48	1.90	.29	11	5	20	35.4	16.1	64.5

SOURCE: Vegetable Study Schedules.

1 Sample selected from Tulsa and Wagoner counties, Oklahoma

2 Does not include 1947 fall spinach.

3 Does not include hired hands.

4 Includes part-owners.

Table 15. Organization of General Farms Excluding Vegetable Crop Production, Included in Sample of 70 Farms[1] In the Arkansas River Bottom, 1947, By Size Groups

Size	Number of Farms	Land in Farms	Cropland	Pasture	Percentage of Total: All Land	Percentage of Total: Cropland	Percentage of Total: Pasture	Average Acreage Per Farm: Total	Average Acreage Per Farm: Cropland	Average Acreage Per Farm: Pasture	Crop Acreage, 1947: Field Crops: Corn	Cotton	Alfalfa	Other Crops	Total	Percentage Acreage of Each Crop: Field Crops: Corn	Cotton	Alfalfa	Other Crops	Total
(Acres)	(Number)	(Acres)	(Acres)	(Acres)	(Percent)			(Acres)			(Acres)					(Percent)				
10 - 69	4	175	149	15	10.0	12.1	3.4	43.8	37.3	3.8	87	28	0	4	119	73.1	23.5	0	3.4	100.0
70 - 179	7	830	587	213	47.5	47.7	48.8	118.6	83.9	30.4	213	100	55	199	567	37.6	17.6	9.7	35.1	100.0
180 - 379	3	750	494	208	42.7	40.2	47.8	250.0	164.7	137.0	36	60	263	125	484	7.4	12.4	54.5	25.9	100.0
Total	14	1,755	1,250	436	100.0	100.0	100.0	125.4	87.9	45.6	336	188	318	328	1,170	28.7	16.1	27.2	28.0	100.0

Size	Number of Farms	Average Acreage Per Farm: Field Crops: Corn	Cotton	Alfalfa	Other Crops	Total	Total Number of Livestock, 1947: Milk Cows	Brood Sows	Hogs	Hens and Pullets	Chickens Raised	Work-stock	Sheep	Beef Cattle	Average Number of Livestock Per Farm: Milk Cows	Brood Sows	Hogs	Hens and Pullets	Chickens Raised	Work-stock	Sheep	Beef Cattle
(Acres)	(Number)	(Acres)					(Number)								(Number)							
10 - 69	4	21.8	7.0	0	1.0	29.8	6	2	8	222	40	7	0	3	1.5	.5	2.0	55.5	10.0	1.8	0	.8
70 - 179	7	30.4	14.3	7.9	28.4	81.0	37	12	95	307	275	16	0	13	5.3	1.7	13.3	43.9	39.3	2.3	0	1.9
180 - 379	3	12.0	20.0	87.6	41.7	161.3	2	5	29	78	26	0	0	0	.7	1.7	9.7	26.0	8.7	0	0	0
Total	14	24.0	13.4	22.8	23.4	83.6	45	19	130	607	341	23	0	16	3.2	1.4	9.3	43.4	24.4	1.6	0	1.1

Size	Number of Farms	Mechanization and Labor: Number Tractors	Number in Family	Number Working on Farms[2]	Hired Hands	Average Per Farm: Number Tractors	Number in Family	Number Working on Farms[2]	Hired Hands	Tenure of Operators: Owners[3]	Part-Owners	Tenants	Managers	Percentage Tenure of Operators: Owners[3]	Part-Owners	Tenants	Managers
(Acres)	(Number)	(Number)				(Number)				(Number)				(Percent)			
10 - 69	4	1	12	6	0	.3	3.0	1.5	0	2		2		50.0	0	50.0	0
70 - 179	7	7	24	7	2	1.0	3.4	1.0	.3	4		3		57.1	0	42.9	0
180 - 379	3	5	10	4	3	1.7	3.3	1.3	1.0	1	1	1	1	33.3	33.3	33.3	33.3
Total	14	13	46	17	5	.9	3.3	1.2	.4	7	1	6	1	50.0	7.1	42.9	7.1

SOURCE: Vegetable Study Schedules.

[1] Sample selected from Tulsa and Wagoner counties, Oklahoma.

[2] Does not include hired hands.

[3] Includes part-owners.

Table 16. Organization of Vegetable Farms Included in A Sample of 70 Farms[1] In the Arkansas River Bottom, 1947, By Size Groups

Size	Number of Farms	Acreage: All Land	Acreage: Crop-land	Acreage: Pasture	Percentage of Total: All Land	Percentage of Total: Crop-land	Percentage of Total: Pasture	Average Acreage Per Farm: All Land	Average Acreage Per Farm: Crop-land	Average Acreage Per Farm: Pasture	Crop Acreage, 1947: Vegetable Crops 2	Crop Acreage, 1947: Field Corn	Crop Acreage, 1947: Cotton	Crop Acreage, 1947: Alfalfa	Crop Acreage, 1947: Other Crops	Crop Acreage, 1947: Total	Percentage Acreage of Each Crop: Vegetable Crops 2	Percentage Acreage of Each Crop: Field Corn	Percentage Acreage of Each Crop: Cotton	Percentage Acreage of Each Crop: Alfalfa	Percentage Acreage of Each Crop: Other Crops	Percentage Acreage of Each Crop: Total
(Acres)	(Number)	(Acres)			(Percent)			(Acres)			(Acres)						(Percent)					
10 - 69	3	140	132	2	14.1	16.0	2.6	46.7	44.0	.7	133	0	0	18	3	154	86.4	0	0	11.7	1.9	100.0
70 - 179	3	302	249	47	30.4	30.1	60.3	100.7	83.0	15.7	228	143	0	4	18	393	58.0	36.4	0	1.0	4.6	100.0
180 - 379	2	550	445	29	55.5	55.9	37.1	275.0	222.5	14.5	363	84	0	30	0	477	76.1	17.6	0	6.3	0	100.0
Total	8	992	826	78	100.0	100.0	100.0	124.0	103.7	9.8	724	227	0	52	21	1,024	70.7	22.2	0	5.1	2.0	100.0

Size	Number of Farms	Average Acreage Per Farm: Vegetable Crops 2	Average Acreage Per Farm: Field Corn	Average Acreage Per Farm: Cotton	Average Acreage Per Farm: Alfalfa	Average Acreage Per Farm: Other Crops	Average Acreage Per Farm: Total	Number of Livestock, 1947: Milk Cows	Number of Livestock, 1947: Brood Sows	Number of Livestock, 1947: Hogs	Number of Livestock, 1947: Hens and Pullets	Number of Livestock, 1947: Chickens Raised	Number of Livestock, 1947: Work-stock	Number of Livestock, 1947: Sheep	Number of Livestock, 1947: Beef Cattle	Average Number of Livestock Per Farm: Milk Cows	Average Number of Livestock Per Farm: Brood Sows	Average Number of Livestock Per Farm: Hogs	Average Number of Livestock Per Farm: Hens and Pullets	Average Number of Livestock Per Farm: Chickens Raised	Average Number of Livestock Per Farm: Work-stock	Average Number of Livestock Per Farm: Sheep	Average Number of Livestock Per Farm: Beef Cattle
(Acres)	(Number)	(Acres)						(Number)								(Number)							
10 - 69	3	44.3	0	0	6.0	1.0	51.3	2	1	5	45	0	5	0	0	.7	.3	1.7	15.0	0	1.7	0	0
70 - 179	3	76.0	47.7	0	1.3	6.0	131.0	3	0	3	120	175	2	0	1	1.0	0	1.0	40.0	55.0	.7	0	.3
180 - 379	2	181.5	42.0	0	15.0	0	238.5	2	0	0	24	0	2	0	0	1.0	0	0	12.0	0	1.0	0	0
Total	8	90.5	28.4	0	6.5	2.6	128.0	7	1	8	189	175	9	0	1	.9	.1	1.0	23.6	21.9	1.1	0	.1

Size	Number of Farms	Mechanization and Labor: Tractors	Mechanization and Labor: Number in Family	Mechanization and Labor: Number Working on Farm 5	Mechanization and Labor: Hired Hands	Average Number Per Farm: Tractors	Average Number Per Farm: Number in Family	Average Number Per Farm: Number Working on farm 5	Average Number Per Farm: Hired Hands	Tenure of Operators: 4	Tenure of Operators: Owners	Tenure of Operators: Part-Owners	Tenure of Operators: Tenants	Tenure of Operators: Managers	Percentage Tenure of Operators: 4	Percentage Tenure of Operators: Owners	Percentage Tenure of Operators: Part-Owners	Percentage Tenure of Operators: Tenants	Percentage Tenure of Operators: Managers
(Acres)	(Number)	(Number)				(Number)				(Number)					(Number)				
10 - 69	3	2	10	5	1	.7	3.3	1.7	.3	3	2	0	0		100.0	66.7		0	
70 - 179	3	6	17	5	2	2.0	5.7	1.7	.7	1	1	2	0		33.3	33.3	66.7	0	
180 - 379	2	5	7	2	3	2.5	3.5	1.0	1.5	1	1	1	0		50.0	50.0	50.0	0	
Total	8	13	34	12	6	1.6	4.3	1.5	.8	5	4	3	0		62.5	50.0	37.5	0	

(Continued)

(Continued)

Table 16. Organization of Vegetable Farms Included in A Sample of 70 Farms[1] In the Arkansas River Bottom 1947, By Size Groups

Size	Number of Farms	Vegetable Crop Acreage, 1947								Percentage Acreage of Each Vegetable Crop							
		Sweet Corn	Spinach, Spring	Spinach, Fall 5	Tomatoes	Cantaloupes	Watermelons	Other Vegetables 6	Total	Sweet Corn	Spinach, Spring	Spinach, Fall 5	Tomatoes	Cantaloupes	Watermelons	Other Vegetables 6	Total
(Acres)	(Number)	(Acres)								(Percent)							
10 - 69	3	42	6	4	3	10	6	62	133	31.6	4.5	3.0	2.3	7.5	4.5	46.6	100.0
70 - 179	3	42	18	70	7	6	0	85	228	18.4	7.9	30.7	3.1	2.6	0	37.3	100.0
180 - 379	2	220	0	16	17	32	15	63	363	60.6	0	4.4	4.7	8.8	4.1	17.4	100.0
Total	8	304	24	90	27	48	21	210	724	42.0	3.3	12.5	3.7	6.6	2.9	29.0	100.0

Size	Number of Farms	Average Acreage Vegetable Crops Per Farm							
		Sweet Corn	Spinach, Spring	Spinach, Fall 5	Tomatoes	Cantaloupes	Watermelons	Other Vegetables 6	Total
(Acres)	(Number)	(Acres)							
10 - 69	3	14.0	2.0	1.3	1.0	3.3	2.0	20.7	44.3
70 - 179	3	14.0	6.0	23.3	2.3	2.0	0	28.3	70.6
180 - 379	2	110.0	0	8.0	8.3	16.0	7.5	31.5	181.3
Total	8	38.0	3.0	11.3	3.3	6.0	2.6	26.3	90.5

SOURCE: Vegetable Study Schedules.

1 Sample selected from Tulsa and Wagoner counties, Oklahoma.

2 Does not include 1947 fall spinach.

3 Does not include hired hands.

4 Includes part-owners.

5 Figures are for 1946 fall spinach crop.

6 Includes cabbage, onions, asparagus, cucumbers, green beans, okra, sweet potatoes, beets, peas and radishes.

CHAPTER III. MARKETING PRACTICES AND PROBLEMS

Market Outlets

Vegetable market outlets serving this area, as well as those in the State as a whole, have undergone marked changes since 1940. Prior to that time most of the vegetables for the fresh market were sold at the Tulsa Farmers Market and very little acreage was devoted to crops for processing. Until 1942, when the processing acreage for the State increased by more than 200 percent over the previous year, there had been only one year that it exceeded 7,000 acres (Table 17). Most of this acreage was in the extreme eastern part of the State, and a great deal of the produce was sold to canneries in Arkansas. All of the organizations listed in Table 18, with the exception of the Tulsa market and the two processing companies in Muskogee, have come into existence since 1940, and most of the canneries were established since 1944.

As a whole, procedures in marketing vegetables have not been clearly defined, and have resulted in unstable market outlets. The amount of vegetable acreage contracted by processors has varied markedly between years with little direct relationship to the overall supply and demand situation.[1]

Many vegetable producers have had to depend on processing facilities in other states and located long distances from the Oklahoma centers of production.[2] There have been some instances where it was necessary to transport produce as much as 150 miles, and other instances in which no market at all could be found. The situation in 1944 was described as follows:

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[1] Oklahoma Agricultural and Mechanical College, Oklahoma Agricultural Experiment Station, Op. cit., p. 12.

[2] Ibid., p. 12.

The marketing of fruits and vegetables gave considerable concern during the year. The crop of snap beans was much larger than the local processing and fresh market outlets would take. There was also a scarcity of labor in harvesting snap beans at the proper time so as to have high grades of beans for consumers. There was also difficulty in the handling of the fresh spinach crop as producers, because of the favorable season, produced more than could readily be marketed or handled by the local canneries. 3

Table 17. Commercial Truck Crop Acreage and Production In Oklahoma, 1936-1945 1

Year	Acreage			Production		
	Fresh Market	Processing	Total	Fresh Market	Processing	Total
	(Acres)	(Acres)	(Acres)	(Tons)	(Tons)	(Tons)
1936	12,400	6,150	18,550	-	-	-
1937	13,100	4,340	17,440	-	-	-
1938	12,900	5,290	18,190	-	-	-
1939	19,600	5,180	24,780	-	-	-
1940	19,250	8,750	28,000	-	-	-
1941	17,600	6,750	24,350	-	-	-
1942	16,350	22,600	38,950	42,871	39,360	82,231
1943	13,100	23,590	36,690	35,471	28,130	63,601
1944	20,900	27,800	48,700	56,761	43,570	100,331
1945	14,750	20,980	35,730	34,700	26,700	61,400

SOURCE: Agricultural Statistics, for the years 1937-1946, United States Department of Agriculture.

1 Does not include potatoes and sweet potatoes.

A recent experiment station bulletin[4] states that to insure continued large acreages of spinach and snap beans in Oklahoma there will have to be more adequate facilities for handling these crops.

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3 A. W. Jacob, Annual Narrative Report of Extension Economist, Marketing, 1944, Oklahoma Agricultural and Mechanical College, Extension Service, p. 32.

4 Oklahoma Agricultural and Mechanical College, Division of Agriculture, Looking Forward in Oklahoma Agriculture, Experiment Station Bulletin No. B-299, p. 28.

Table 18. Vegetable Market Outlets Serving the Portion[1] of the Arkansas River Bottom Which Was Sampled For This Study

Name	Location
Tulsa Farmers Market-Trenton St. [2]	Tulsa
Bixby Truck Growers Association [2]	Bixby
Bixby Canning Company	Bixby
Haskell Truck Growers Association [2]	Haskell
Fresh-O Canning Company	Haskell
Thomas and Drake Canning Company	Haskell
Gardner Canning Company	Broken Arrow
Kimmel Food Products Company	Coweta
Muskogee Truck Growers Association [2]	Muskogee
Hyde Park Canning Company	Muskogee
Griffin Grocery Company	Muskogee

SOURCE: Vegetable Study Schedules.

[1] That portion located in Tulsa and Wagoner counties, Oklahoma.

[2] Fresh markets.

Capacity of Present Processing Facilities

Since the influx of canneries in 1944 and 1945, few, if any of them, have been operating at a volume anywhere approaching capacity. Those which have operated more nearly at capacity have imported vegetables from other areas or have temporarily turned to packing other types of food products.

Thus, an increased production can be handled and is desirable from the viewpoint of processors. The entrepreneurs who have located factories in this area are all experienced in the processing of vegetables. Undoubtedly, their calculations included a production considerably greater than has existed since they have been in operation.

Market Areas

Market areas, as well as the entire marketing procedure, are poorly defined with the exception of fresh market vegetables handled through The Bixby Truck Growers Association and The Tulsa Farmers Market, and sweet corn for processing which is grown under contract for one of the Muskogee processors.

An estimated 90 percent or more of the sweet corn grown in Tulsa County is marketed through the Bixby association. Approximately 90 percent of this association's members are located within a radius of 10 miles of Bixby. The Muskogee processor, who contracts his supply prior to planting, stipulating price and other conditions at that time, receives most of his supply from within 15 miles of Muskogee.

While earlier years had found growers traveling long distances to market their vegetables, in 1946 and 1947 some processors in this area imported snap beans from Arkansas and Mississippi and blackeye peas from Texas. Another was canning horse meat for the government. All agreed, however, that they did not want or intend to continue these practices, but expected to use local produce almost entirely in the future as production became adjusted to their needs.

Most of Oklahoma sweet corn for the fresh market apparently terminates at Kansas City and Chicago. There have been no quotations for Oklahoma sweet corn on the New York City market, which receives most of its July[5] supply from New Jersey and Virginia.[6]

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[5] The bulk of Oklahoma sweet corn is harvested and marketed in July.

[6] United States Department of Agriculture, Production and Marketing Administration, Fruit and Vegetable Branch, Wholesale Prices of Fruits and Vegetables at New York City, Chicago, and Leading Shipping Points, By Months, 1946, p. 27.

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Methods of Selling

Nearly all of the vegetables in this area, as is the case throughout the vegetable producing areas of the State, are sold in wholesale quantities by the producer and are delivered by the producer to the buyer. Most of the exceptions occur in the case of cantaloupes and watermelons, which are sometimes sold at the field. A very small amount of the total volume is sold at retail by producers who operate roadside markets.

Those growers in Tulsa County who produce principally for the fresh market sell most of their vegetables, with the exception of sweet corn, through commission men at the Tulsa Farmers Market. Ten percent of the sales price is the usual fee.

Contracts Between Growers and Processors

Although about 90 percent of the acreage of commercial processing vegetables in the United States is grown under the control of processors, mostly under contracts between processors and farmers,[7] this system had not been used very much in this area until 1946 and 1947. One exception to this is the case of sweet corn for processing, which was mentioned previously.

Some contracts now in use stipulate a definite price, while others agree to pay the "market price" at time of delivery. Other provisions include the acreage to be grown, the variety of the crop, the quality of the raw product which will be accepted, and the time of delivery. Most of the processors now in operation are small and could not afford to bring suit for specific performance of contracts or for damages, and some would not do so even if it were feasible because of the ill will it would create among many

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[7] United States Department of Agriculture, Bureau of Agricultural Economics, Commercial Truck Crops (mimeographed) p. 1.

of the growers. The grower, then, is not too closely bound to deliver his vegetables to the processor, but can market them elsewhere if the price is higher. On the other hand, the processor must accept all produce delivered to him under contract in order to maintain his source of supply and keep up the good will of the growers. In other words, these contracts are more of a "gentlemen's agreement," which the processor is using to build up his source of supply and to gain the confidence and good will of the producer.

Contracts are needed when there is a risk of supply or a risk of demand. They are necessary in this area particularly in the case of sweet corn for processing, blackeye peas, and other crops for which there are not numerous outlets. Otherwise, growers would not risk producing such crops and facing a possibility of having no market for them. Processors need contracts in order to insure their raw material supply.

The percentages of acreages of individual crops in the United States grown under contracts or otherwise under processors' control are usually about as follows: Asparagus, 35 percent; beets, 70 percent; green lima beans, 95 percent; snap beans, 70 percent; cabbage for kraut, 45 percent; sweet corn, 100 percent; cucumbers for pickles, 90 percent; green peas, 100 percent; pimientos, 100 percent; spinach, 60 percent; and tomatoes, 80 percent.[8] Percentages that may be expected in Oklahoma will, of course, depend to a large extent on the number of outlets available for individual crops, and the type of outlets, whether fresh market or processing.

Converse and Huegy point out that contracts assure the farmer of a market. In poor seasons he could often sell his produce elsewhere at prices

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[8] United States Department of Agriculture, Bureau of Agricultural Economics, Op. cit., p. 1

higher than the contract calls for, but in good seasons he will likely receive more for his product than he would if the price were determined by the supply and demand. The contract benefits the farmer in that it tends to stabilize the price that he receives.[9]

Contracts are of advantage to the processor in that they assure him of his raw material supply, they allow him to plan his operations before time of harvest and delivery, and the cost of his raw material is known in advance. As the situation now stands, contracts would be a prerequisite to the production of all crops for processing other than spinach and other greens, snap beans, and tomatoes, for which there are numerous outlets. However, they would be of advantage to both grower and processor for all crops. Some promotional work, with contracts as one of the incentives, will likely be necessary to induce growers to produce such crops as asparagus, lima beans, green peas, and blackeye peas.

Transportation and Communication

Transportation and communication facilities for the individual farm operator are good. The farm-to-market roads are mostly graveled or sandy of an all-weather type and are not a problem. Trucks are plentiful. A large percentage of farmsteads have telephones and most farm operators who do not have one of their own do have access to one nearby.

U. S. Highway 64, which runs the length of Oklahoma's principal vegetable producing area, provides a concrete road to Tulsa and connection with other highways in all directions. Two railroads, the Midland Valley and the Missouri-Kansas-Texas, serve this area. Telegraph and long distance telephone service are available at all towns in the area.

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[9] Paul D. Converse and Harvey W. Huegy, The Elements of Marketing, pp. 488-489.

Canners

The latest report indicates that there are 20 canneries in Oklahoma.[10] Of these, 14 were members of the Ozark Canners Association, a trade organization. The growth of the canning industry and the production necessary to maintain it is shown in Table 19. It is estimated that the Oklahoma members of the Ozark association account for 75 percent to 80 percent of the total state pack. Spinach and other greens, snap beans, and tomatoes have thus far been the leading processing crops. Figures on sweet corn were not available, as they would disclose the operations of the one Oklahoma canner who processes this vegetable, and this particular canner was not a member of the association.

Blackeye peas were processed by Oklahoma members of the Ozark association for the first time in 1946. They ranked third in number of cases then and indications are that they will be a large item again in 1947.

The Bixby Truck Growers Association

Prior to 1940, most of the vegetables grown in the Bixby area were marketed in Tulsa. The marketing association in Tulsa collapsed in 1939 and growers established a local concentration market at Bixby. The association operated as an unincorporated organization the first year, but with the assistence of Claude Todd, then a vocational agriculture instructor in the local school system, and O. J. Moyer, Tulsa County Agent, The Bixby Truck Growers Association was incorporated in May, 1941.[11]

Selling their vegetables was a major problem for growers prior to the organization of this association. It was a common practice for buyers to

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[10] Oklahoma Agricultural and Mechanical College, Extension Service, Marketing Fruits and Vegetables in Oklahoma, p. 12.

[11] Files of A. W. Jacob, Marketing Specialist, Oklahoma Agricultural and Mechanical College, Extension Service.

Table 19. Estimate of the Vegetable Pack of Oklahoma Members of the Ozark Canners Association, 1943-1946

Year	Number of Plants	Vegetable						
		Spinach	Other Greens	Snap Beans	Tomatoes	Blackeye Peas	Lima Beans	Total
	(Number)	(Cases)[1]	(Cases)[1]	(Cases)[1]	(Cases)[1]	(Cases)[1]	(Cases)[1]	(Cases)[1]
1943	4	150,632	-	113,985	23,109	-	-	291,602
1944	8	703,175	121,765	166,954	100,585	-	-	1,092,479
1945	3	427,668	370,997	137,916	39,714	-	-	976,295
1946	11	536,052	140,584	302,475	175,150	225,141	1,042	1,380,444

SOURCE: Ozark Canners Association.

[1] Cases were estimated on the basis of 24 No. 2 cans per case.

let the grower wait at the market place until almost night before making an offer for his vegetables.[12] The grower, after waiting all day, was ready to sell his highly perishable produce at any price rather than chance taking a complete loss.

The present manager of the association, a local business man, is hired on a part-time basis. Since the association does not buy or sell any produce, his job is confined largely to maintaining facilities and arranging for supplies.

The physical facilities of the market are fairly adequate at the present. The largest building is a packing shed, approximately 300' x 35'. Most of the space in it is devoted to tables and other equipment and machinery for trimming and sacking sweet corn. Waxing machines for tomatoes, washing machines for green beans and greens, and icing machines are also housed here, but are moved to one side during the sweet corn season. A railroad siding is next to the back side of the shed, and the front side has an overhanging roof which furnishes protection for the trucks while they are unloading. Thus, both truck and rail shipments can be loaded or unloaded directly from or to the packing shed. Another building, facing the front of the packing shed houses the association office and offices for the buyers.

The association itself does not ever take title to the produce that is sold through it. Member producers contact one of the buyers, who inspects their produce and either agrees to buy it or rejects it. There is no question about the price since this is fixed by the association's board of directors.

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[12] Interview with Mr. Claude Todd, former manager of The Bixby Truck Growers Association.

The buyer gives the grower a ticket upon delivery of produce, indicating the amount delivered to him. The grower presents this ticket at the association office and is paid at the current price, less 5 percent which goes to the association. The buyer in turn pays the association for the amount of produce he has received. This method is particularly desirable to the growers as they are paid on delivery of their produce.

In fixing or changing the price of sweet corn, the board of directors usually has set a price in increments of five cents per dozen ears. The corn is packed in sacks of five dozen ears each, so this means that the price of a sack of corn changes in increments of 25 cents. Prices at the terminal markets are usually more flexible than this, thus it is probable that the grower is the loser because of this pricing system.

The price spread between Bixby and the terminal market seems rather wide. The price of Oklahoma sweet corn at Chicago in July, 1945 was $3.48 per sack containing five dozen ears.[13] The price paid the grower at Bixby averaged 37.5 cents per dozen or $1.88 per sack, which was 54 percent of the wholesale price at the terminal market. It is estimated that this was about 37 percent of the retail price. Apparently, Oklahoma was the only state which shipped corn to the Chicago market at this time in a volume sufficient to justify quotation of a monthly average price. This limited supply was probably responsible for the high price and for the comparatively high percentage of the price which the grower received. The buyers at the Bixby association refused to pay more than 15 cents per dozen ears (75 cents per sack) in 1946. The price quoted on the Chicago market at the same time for

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[13] United States Department of Agriculture, Production and Marketing Administration, Fruit and Vegetable Branch, Op. cit., pp. 24-25.

Oklahoma sweet corn was $2.27 per sack.[14] The grower in this instance received less than 33 percent of the wholesale terminal market price. This probably amounted to no more than 20 percent of the retail price.

Data on the grower's share of the retail price of sweet corn for fresh market are not available. However, the grower's share of the retail price of 10 fresh vegetables combined ranged from 34 percent to 47 percent in the period 1937-1946. Seasonal percentages for this same period varied from 28 percent to 57 percent.[15]

The monthly average grower's share of cabbage, a highly perishable and comparatively bulky vegetable, ranged from 23 percent to 52 percent of the retail cost in the three-year period 1944-1946.[16] All other vegetables on which data are available show a larger return to the grower.[17]

In 1935 and 1936, when the grower's share of the price of farm products was only 75 percent of his 1946 share,[18] he received 30 percent of the retail price of Florida tomatoes, 23.1 percent of California tomatoes, 19.9 percent of Pacific Coast iceburg lettuce, and 14.5 percent of Texas

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[14] United States Department of Agriculture, Production and Marketing Administration, Fruit and Vegetable Branch, Op. cit. p. 27.

[15] United States Department of Agriculture, Bureau of Agricultural Economics, Price Spreads Between Farmers and Consumers for Food Products, pp. 205, 223.

[16] Beets, snap beans, carrots, lettuce, onions, potatoes, spinach and sweet potatoes.

[17] United States Department of Agriculture, Bureau of Agricultural Economics, Price Spreads Between Farmers and Consumers for Food Products, (statistical supplement) pp. 20-23.

[18] United States Department of Agriculture, Bureau of Agricultural Economics, The Marketing and Transportation Situation, September, 1947, p. 2.

cabbage,[19] all of which were sold in nine large cities and required transportation for long distances.

The price received by the members of the Bixby association may be only 1 percent, or even less, lower than it should be. One percent of retail price does not appear offhand to be of too great importance, but when the increase is from 20 percent to 21 percent, it means an increase of 5 percent in the price received by the grower, and a much larger percentage increase in the grower's net return. The present pricing system of the Bixby association will not allow adjustments that will even approach the minuteness needed, and it is certain that the buyers have not been on the losing end of this pricing system.

All physical facilities are furnished to the buyer at no charge, and theoretically any buyer who desired to do business at the market would have access to a proportionate share of the facilities. Buyers must buy their own sacks, boxes, crates, ice or other packing supplies, and hire whatever labor they require in the packing and shipping process.

The association usually has four or five buyers during the sweet corn season, and one to three buyers at other times. There were four buyers on the market during the 1947 sweet corn season. Two of these were local buyers who shipped mostly by truck to such centers as St. Paul, Chicago, Detroit, Omaha, Cincinnati, St. Louis, Kansas City, Wichita, Denver, Dallas and San Antonio. The other two buyers were representatives of Chicago wholesale firms, who shipped exclusively by rail. Most of their shipments go to Chicago. These out-of-state buyers usually deal only in sweet corn, but some years they also buy cantaloupes.

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[19] The Twentieth Century Fund, Does Distribution Cost Too Much? p. 380.

The local buyers deal in other produce in season, however, most of the buying (other than sweet corn) seems to have been dominated by one of these two buyers ever since the association was established. The other local buyer on the market this year is also one of the larger vegetable growers of the area in terms of acreage. He has entered the market as a buyer for only the past three years. His entrence as a buyer was brought about by dissatisfaction with prices and with buyers practices.[20]

The principal vegetable sold through this association is sweet corn, which accounted for over 68 percent of the total dollar volume over the six-year period, 1942 through 1946 (Table 20). Watermelons, centaloupes, tomatoes, and snap beans ranked next in importance in that order, although the volume of each varied greatly in individual years.

The quality of the vegetables marketed through the association is kept high by a series of precautions. Since heat is damaging to sweet corn, it is pulled early in the morning. Most growers are in the field before dawn ready to begin pulling as soon as there is light. At the packing shed each ear is trimmed and ears are placed five dozen to the sack, each sack bearing the name of the association. The sacks are then loaded in railroad refrigerator cars or in trucks with alternating layers of crushed ice.

Tomatoes are sized and otherwise graded, and are waxed to preserve looks and moisture. Spinach and green beans are waxed and then packed with ice. Refrigeration is important in checking evaporation and shriveling as well as other forms of deterioration.

Standardization of produce in the Bixby area has been accomplished by the association whose members grow Golden Cross Bantam sweet corn,

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[20] Interview with Mr. H. L. Skaggs, Bixby, Oklahoma.

Table 20. Volume of Sales By The Bixby Truck Growers Association By Commodities, 1942-1946

Commodity	Volume of Sales 1942	1943	1944	1945	1946	Total	Percentage
	(Dollars)	(Dollars)	(Dollars)	(Dollars)	(Dollars)	(Dollars)	(Percent)
Sweet corn	44,125	122,207	109,672	151,767	132,694	560,465	68.5
Spinach	6,000	1,472	1,800	8,190	7,026	24,488	3.0
Tomatoes	-	3,643	18,172	13,102	2,346	37,263	4.6
Snap beans	3,000	8,975	11,352	5,625	4,135	33,087	4.0
Cantaloupes	-	3,730	9,700	17,384	9,415	40,229	4.9
Watermelons	25,000	10,470	21,110	2,286	5,042	63,908	7.8
Other vegetables	8,000	7,301	16,773	18,069	8,058	58,201	7.2
Total	86,125	157,798	188,579	216,423	169,316	818,241	100.0

SOURCE: Records of The Bixby Truck Growers Association; and files of A. W. Jacob, Extension Economist, Marketing, Oklahoma Agricultural and Mechanical College, Extension Service.

Stokesdale or Rutgers tomatoes, Bloomsdale spinach and Black Diamond or Smith-Watson watermelons.[21]

Shipments are inspected by a licensed grader and records show that almost all of the produce shipped grades No. 1. Sweet corn is graded by the handlers in the trimming and packaging procedure already described. The grading of tomatoes is aided by the waxing machine, which also separates the fruits according to size.

Members of the association have accused it and the buyers of many forms of unfairness ranging from outright theft to price manipulation. Following is the report of one such incident:

> Some difficulty was experienced in the marketing of sweet corn because of the scarcity of ice. ... In the shipment of a car of sweet corn a large amount of crushed ice is needed. The marketing period of sweet corn coincided with the heavy demand for ice by consumers at Tulsa and Muskogee, where the ice plants are located which supply this area. There was also a heavy drain upon these plants for ice to supply the army at Gruber and at air fields in Tulsa. During this scarcity, farmers were advised not to bring in sweet corn right in the height of the production season. Upon receipt of the information contact was made with the Secretary of the Chamber of Commerce at Tulsa, who immediately enlisted the support and cooperation of ice processors in that area. There was sufficient diversion of ice to the area to take care of corn brought in at this period...
>
> As sweet corn was selling at high prices, growers were very much disturbed, and many felt that the rumor of scarcity of ice was unwarranted and was made only to secure a break in the prices paid for sweet corn... [22]

This latter view was shared by some agricultural workers, who had first-hand knowledge of the situation.

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[21] A. W. Jacob, Annual Narrative Report of Extension Economist, Marketing, 1943, pp. 30-31.

[22] A. W. Jacob, Annual Narrative Report of Extension Economist, Marketing, 1945, pp. 45-46.

In regard to the price fixing policy of the association, one member told of an incident which indicated that the buyers are not allowed to bid the price up, as well as not being allowed to offer less than the price the association sets. There is some doubt whether the price set is a floor, then, or a ceiling.

Many accused the association of discriminating between the different members by refusing to buy produce from some when demand was low. One member, who was definitely on the "inside", made the statement that he thought he was going to have to sell his neighbor's sweet corn for him, but the market picked up and it was not necessary. Both were members in good standing.

Most members of the association and agricultural workers familiar with the situation realize that the present marketing system is far from ideal, but the improvement over that which existed prior to the incorporation of the Bixby association is so great that many have relaxed any efforts toward further improvements. A former manager had this to say in 1944:

> The Bixby Truck Growers Association has provided a very crude, partial solution to this problem...yet it is the best answer available. There is too much spread between the price the farmer receives and the price the consumer pays for his food. A marketing program is successful only to the degree to which it lessens that spread. If this program of marketing succeeds so that the farmer receives a fair price for the fruits of his efforts, the Arkansas Valley will become a great food producing region...the production will double and treble. 23

The accomplishments of the Bixby association may be summarized as adequately providing for three main marketing functions, namely,

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23 Files of A. M. Jacob, Marketing Specialist, Oklahoma Agricultural and Mechanical College, Extension Service.

assembling, standardization, and selling. It also has added materially to the transportation function by providing loading and refrigerating facilities for both rail and truck shipments.

Some credit may also be given the association for the following: Improvement of quality in vegetables produced by growers, development of rural leadership and understanding of market practices, establishment of the Oklahoma Vegetable Research Station just northeast of Bixby, and establishment of a cannery at Bixby to supplement the fresh market sales.[24]

Observation indicates that many of the improvements brought about by the Bixby association are spreading to other areas capable of producing vegetables. Considering the industry as a whole, this may be one of the most important accomplishments of the association.

Suggested improvements for the Bixby association are:

1. Hire a full time manager who is familiar with the marketing procedure for fresh vegetables, and who believes in cooperatives.

2. Contact with terminal market outlets should be established and maintained.

3. The association should enter the buying field and sell to buyers at the dock or ship the produce to terminal markets. This would remove the disadvantage now presented by the pricing system in use.

4. If the present system of the grower selling directly to the buyer is continued--which is inadvisable--the pricing system should

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[24] A. W. Jacob, Annual Narrative Report of Extension Economist, Marketing, 1945, p. 48.

be changed so that the price changes in increments of one cent per sack of sweet corn.

5. Labeling of the other products sold through the association would build prestige for the product as has already been done in the case of sweet corn.

6. Produce delivered by members to the association should be accepted on a first come, first served basis in order to eliminate discrimination between members.

7. The association should assist in disseminating information on improved practices and new developments to the growers. The promotion of new vegetable crops such as asparagus, which would be profitable to the grower and would make for better efficiency and economy in the operation of the association, should be undertaken.

8. Membership selection would probably be of advantage.

9. A program of membership relations should be inaugurated, and at least two meetings should be held each year.

Other Associations

The Muskogee Truck Growers Association and The Haskell Truck Growers Association have been in operation only since 1945. The operations of both have been small. The Haskell association has dealt only in sweet corn. The Muskogee association has been handicapped by lack of volume. Since the latter sells its produce primarily in carload lot quantities, it can accept produce from growers only when there is sufficient volume to completely fill one or more cars, and then it can accept only as much as is required to fill the cars.[25]

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[25] Interview with Mr. Claude Todd, Manager of The Muskogee Truck Growers Association.

Summary

There has been a rapid increase in the number of outlets for processing vegetables in this area since 1944, which promises to improve the possibilities for vegetable crops. So far, full advantage has not been taken of the opportunities offered by these canneries.

Contracts have been used very little in the past, but their use is increasing and will probably continue to increase as the processing industry develops. These agreements are of definite advantage both to grower and processor.

The Bixby Truck Growers Association has been one of the biggest steps forward in the marketing of fresh vegetables in Oklahoma, although it is far from the perfect answer to the problem. The foundation presented by this organization could be built into a much larger and more successful marketing cooperative.

CHAPTER IV. POTENTIAL PRODUCTION FOR SELECTED AREAS AND FOR INDIVIDUAL VEGETABLES

The potential production of commercial vegetable crops in Oklahoma is limited by both physical and economic factors. Physical factors are topography, soil, and climate, which in turn determine largely the individual vegetable crops which can be produced. The economic factors include the extent to which the individual farm operator can include vegetables in his organization, the market outlets which are available and their efficiency, and the problems involved in a shift to a more intensive type of farming. Not to be overlooked, although it may be possible to change with time, is the attitude of the farm operators toward the production of vegetables. Also to be considered is the low specificity[1] of the vegetable producing industry, which enables it to shift to other enterprises when demand is light.

Climate and Soil

The regions in Oklahoma where soil and climate are favorable to vegetable production are fixed with the exception of the possibilities presented by reclamation and irrigation projects.

Commercial production of vegetables is confined chiefly to regions having either ample irrigation water or an annual rainfall of between 30 and 40 inches or more.[2] The latter requirement limits possibilities for a sound,

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[1] This low specificity results from the wide adaptability of the factors of production used. The land, most machinery, labor, and management used in producing vegetables can easily be turned to the production of other crops. In contrast, the farmer who grows mostly alfalfa for hay has a large investment in machinery which can be used only for hay crops, thus his business has a relatively high specificity.

[2] United States Department of Agriculture, Climate and Man, Yearbook of Agriculture, 1941, p. 376.

diversified vegetable industry in Oklahoma to the eastern half of the State, unless irrigation is employed.

> More important than the annual rainfall is the 20 to 25 inches of rainfall required during the six months' growing season--a very rough figure since the efficiency of the water supply is dependent upon many factors. 3

The most abundant rainfall in eastern Oklahoma occurs in the seven-month period of April through October (Figure 5) when the total normal rainfall is about 26 to 28 inches.

Extremes in temperature prevent the commercial production of most common vegetables in only a very few areas in the United States. The more than 30 commercially important vegetable crops require monthly mean temperatures ranging from 60° to 80° F.[4] The seasonal periods in which these temperatures occur (Figure 6) coincide with those of the heaviest rainfall mentioned previously, except for the months of July and August, when temperatures are slightly above the upper limit.

The limitations set by climate may be lessened in several ways. Two of these which can and are being applied in Oklahoma are irrigation and research.

An irrigation project is being undertaken near Altus in the southwestern part of the State. This may open a new area of vegetable production in the near future.

The Oklahoma Vegetable Research Station at Bixby, located in the principal vegetable producing region of the State, is doing extensive work in variety tests, new variety development, rotation and fertilizer tests

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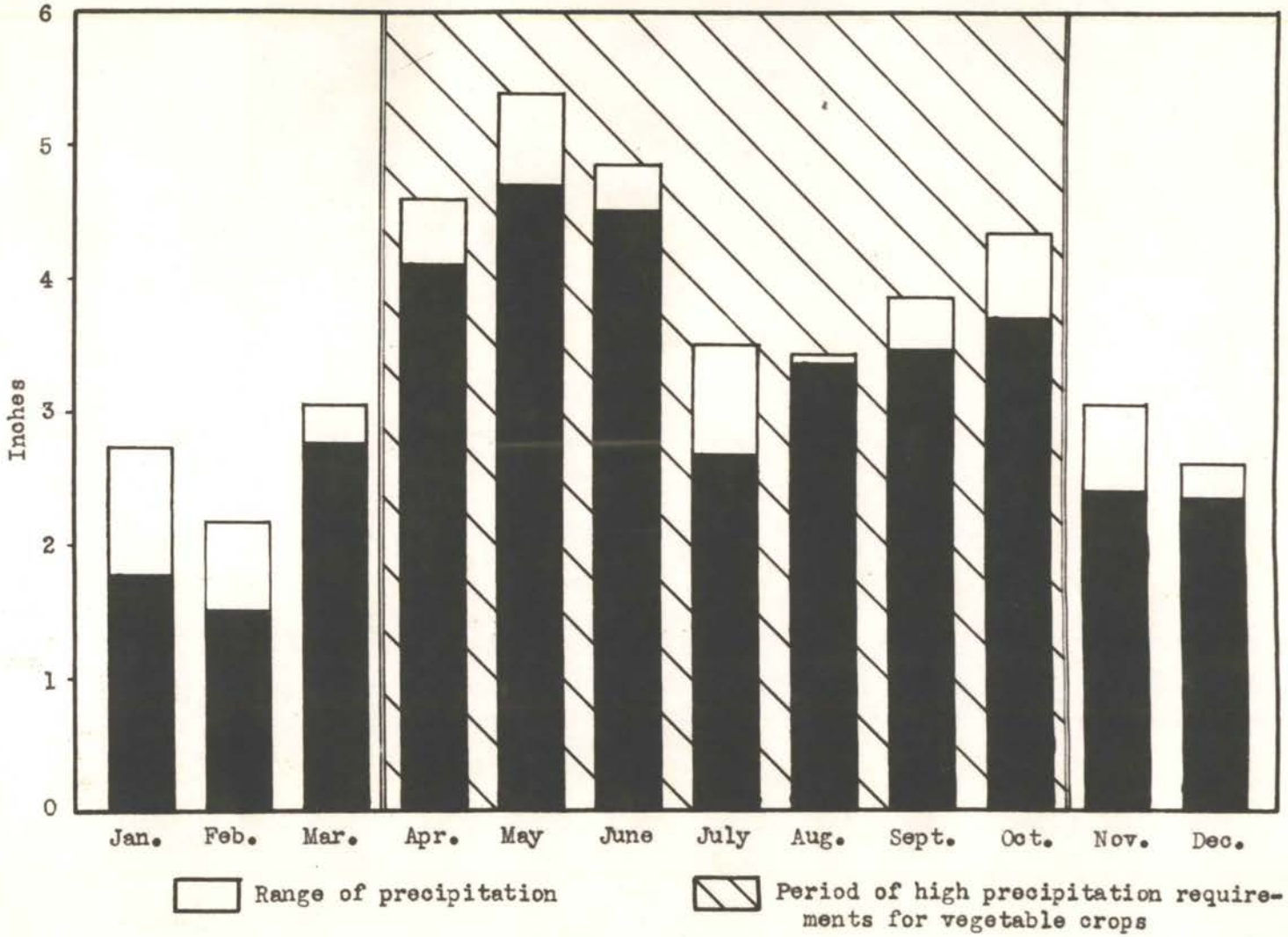
[3] Loc. cit.

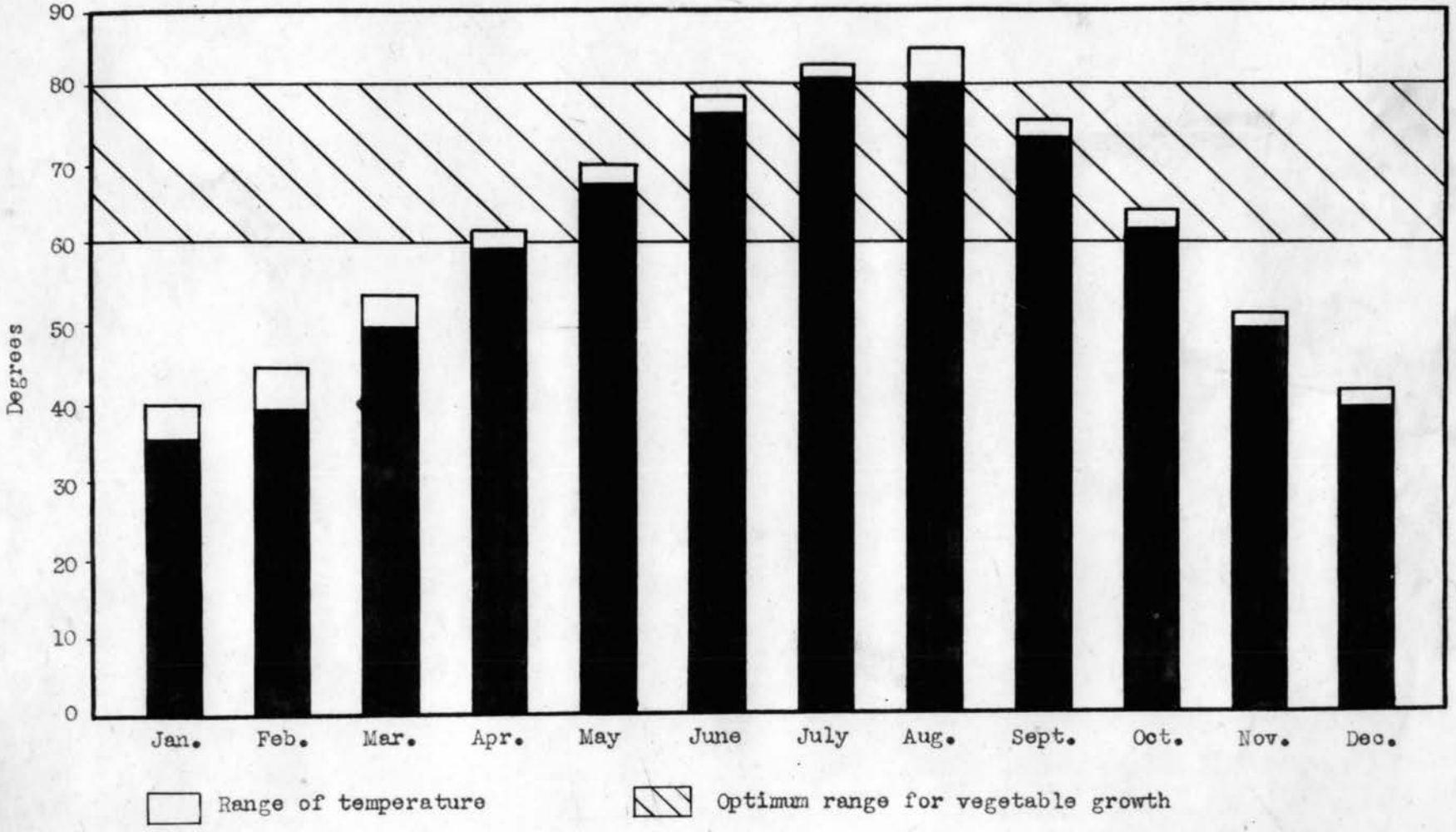
[4] Ibid., pp. 377-378.

Figure 5. Range of Normal Monthly Precipitation in Inches, Selected Weather Stations in Eastern Oklahoma



SOURCE: Appendix Table 2.

Figure 6. Range of Normal Monthly Mean Temperature in Degrees Fahrenheit for Selected Weather Stations in Eastern Oklahoma



SOURCE: Appendix Table 3.

both in vegetables and small fruits. The work at this station is intended to develop or determine crops and varieties of crops which will produce good quality and high yield under existing climatic conditions. Also a supply of water is being developed at the station in order to provide a demonstration of the value of irrigation water in vegetable growing in that area.

The soils best adapted to vegetable crops are deep, well drained, friable, and permeable soils that range in texture from fine sands to clay loams. Available county soils surveys indicate that the Arkansas River bottom land as a whole meets these requirements, although there are parts where the soil is unfavorable or where drainage is poor.

It can be seen from the evidence presented above and from the successful past and present production of some vegetable crops in eastern Oklahoma that the climate and the soils of certain regions are adapted to the growth of many vegetable crops.

Vegetable Crops

The individual vegetable crops which have proved adapted, at least to some extent, to Oklahoma and have been produced in volume are spinach, green beans, tomatoes, sweet corn, sweet potatoes, Irish potatoes, watermelons and cantaloupes. Vegetables which have not been widely grown, but which seem to have good possibilities for Oklahoma are asparagus, blackeye peas, lima beans and peas.

In the following discussion of individual vegetable crops, reference is made to results obtained at the research station at Bixby. It is realized that these results cannot be accepted as conclusive evidence, since most agricultural research work requires several years of

experimentation.[5] However, other data are not available for many Oklahoma vegetable crops.

Figures on vegetable crops for which a reasonable amount of data were obtained in the schedules taken are presented in Table 21. Some reference will be made to these figures in the discussion of individual crops.

It has been found in studies made in the northwest section of the United States that variety is not important in selecting the raw material for canning or freezing. More important than variety is harvesting at the proper stage of maturity and processing by the accepted procedures. The limiting factors as to whether a particular variety is suitable for processing was found to be generally its ability to grow well in the locality concerned and its resistance to disease and insect pests.[6]

Spinach. Spinach is the leading processing vegetable in the State both in terms of acreage and of volume processed (Tables 19 and 22). The average yield of 1.8 tons per acre is considerably below the United States average, but the average price is much higher, due to the high quality of the product.

The Oklahoma Agricultural Experiment Station, in recommending a reduced acreage of commercial vegetable crops in the State for 1948 as compared with 1946, says that most of the reduction would be in spinach acreage planted. They believe that more careful land selection will lower the abnormally heavy abandonment of recent years.[7]

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[5] Oklahoma Agricultural Experiment Station, The Oklahoma Vegetable Research Station at Bixby, Progress Report, 1946, p. 8.

[6] United States Department of the Interior, Bureau of Reclamation, Columbia Basin Joint Investigations, Agricultural Processing Industries, Problem 24, p. 49.

[7] Oklahoma Agricultural and Mechanical College, Oklahoma Agricultural Experiment Station, Oklahoma Farm Production Prospects for 1948, p. 13.

Table 21. Acreage, Production and Yield of Selected Vegetable Crops, 1946, In A Sample In the Arkansas River Bottom, and Estimated Average Yield

Vegetable	1946 Acreage	1946 Production	1946 Yield Per Acre	Estimated Average Yield 1
	(Acres)			
Sweet corn	522	141,680 Dozen ears	271 Dozen ears	300 Dozen ears
Tomatoes	40	176 Tons	4.4 Tons	3.8 Tons
Spinach, spring	223	392 Tons	1.8 Tons	1.8 Tons
Spinach, fall	192	248 Tons	1.3 Tons	1.8 Tons

SOURCE: Vegetable Study Schedules.

[1] The estimated long time average yield which now exists in the area, or the yield which would probably be obtained in a year of normal rainfall and temperature if the practices now in use were applied to cross section resources by the average management in this area.

Table 22. Spinach for Processing; Acreage, Yield, Production, and Seasonal Average Price Received By Farmers In Oklahoma, 1936-1945

Year	Acreage Planted	Yield Per Acre	Production	Price
	(Acres)	(Tons)	(Tons)	(Dollars)
1936	5,250	2.0	10,500	21.40
1937	2,000	2.4	4,800	17.50
1938	1,400	2.1	2,900	26.80
1939	1,100	1.5	1,600	27.50
1940	6,530	2.0	9,400	24.00
1941	2,700	1.0	2,700	46.40
1942	12,600	2.0	25,200	59.90
1943	15,100	1.4	21,100	75.30
1944	14,100	1.8	25,400	69.50
1945	9,000	1.4	12,600	83.20
Average 1936-43:				
Oklahoma	5,600	1.8	9,800	37.40
United States	25,600	2.4	60,400	21.93

SOURCE: Agricultural Statistics, for the years 1937-1946, United States Department of Agriculture.

Results of tests of fall spinach at the Oklahoma Vegetable Research Station in 1946 showed yields ranging from 3.07 tons per acre on fertilized plots to 1.37 tons on unfertilized plots. Similar results were also obtained in 1945. Fertilizer and improvement in other practices such as preparation of the seed bed and time of planting, given favorable weather conditions, will increase the yield of this crop.

The possibilities present for increased yields, the comparatively favorable prices, and the ample market outlets are conducive to the continuation of this vegetable as one of the leaders in the State.

Snap beans. Snap beans rank second in acreage for processing and in processed volume (Tables 19 and 23). The average yield is 1.0 ton per acre, which is low in comparison with that of other states. The ten-year average price is a little lower than the United States average.

The Oklahoma Agricultural Experiment Station says that processing facilities for snap beans are ample for a pack from a considerably larger acreage than will be planted in 1948; but marketing problems, such as inferior grading and handling and low prices resulting from apparent greater competitive advantage of other areas, are acute.[8] In 1944 and 1946, Oklahoma prices were about $6.00 below the United States average; in 1945 the two prices were about the same.

The average yield from experiments with fertilizer at the Bixby research station in 1946 was 2.36 tons per acre.

Tomatoes. Tomatoes rank third in processing acreage and volume processed in the State, and in 1946, the processing acreage was estimated as being equal to that of green beans.

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[8] Loc. cit.

Table 23. Snap Beans for Processing; Acreage, Yield, Production, and Seasonal Average Price Received By Farmers In Oklahoma, 1930-1946

Year	Acreage Planted	Yield Per Acre	Production	Price
	(Acres)	(Tons)	(Tons)	(Dollars)
1930	700	.6	420	50.00
1931	200	1.0	200	40.00
1932	100	1.0	100	30.00
1933	200	1.0	200	37.50
1934	300	.8	50	40.00
1935	100	1.0	100	40.00
1936	350	.2	70	40.00
1937	600	1.1	440	40.00
1938	1,000	.9	800	39.20
1939	270	1.0	200	30.00
1940	600	1.5	840	40.00
1941	2,590	1.5	3,880	40.00
1942	5,300	1.4	7,400	89.80
1943	6,000	.7	4,200	92.50
1944	9,700	1.2	11,600	90.00
1945	5,000	1.0	5,000	104.80
1946	2,000	1.1	2,200	105.00
Average 1935-44:				
Oklahoma	2,610	1.0	3,000	54.10
United States	89,080	1.67	146,800	58.47

SOURCE: Commercial Truck Crops, 1944 (and supplements for 1945 and 1946) United States Department of Agriculture.

Although this crop is being canned in the State, horticultural authorities have pointed out that:

> ...a canner in Oklahoma would find it difficult to compete with the factories located in Indiana or Maryland in the production of manufactured tomatoes and sweet corn. With the climate found in Oklahoma, it is not reasonable to expect to be able to produce the yield and the quality in these crops necessary to develop a large canning enterprise. [9]

Tomatoes for canning should be well ripened, sound, smooth, free from rot, cracks, sunburn and other defects, and medium to large size. Poor quality in the raw product makes it impossible for the canner to pack acceptable canned stock.

High summer temperatures, such as are found in most of Oklahoma, limit the setting of fruit and affect the development of the red color in tomato fruits. Color is the greatest single factor affecting the grade of canned tomatoes.[10]

The average yield of tomatoes for processing in Oklahoma has been estimated at figures ranging from 1.3 tons[11] to over 2 tons[12] per acre. However, since these are State figures, they include much upland acreage found in the extreme eastern part of Oklahoma. Thus they are not representative of the bottom lands, which are adapted to the production of a variety of vegetable crops. The average yield in 1946 of all farms in the sample taken from Tulsa and Wagoner counties was 4.4 tons. One five acre patch in Tulsa

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[9] Frank B. Cross, et al, An Elementary Course in General Horticulture, p. 111.

[10] H. B. Cordner, Production of Tomatoes for Canning in Oklahoma, pp. 2-5.

[11] United States Department of Agriculture, Bureau of Agricultural Economics, Commercial Truck Crops for Market and for Processing, 1946, p. 2.

[12] H. B. Cordner, Op. cit., p. 6.

County yielded 10.8 tons per acre in 1946.[13] Professor Cordner states that with better practices it is reasonable to expect yields of five to eight tons in tomatoes grown for canning.[14] Results of experiments at the Bixby research station in 1944 and 1945 show an average of over 8.6 tons of marketable fruits per acre for the highest yielding variety.[15] Plants in this test were set four by four feet in the field. Considering cross section resources and average management, it is believed that five tons per acre is not too high a figure to set as an attainable yield.

The average price paid for processing tomatoes in Oklahoma for the period 1935 to 1944 was $12.60 per ton, while the average for the United States for the same period was $16.20. However, recent years have found prices comparatively more favorable. The 1945 price in Oklahoma was about $1.00 less and the 1946 price was about $5.50 more than the United States average.

In regard to the tomato canning industry in Oklahoma, Professor Cordner points out that its minor importance in the past[16] has been due to poor practices on the part of growers and the fact that climatic factors in certain parts of the State are not especially conducive to the production of a good yield and high quality product.[17]

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[13] Vegetable Study Schedules.

[14] Cordner, loc. cit.

[15] Oklahoma Agricultural Experiment Station, The Oklahoma Vegetable Experiment Station at Bixby, Progress Report, 1946, pp. 27-28.

[16] The publication referred to is dated March, 1942.

[17] Cordner, Op. cit., pp. 5-6.

In view of the adaptability of this vegetable to the climatic conditions and the resulting yield and quality, it is doubtful that it will become a major crop even among vegetables. However, it will fit into and have a place in a well diversified farming system which is made up largely of vegetable crops.

Sweet corn. Sweet corn is processed by only one canner in the State, but is important as a fresh market crop, particularly in the Bixby area. It was brought out in the preceding section that horticultural authorities do not believe the yield and quality to be sufficient for a large canning enterprise. An investigation in the Columbia Basin in Washington points out that an attempt to operate a cannery to care for the surplus in a region in which truck crops are grown primarily for fresh market is an unsound practice because such surplus truck crops often are not suitable for processing. Canning, freezing, or dehydrating require certain qualities in the raw product, if the processed goods are to be satisfactory.[18]

On the other hand, some large growers sort the ears in the packing shed, send the poorer quality ears to the cannery, and sell the better quality ears on the fresh market.[19]

Although, the sweet corn is sorted at the association sheds in Oklahoma and a great deal of it goes to waste or is fed to hogs, it is doubtful that the volume would be sufficient for even a small processing plant. Then, too, the volume of culls varies a great deal from year to year according to the intensity of the worm infestation and other factors.

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[18] United States Department of the Interior, Bureau of Reclamation, Op. cit., p. 55.

[19] Paul Work, Op. cit., p. 370.

Results of the schedules taken show a yield of 271 dozen ears of sweet corn per acre in 1946. Yields vary a great deal between individual farms. Some operators reported yields of as much as 1,000 dozen ears in unusual years, while others made as little as 150 dozen ears. These yields represent for the most part the count of high grade marketable ears accepted at The Bixby Truck Growers Association, and does not include ears which were seriously damaged by insects or were smaller than a specified size. Those operators with the largest sweet corn acreages (50-100 acres) reported significantly lower yields than those with smaller acreages. Yields of 903, 890 and 723 dozen ears per acre were obtained in tests with treated and untreated seed at the Bixby research station in 1945.

The canning of sweet corn requires additional processing equipment not used for such vegetables as spinach, snap beans, tomatoes, sweet potatoes, asparagus, etc. Therefore, a canner would have to have a relatively large supply of raw material before a sweet corn enterprise would be economically feasible, whereas processing a relatively small supply of another crop which did not require special equipment might be justified.

Sweet corn will likely continue to be a major vegetable for the fresh market, but its potentialities as a processing crop are doubtful.

Sweet potatoes. Sweet potato acreage in Oklahoma averaged 12,000 acres per year for the period 1934-43 (Table 24). Yield per acre for the same period was 66 bushels which is low compared with yields in other states; however, the price received has been high compared with prices in other states. Experiments at the Bixby research station with the time of planting and time of harvest of the Porto Rico variety in 1944 and 1945 produced maximum average yields of 214 and 215 bushels of No. 1 roots

Table 24. Sweet Potato Acreage, Yield, Production, and Seasonal Average Price Received By Farmers In Oklahoma, 1930-1945

Year	Acreage Harvested	Yield Per Acre	Production	Price
	(Acres)	(Bushels)	(1,000 Bushels)	(Dollars)
1930	17,000	70	1,190	1.00
1931	19,000	70	1,330	.70
1932	22,000	72	1,584	.47
1933	18,000	78	1,404	.62
1934	14,000	55	770	.97
1935	15,000	72	1,080	.70
1936	15,000	35	525	1.43
1937	15,000	70	1,050	1.05
1938	21,000	70	1,470	.91
1939	21,000	45	945	1.00
1940	10,000	80	800	.90
1941	12,000	90	1,080	.90
1942	10,000	80	800	1.34
1943	12,000	50	600	2.65
1944	13,000	80	1,040	2.11
1945	10,000	75	750	2.44
Average 1934-43:				
Oklahoma	12,000	66	792	1.20
United States	796,600	84	67,059	.97

SOURCE: Agricultural Statistics, for the years 1931-1946, United States Department of Agriculture.

respectively. This variety is considered the best available for commercial production at present.[20]

At least one Oklahoma canner packed sweet potatoes in 1947 and another has indicated an interest in processing this crop. Because of the time of harvest, it would fill an otherwise slack season for processors, thus adding to their economic efficiency.

Sweet potatoes have been canned commercially for many years, but consumer acceptance has been slow in spite of the fact that much of the product is of a very high quality.

> Opportunity for expanding this outlet could perhaps be enhanced by the utilization of varieties and strains of uniform color. Assuming an attractive product, there seems little doubt that canned sweet potatoes could be more effectively utilized as another method of making sweet potatoes available the year around. 21

As a processing crop this vegetable also has the advantage that it requires relatively simple equipment, which is common to most canneries using pressure cookers.

Preliminary investigations in Oklahoma have indicated that dried sweet potatoes can satisfactorily replace corn in beef calf ration. Since a part of the sweet potato crop each year consists of culls undesirable for human consumption, this can provide a market for the culls and a carbonaceous feed for finishing cattle. A substitute for corn would be desirable since it is not produced in sufficient volume in Oklahoma to supply the needs of

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[20] Oklahoma Agricultural Experiment Station, The Oklahoma Vegetable Research Station at Bixby, Progress Report, 1946, pp. 24-25.

[21] M. J. Peterson, et al, Sweet Potato Production Possibilities in South Carolina, Clemson Agricultural College, South Carolina Agricultural Experiment Station Bulletin No. 364, pp. 48-49.

cattlemen producing finished beef.[22] In South Carolina, sweet potatoes have also been used in experiments in an effort to find a substitute for corn as livestock feed, and the evidence indicates that sweet potatoes may be such a crop. Data from these experiments show that an acre of sweet potatoes in South Carolina under current conditions and practices will yield a volume of total digestible nutrients 2.2 to 2.5 times greater than an acre of corn and 3.0 to 3.4 times greater than an acre of oats. These differences were obtained by the use of table stock varieties grown with a view toward quality of product rather than quantity. Greater differences would be obtained by the use of varieties designed to produce the highest possible total yield instead of the largest volume of No. 1's.[23]

Indications are that Oklahoma sweet potatoes have increasing possibilities for fresh market, processing, and as stock feed.

Irish potatoes. The commercial Irish potato acreage and production in Oklahoma have decreased for the past 15 years (Table 25). This has been due largely to low yields and poor marketing practices as compared with other areas.[24]

The average yield for the period 1934-1943 was only 93 bushels per acre. The United States average was 149 bushels per acre for the same period.

The price, too, has been very unfavorable as compared with other states and has been far below the United States average. The low price probably has been due largely to the poor marketing practices and low quality.

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[22] Oklahoma Agricultural and Mechanical College, Agricultural Experiment Station, Progress Reports, Feeding Tests With Sheep, Swine, and Beef Cattle, 1946-47, p. 39.

[23] Peterson, et al, Op. cit., pp. 49-50.

[24] Oklahoma Agricultural and Mechanical College, Extension Service, Marketing Fruits and Vegetables in Oklahoma, p. 6.

Table 25. Commercial Potato Acreage, Yield, Production and Seasonal Average Price Received By Farmers In Oklahoma, 1930-1945

Year	Acreage Harvested	Yield Per Acre	Production	Price
	(Acres)	(Bushels)	(1,000 Bushels)	(Dollars)
1930	11,000	128	1,408	1.10
1931	11,750	85	999	.50
1932	8,300	114	946	.46
1933	7,000	97	679	.88
1934	10,000	100	1,000	.46
1935	9,000	84	756	.45
1936	7,500	80	600	1.05
1937	6,900	95	656	.53
1938	6,200	96	595	.60
1939	5,600	90	504	.55
1940	4,500	117	526	.51
1941	4,200	95	399	.60
1942	3,700	100	370	.90
1943	7,500	70	525	1.15
1944	2,800	75	210	1.15
1945	500	60	30	1.70
Average 1934-43				
Oklahoma	6,360	93	589	.68
United States	322,960	149	48,067	.82

SOURCE: Agricultural Statistics, for the years 1931-1946, United States Department of Agriculture.

One of the most important failures of Oklahoma growers in the field of marketing practices has been washing of the product. Improvement by adoption of this and other good practices would likely improve the competitive ability of Oklahoma potatoes both in the principal markets and for the use of land. The low quality of Oklahoma potatoes has often been the result of sun scald, or of wet weather conditions at the time of harvesting.

Reports of the Bixby research station have not included any data on yields, but experiments in rotations of vegetable crops there have shown potatoes to be a most desirable crop to precede fall spinach.

Although Irish potatoes are not generally thought of as a canning crop, a limited amount is packed in the United States. One Oklahoma canner packed whole new potatoes with snap beans in 1947. However, his supply of potatoes was obtained from an out-of-state source.

This action by the canner and the findings of the Bixby research station suggest that this crop may have a place in the organization of farms producing vegetable crops primarily for processing.

Asparagus. Asparagus, produced by a very small number of growers in Oklahoma is marketed as a fresh vegetable. Members of the staff of the horticulture department of Oklahoma Agricultural and Mechanical College strongly recommend asparagus as a vegetable well adapted to the soil and climate of the vegetable producing regions of Oklahoma. The Oklahoma Vegetable Research Station at Bixby is now growing this crop in an effort to learn more about its adaptability to the State. Yields of 1.0 to 1.5 tons per acre may be expected.

Relatively simple equipment which is common to most canneries using pressure cookers is adapted to processing asparagus. Therefore, this vegetable would require no extra or added expense for the canner.

Asparagus is one of the two vegetables of major importance that are perennial. Heavy yields are not to be expected until the fourth year from seed or the third year from plants set in the field, however, beds last from 12 to 20 years or longer. This vegetable is costly to bring into production but it is relatively cheap to maintain.[25]

The largest hurdle in the way of extensive adoption of this vegetable is to be found in the type of land tenure predominating in the potential regions of production. Fifty-six percent of the general farms and vegetable farms combined which fell in the sample survey were tenants.

Most tenants rent land for a period of one year, and most agreements are oral. Provisions are not made for paying the tenant for making improvements; neither are provisions made for the tenant to pay for any damages to the property. Without some type of relatively long-time lease and other agreements to pay the tenant for improvements, the possibilities for this crop are limited to the remaining 44 percent of the farms.

One other remedy is, of course, an increase in operator-ownership. Besides the ordinary obstacles to ownership, mineral activity in the form of oil and gas leasing and production activities prevail in some parts of the area, and inflated land prices as a result of this activity have put ownership beyond the reach of most potential owners.

Asparagus is particularly desirable as a part of the farm organization because harvesting and marketing occur in the spring and early summer when the labor demand is relatively low. Also this crop provides a source of income at a time of the year when the grower has just been out a great deal

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[25] Paul Work, Op. cit., p. 523.

of expense for seed and fertilizer, and at a time in advance of income from most other crops.[26]

In California, the early part of the asparagus crop is sold on the fresh market and the later harvest is canned. This is a desirable arrangement for the grower as it may provide him with a little added income. A program which included such an arrangement as this might add the necessary incentive to develop this crop as an important one in the Oklahoma vegetable industry.

Due to the perennial nature of this crop, its high initial cost, its long period of gestation, and the high percentage of tenancy present, the instigation of asparagus production in a volume sufficient to meet the needs of a processor will require intensive effort on the part of interested parties--much more so than in the case of other vegetables.

If each owner-operator of the general and vegetable farms in the area sampled planted four acres of asparagus and it yielded 1.2 tons per acre, it would result in a volume which would produce approximately 33,000 cases of the canned product. This would involve transporting produce a long distance to reach one cannery centrally located, and the volume would be small.

Green peas. Most green peas for canning are grown in the northern one-half of the United States. As far as can be determined only one Oklahoma processor has canned peas in the past. Data concerning this crop and the volume packed are not available. The processor produces his own supply of raw material of this vegetable as well as processes it.

The long-time average yield in the United States is about 1,500 pounds of shelled peas per acre. In only a few states does the yield run

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[26] Paul Work, loc. cit.

as high as 2,000 pounds per acre; the lowest long-time yield for an individual state is 1,300 pounds per acre. A favorable season in 1947 produced yields in different varieties ranging from 1,400 to 2,200 pounds of shelled peas per acre at the Bixby research station.[27] In 1945 the maximum yield was 1,000 pounds.

Peas have several advantages. It is a nitrogen gathering crop, and land devoted to it, when properly handled, increases in productiveness. For this reason it makes an ideal addition to a crop rotation. Harvesting of the pea crop is early enough that it may be followed by another crop such as lima beans or blackeye peas. In cases where for some reason it is not profitable to harvest the pea crop, the vines may be turned under, adding materially to the fertility of the soil. A by-product of the pea processing industry is the pea vines. These vines may be utilized as cattle feed either green, as hay, or as silage.[28] Peas also have the advantage that their harvesting is mechanized to a large degree.[29]

Blackeye peas. Blackeye peas have not been grown extensively in the past, but interest in this crop is increasing among growers. The latter fact can be attributed to the recent desire of canners to process blackeye peas. This vegetable ranked third in volume processed in the State in 1946 by members of the Ozark Canners Association and promises to be among the leaders in 1947. However, a great deal of the raw product was imported from out-of-state sources.

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[27] Oklahoma Agricultural Experiment Station, The Oklahoma Vegetable Research Station at Bixby, Progress Report, 1947, p. 3.

[28] United States Department of Agriculture, Growing Peas for Canning and Freezing, pp. 20-22.

[29] Paul Work, Vegetable Production and Marketing, pp. 401-402.

This crop is also a legume, thus it has several advantages which were discussed under green peas. Since this is a fairly late crop it may follow an early one such as green peas. Experiments are under way to discover a vine type that stands up off of the ground far enough to permit mechanized harvesting similar to that used for green peas. The successful development of mechanized harvesting of blackeye peas would give the crop added advantage in competing with other vegetables for the use of land, and the vine by-product would be made available for feed or fertilizer.[30]

Lima beans. As in the case of blackeye peas, this vegetable has not been grown very extensively. Available records show that it was first processed in the State in 1946.

Experiments at the Bixby research station in 1946 showed that four different varieties yielded around 800 pounds or more of shelled beans per acre.

> These results suggest that lima beans may be profitably grown as a fall crop for canning and freezing in Oklahoma when planted after an early maturing crop such as peas. 31

The long-time average yield of lima beans for processing in the United States is over 1,100 pounds per acre, but the average is less than 700 pounds in one state which grows a large acreage.

Vegetable Crops in Farm Organization

The extent to which the individual farm operator can go in including vegetable crops in his organization is, of course, primarily influenced by the market outlets available. This will be discussed in the

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[30] See discussion under section on green peas.

[31] Oklahoma Agricultural Experiment Station, The Oklahoma Vegetable Research Station at Bixby, Progress Report, 1947, p. 1.

next section. If all the advantages of diversification are to be realized, there is a limit to the amount of vegetable which may be included. The 55 acres of vegetables on 135 acres of cropland recommended by a study of production adjustments to improve farming opportunities,[32] is not an upper limit for the future, but is probably as much as is advisable at this time. It was brought out in this study that it was believed the present markets would not absorb more than the production of the recommended acreage of vegetables.

It is believed that in a few years 85 acres of the 155 acre farm recommended[33] could be profitably allocated to vegetables. This would leave 50 acres of cropland to be devoted to alfalfa, field corn, and possibly a small acreage of cotton.[34] With the proper selection of the individual vegetable crops, the resulting system should be sufficiently diversified.

Returns from the several crops physically adapted must not be overlooked. These were graphically illustrated for selected crops in Figure 4.

Stability is a most desirable condition in any industry. Most of our policies and programs are directed toward this end.

> Under normal conditions, the consumption of vegetable foods is not likely to decline. On the other hand, completion is keen in vegetable production. When prices are good, it is very easy for farmers to take up the production of vegetables after a fashion. Similarly, when prices are low, it does not take long to quit. Thus we are viewing a field of agriculture in which adjustments are rapid. The backbone of the vegetable industry consists of

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[32] See page 19 and Table 5.

[33] See Table 5.

[34] The selection of these vegetable crops should be carefully considered as pointed out on page 22 and in Table 6.

> large numbers of steady, intelligent growers who adjust gradually as conditions change but who do not increase or decrease their operations from year to year. The vegetable business as a whole has shown greater stability under boom and depression than the other branches of agriculture, not rising so high, relatively, as cotton, corn, wheat, or meat, and not falling so low. 35

From this point also, it seems that the inclusion of vegetable crops in a farming system for this area would be desirable.

Market Outlets and Efficiency

These must be reasonable assurance of a market for vegetable crops before farm operators will produce them.

> Quite often producers are encouraged by promoters to plant vegetables in new areas. Many have had the unhappy experience of producing a large supply of vegetables only to find that there were no market facilities or outlets available. Because fruits and vegetables are highly perishable, it is most important that ready markets be available to provide for their easy movement into consumption channels. A few days' delay without a market outlet may mean total loss of the crop. Generally speaking, commercial fruit and vegetable production and marketing is a highly specialized field. 36

A Columbia Basin study points out that the relation between agricultural production and agricultural processing industries is two-fold:

> The types of agricultural production which are physically and economically feasible set a certain limit to processing, but the efficiency with which processing is carried on may go far toward determining the economic feasibility and scale of production of a particular commodity. 37

Products from this area will have to compete in the central market with those from other areas. If the operating costs of processors in this area are higher than those elsewhere, they will pay correspondingly lower

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35 Paul Work, Vegetable Production and Marketing, p. 16.

36 Oklahoma Agricultural and Mechanical College, Extension Service, Marketing Fruits and Vegetables in Oklahoma, p. 8.

37 United States Department of the Interior, Bureau of Reclamation, Columbia Basin Joint Investigations, Agricultural Processing Industries, Problem 24, p. 2.

prices for the raw product. A difference of one dollar in the price of a ton of spinach may not seem much, but that dollar, though a small part of the price, is a large part of the grower's net return and whether he receives is or not makes a great deal of difference in the profitableness of that enterprise. Thus it can be seen that the grower has a direct interest in the efficiency of the transportation, processing, and marketing system.[38]

In order to have a sound, profitable and efficient processing industry, it is necessary that plants be kept in operation over as long a period as possible during the year. Due to the high perishableness of most vegetables, they must be processed immediately after harvesting. Thus the harvesting and packing season are identical for most of them. Good management on the part of the grower in selecting a combination of vegetable crops that mature at different times and over as long a period as is possible will also be in the best interests of the processing industry.

The approximate packing seasons for selecting vegetable crops that may be grown in Oklahoma are graphically illustrated in Figure 7. It can be seen from this that in order to maintain operations on a twelve-month basis, processors would have to depend on raw materials other than vegetables.

Some processors in Oklahoma have recently packed such meat items as chili, tamales, and horse meat; fruits including blackberries, peaches, and apples; and one "dry pack" item, hominy. At least one Oklahoma processor has the equipment for processing pecans and plans to begin operations in this field in 1947. The pecan crop is large in Oklahoma and in the Arkansas River bottom. Processing of this nut may develop into a relatively large and profitable enterprise for some canners during their slack season.

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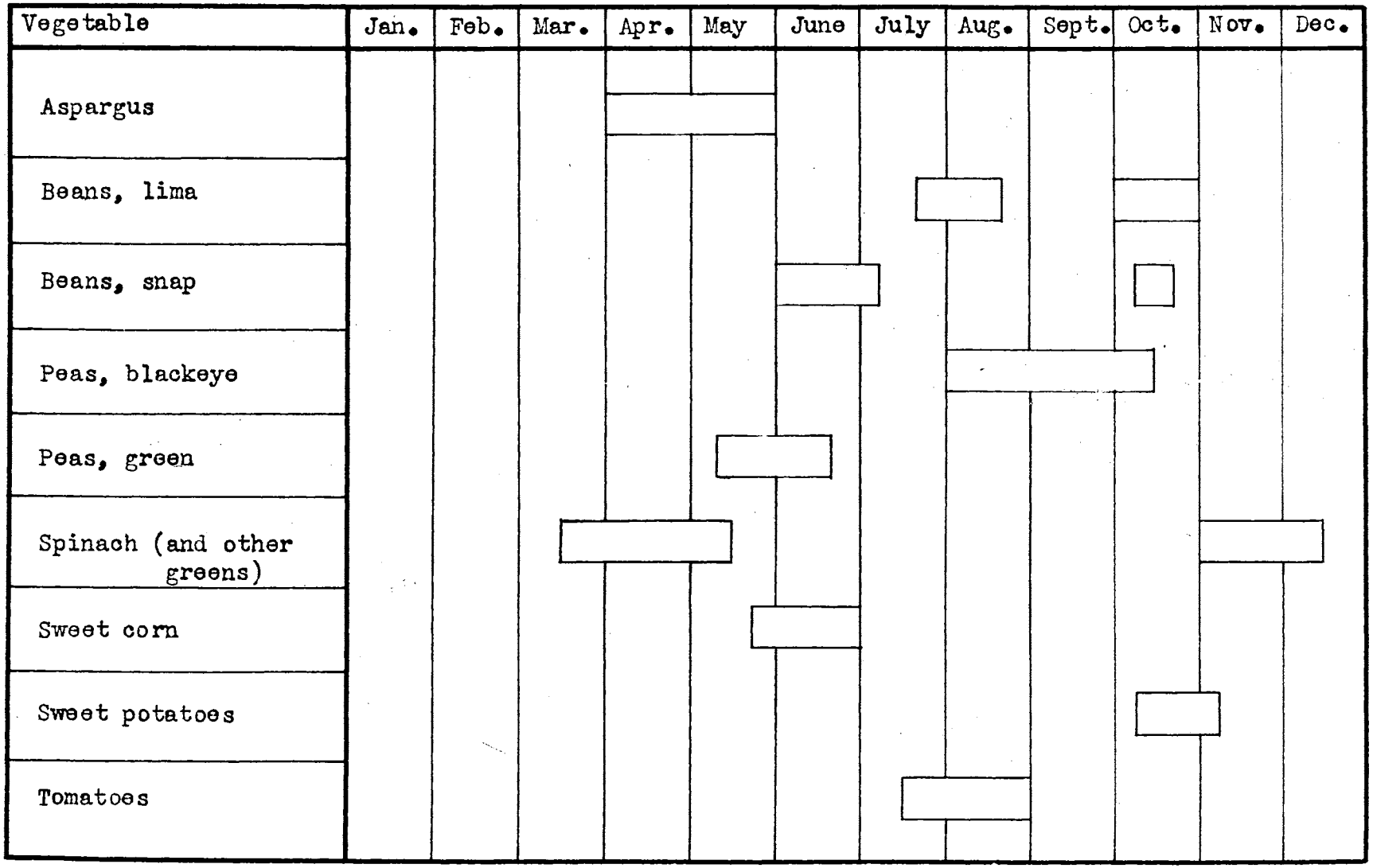
[38] Ibid., p. 3.

Figure 7. Approximate Packing Seasons for Selected Vegetables in Oklahoma



There are many other items such as pork and beans, kidney beans, mung bean sprouts, etc., which can be processed when vegetables are not in season.

Greatly influencing the efficiency of the processing firms and the prices which they can pay for their raw product is their ability to compete in the principal markets. These markets for canned fruits and vegetables in the United States are located east of the Mississippi River and north of the Mason Dixon Line. A comparison of the advantages afforded by locations are indicated by the f.o.b. factory prices of canned vegetables in different parts of the United States which are presented in Table 26. The indications from these figures are that Oklahoma canners will generally be able to compete favorably with those of other areas.

Problems in the Shift

In order for regions such as the Arkansas River bottom to become primarily a vegetable producing area, it will involve changing from a relatively extensive agriculture, producing mainly cotton, corn, and alfalfa, to an intensive type of farming. More labor and more machinery than has been employed in the past will be required. More and costlier seed and more fertilizer will be necessary. Means of rapidly transporting the highly perishable produce to the market or factory must be available. All of these require additional capital that is not needed in the production of cotton, corn and alfalfa. Then there is the problem of management--the farm operator will now have a major job of supervision of employees, whereas he previously performed a large part of the manual labor himself.

The farm labor supply as well as the financing of this factor must be considered. The labor supply was a critical problem during World War II in the vegeteble producing areas of Tulsa and Wagoner counties, as it was in

Table 26. Price Per Dozen Cans of Selected Vegetables F.O.B. Factory, In Different Sections of the United States, 1940

Vegetable	Quality	Can Size	1 Eastern	2 Central	3 Western
			(Dollars)	(Dollars)	(Dollars)
Asparagus	Green tips 60/80	2	2.25	2.10	2.05
Beans, snap	Fancy cut	2	.85	-	1.05
Beans, lima	Fancy small green	2	1.20	1.20	-
Sweet corn	Whole grain	2	1.00	.90	1.05
Peas	Fancy sweet, 2s	2	1.30	1.30	1.35
Peas	Extra std., 2s	2	1.10	1.10	1.20
Spinach	---	2	.67-1/2	.65	1.07-1/2
Tomatoes	Fancy	2-1/2	1.25	1.25	1.25

SOURCE: The Canning Trade Almanac, 1941, The Canning Trade.

1 The Eastern section includes the States of New York, New Jersey, Pennsylvania and Maryland.

2 The Central section includes the States bordering on the Mississippi and principally the Chicago market.

3 The Western section includes the Rocky Mountain States.

most parts of the United States. However, results of the schedules taken in this area indicate that the supply of labor in 1947 was plentiful, although most operators thought the price of labor was too high. Day labor prices ranged from $5.00 in the Bixby area to $3.50 in the Choska bottoms. Much of the farm labor comes from adjoining upland communities and a great many of the laborers are colored.

Capital is the answer to problems such as machinery, seed, and fertilizer. Although only 42 percent of the operators of all general and vegetable farms interviewed reported having loans against their land or machinery, most of the others had borrowed money at some time in the past. Seventy-five percent of the number of loans in existence were from privately owned local banks. Many who had received short term or intermediate term loans from governmental agencies indicated dissatisfaction with these and an intention to seek credit elsewhere should it again become necessary. Eighty percent indicated that if they should need financial aid, they would prefer to do business with a local bank. On the other hand, those dealing with the banks expressed complete satisfaction. More important was the fact that most operators felt they could depend on the local banks to provide for their financial needs. Fifty-six percent of the operators indicated that a substantial increase in their production of vegetable crops would necessitate loans for machinery, or seed and fertilizer.

The seed problem is sometimes answered by processing firms who supply this item to growers, particularly when vegetables are grown under contract. Processors can control the variety and thus obtain a more nearly uniform raw product by using this arrangement.

If Holmes' statement to the effect that, "the supervision of labor absorbs more of the manager's attention than any other factor"[39] is true, the management of vegetable farms will become a much greater problem than on the less intensive type of farm now prevailing. It was previously brought out in this study that, as a whole, the type of farm operator included in the sample was one of high managerial capacity and efficiency. Observation of other farms in the same area substantiate this conclusion. It is believed then the individual operator will master this problem, but the relative success along this line will, of course, vary with the individual.

All of these problems should work out fairly easy. They are small when compared with those involved in a shift from a cash crop system to a livestock-pasture-feed crop system in which the operators would have little or no income for several years.

Paul Work points out that vegetable production is a field of agriculture in which adjustments are rapid--it is very easy for farmers to take up the production of vegetables after a fashion, and it does not take long to quit.[40] In short, the vegetable industry has a low specificity. An exception to this exists in the case of perennial vegetable crops, which is discussed under asparagus.

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[39] C. L. Holmes, Economics of Farm Organization and Management, pp. 213-214.

[40] Paul Work, Vegetable Production and Marketing, p. 16.

Influence of Price on Production

There is evidence of some correlation between low prices and high volume of production (and vice versa) of vegetable crops in Oklahoma. The prices received for fresh vegetables in Oklahoma seem to depend to a great extent upon the amount of competition from other areas at the time of marketing. In July, 1945, growers in the Bixby area were receiving as much as 40 cents per dozen ears for sweet corn. Although the acreage was only about 60 percent of the 1944 acreage,[41] it is believed that a seasonal shortage in supply, evidenced by the fact that sweet corn from other areas appeared on the Chicago market only seven days during the month,[42] was largely responsible for this abnormal price. On the other hand, the 1946 fall spinach price in Oklahoma was low because of favorable production in the early fall states.[43] In Figure 8, price and volume of sweet corn marketed through The Bixby Truck Growers Association was plotted by years. Price and volume have moved in opposite directions except in 1943. This exception can be attributed to the fact that sweet corn production was then experiencing a rapid increase in this area, and was expanding because of the improved marketing opportunities afforded by the organization of the Bixby association in 1941. It appears, therefore, that the price received for sweet corn in this area is affected both by the local volume and by the volume reaching the central markets at the same time as Oklahoma sweet corn.

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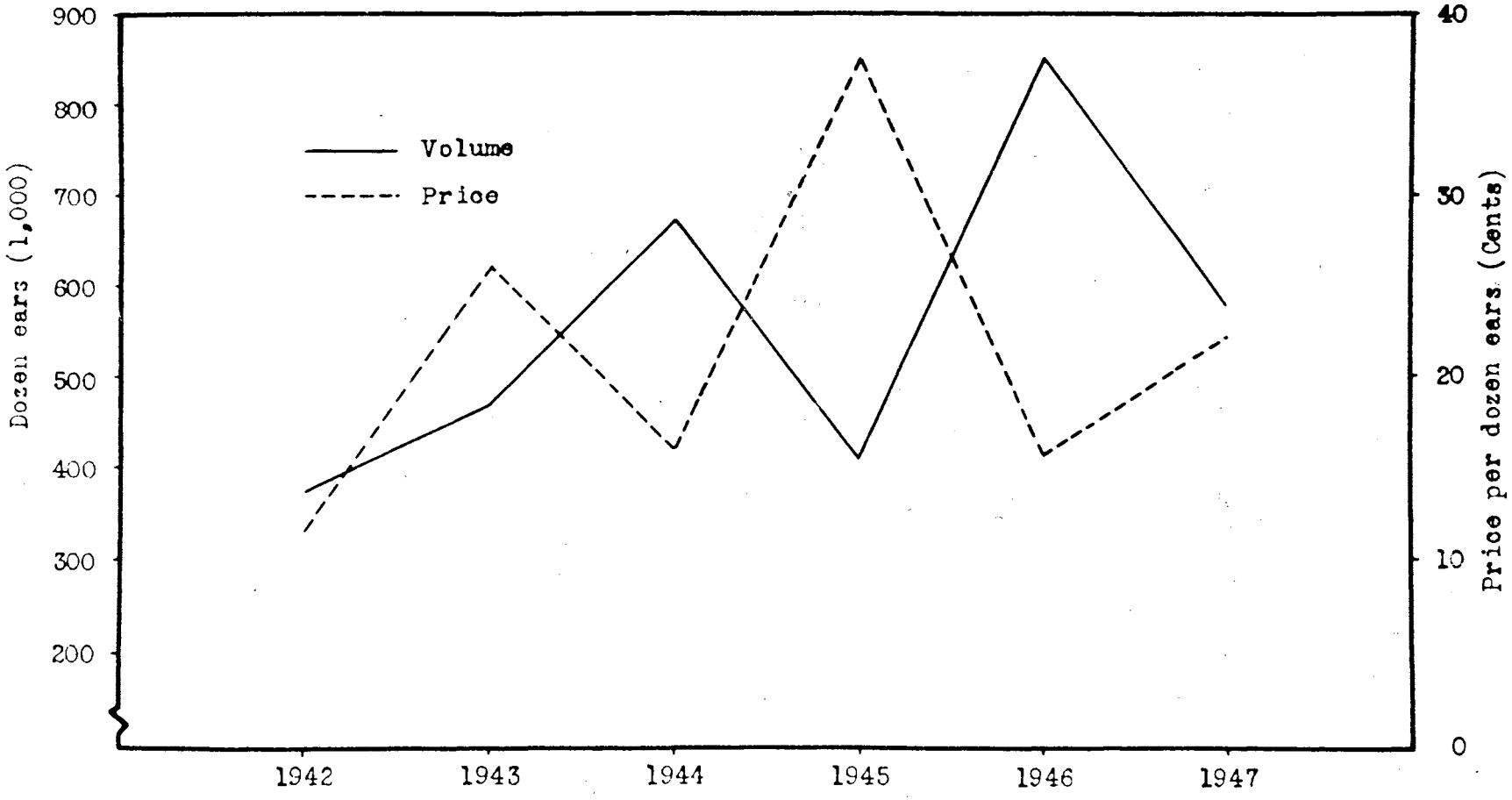
[41] Files of A. W. Jacob, Extension Economist, Marketing, Oklahoma Agricultural and Mechanical College.

[42] Ibid.

[43] United States Department of Agriculture, Bureau of Agricultural Economics, Commercial Truck Crops for Market and Processing, 1946 (mimeographed).

Figure 8. Price and Volume of Sweet Corn Marketed Through The Bixby Truck Growers Association, 1942-1947



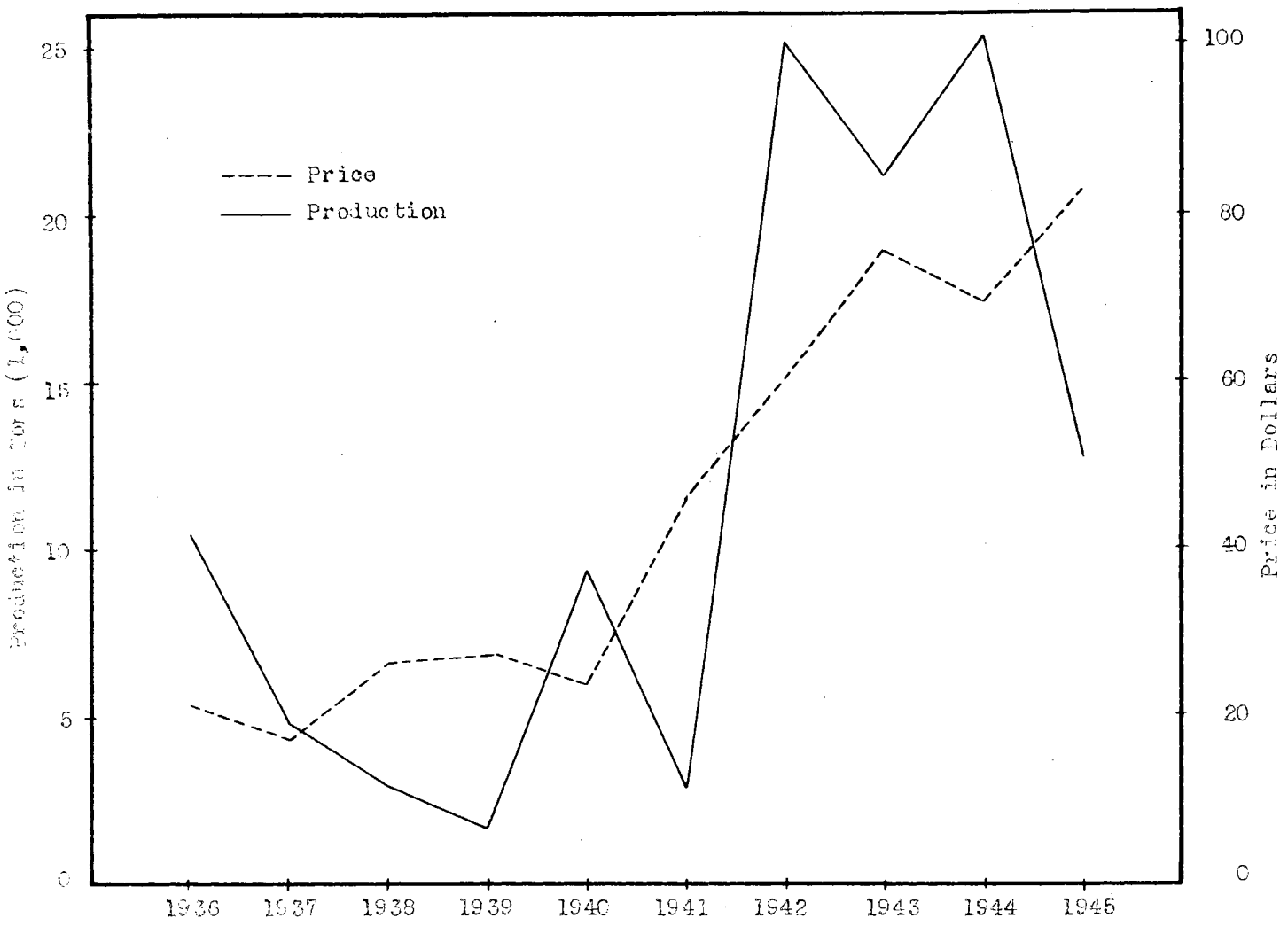
SOURCE: Records of The Bixby Truck Growers Association; and files of A. W. Jacob, Extension Economist, Marketing, Oklahoma Agricultural and Mechanical College, Extension Service.

Most producers in the Sixby area have noticed the relationship between prices and volume of sweet corn, and insist that in the future they plan to make acreage adjustments from year to year which they believe will exert a somewhat stabilizing influence on the price. However, it is believed that the change in acreage and production from year to year largely can be attributed to the practices of a group of growers who do not plant any sweet corn one year, but then include this crop in their organization in those years following a year of high price, while those growers who grow sweet corn year in and year out have maintained about the same amount of acreage each year. This belief is supported by processors, those connected with the fresh vegetable business, and others familiar with the vegetable industry in this section. Data collected in the sample show that 13 percent of the general farms which included vegetables in their organization in 1946, a year of comparatively low price, did not include any in 1947, while there was no evidence that farms excluding vegetables in 1946 included vegetables in 1947.

The price and production of Oklahoma spinach for processing have moved in the same direction five years and in the opposite direction five years out of ten (Figure 9). However, most of those years in which price and production both increased or decreased were war years in which unusual demand existed. Thus, price and production of spinach seem to be inversely related to some extent.

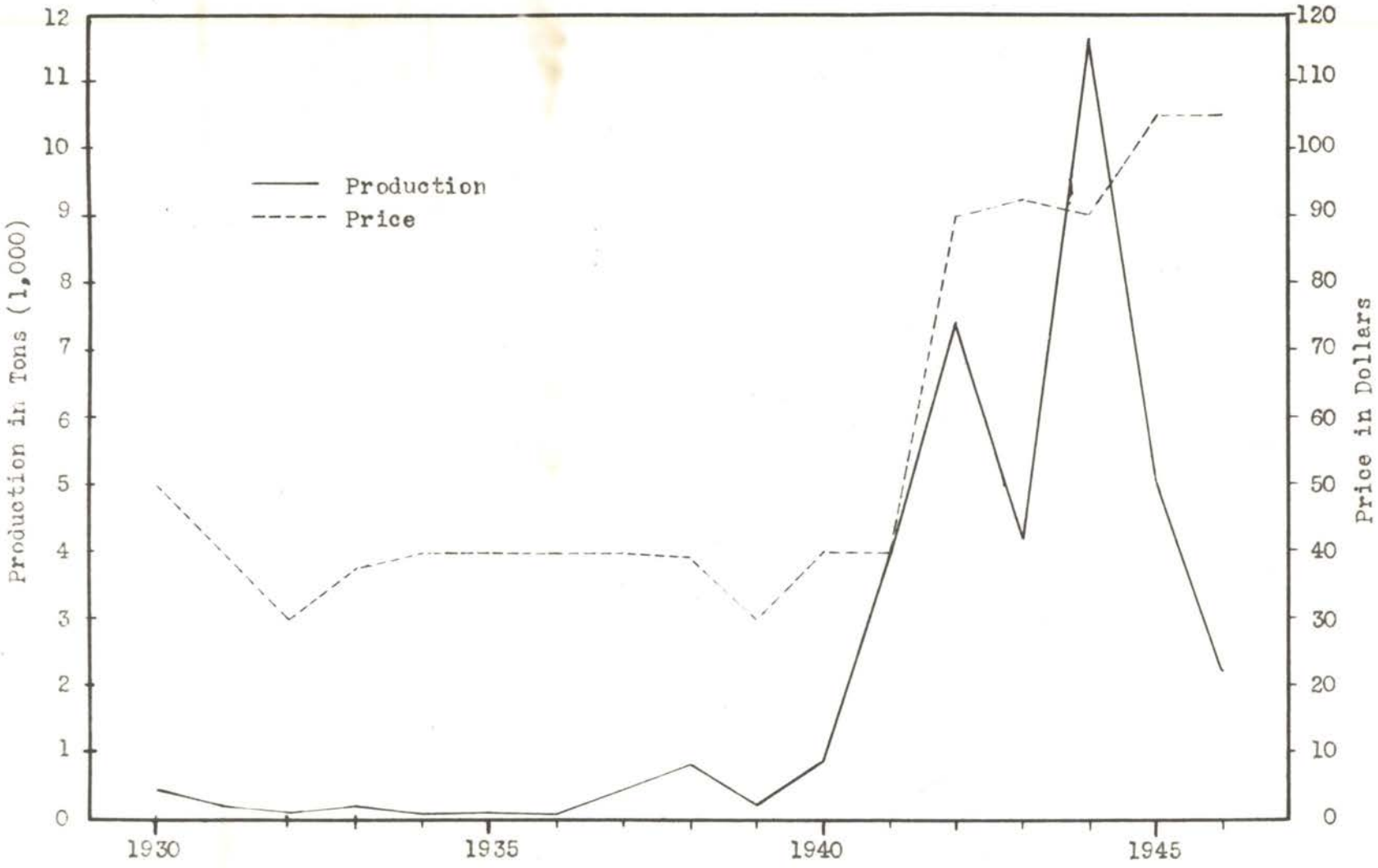
Price and production data for Oklahoma snap beans for processing (Figure 10) indicate movements in the same direction for eight years and in the opposite direction for eight years. As in the case of spinach, most of the movements in the same direction were in unusual years, namely, the depression of the early thirties and World War II.

Figure 9. Production and Price of Spinach for Processing in Oklahoma, 1936-1945



SOURCE: Table 22.

Figure 10. Production and Price of Snap Beans for Processing in Oklahoma, 1930-1946



SOURCE: Table 23.

In regard to fresh vegetable supply and price, Converse and Huegy point out that supply varies widely in short periods because of the perishable character of the commodities. Demand does not vary as widely, so wide seasonal price fluctuations are to be expected.[44] Not only are the harvested vegetables of a highly perishable character, but the quality of the yield is very important, more so than in most other crops. Vegetables of a very poor quality often cannot be sold at any price, whereas, in a crop such as wheat the price will vary in more nearly direct proportions with the quality.

The same writers go on to say:

> With vegetables, only one growing season, often only a few months long, is required for an increase or decrease in acreage in response to price. The acreage of vegetables seems to respond more quickly to price than that of staple field crops such as corn, wheat, and cotton. The difference may be due to the fact that the vegetable farmer often grows a variety of crops. 45

Converse and Huegy further state that since a large part of the vegetables grown for processing is under contract, its price is somewhat stabilized as compared with the price of those grown for the fresh market.[46] A study of the price relatives of nine vegetables for fresh market and for processing for the period 1929-1945 apparently bears out this statement, the processing price being the most stable for six vegetables, the fresh market price being the most stable for one vegetable, and there being no apparent difference in the price stability of the other two. There was, however, very little acreage under contract in Oklahoma. However, a weighted index of all vegetables

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[44] Paul D. Converse and Harvey W. Huegy, The Elements of Marketing, pp. 483-484.

[45] Ibid., p. 484.

[46] Ibid., pp. 488-489.

might favor the processing price. The acreage of processing vegetables decreased a great deal more, relatively, than the acreage of fresh market vegetables during the depression of the thirties.

The stability of processing prices may be due to monopoly pricing and it may be that processing prices are too far out of line with fresh market prices. Further study along this line might be desirable.

Another point that should be brought out is the fact that fresh vegetables represent a relatively expensive source of energy to city consumers, and it would be reasonable to expect that in periods of reduced income their consumption of these would be somewhat curtailed.[47] Therefore, the fact that the vegetable industry as a whole has shown greater stability under boom and depression than the other branches of agriculture[48] can probably be attributed to the processing industry.

As periods of low income are marked by a decrease in the consumption of the more expensive foods, it is reasonable to assume that the consumption of less expensive foods would increase. Spinach, other greens, snap beans, and tomatoes, which are now the leading processing crops in Oklahoma, are among the less expensive canned vegetables. Thus it can be seen how the vegetable industry could bring a more nearly stable agriculture to areas in which it predominates.

It was pointed out that the vegetable industry as a whole has shown greater stability under boom and depression than the other branches of agriculture. A comparison of the price indexes of several groups of crops

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[47] Ibid., p. 479.

[48] Paul Work, Vegetable Production and Marketing, p. 16.

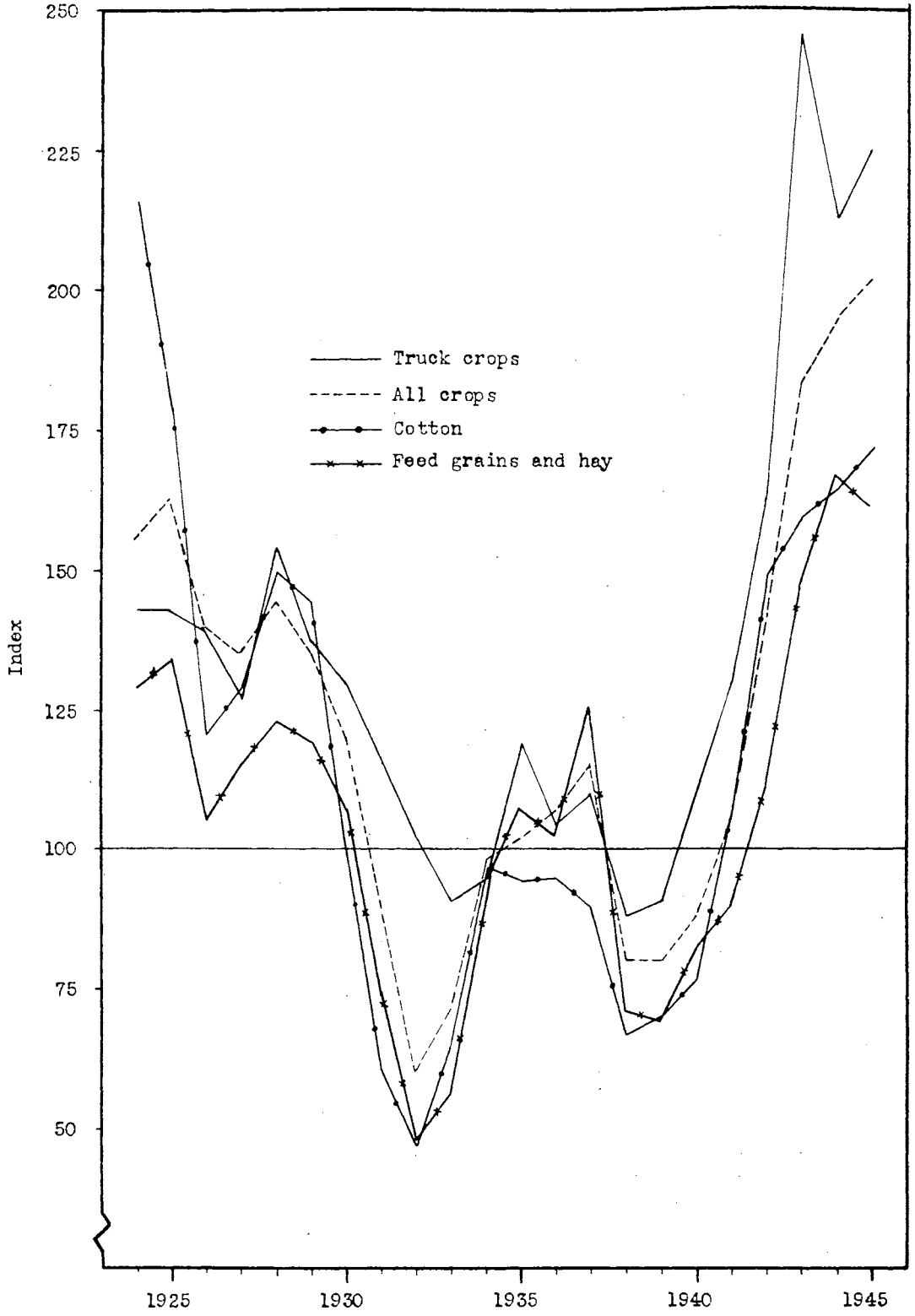
show that truck crop prices received by farmers have been the most stable for the last two decades with the exception of the World War II period (Figure 11). However, indications in 1946 and 1947 were that vegetable prices were falling below those of other crops. Note in the illustration that the vegetable price has been more stable even than a combination of the price of all crops. Therefore, it is probable that the returns from vegetables would not compare with the returns from other crops as favorably when a high price level exists as they would in a period of medium or low price level. It follows from this that from the point of inducing farmers to grow vegetables, the possibilities for establishing a large vegetable industry in an area would be better in times other than a period of high price level.

Attitude of Farm Operators

A large percentage of farm operators in adapted regions have already indicated their desire to grow vegetable crops by entering into these enterprises. Data on the inclusion of vegetable crops in the organization were presented in the chapter on farm organization and in Tables 7 and 10. The operators of 85 percent of the cropland of the general farms which excluded vegetable crops from their organization either were prejudiced against vegetable production or for other reasons preferred to grow such crops as cotton, corn, and alfalfa. This percentage amounted to 19.6 percent of the total cropland, which, when combined with the cropland on livestock farms, fruit farms, and residential and retirement farms, amounted to 25 percent of all cropland in the sample. Although some part of this land might be brought into vegetable production at some time in the future, the production picture is definitely limited by the attitude of the farm operators.

Several farm operators in the sample volunteered the information that they would like to grow vegetables under contract. Those who did not

Figure 11. Index Numbers of Prices Received by Farmers, by Selected Groups, in the United States, 1924-1945



SOURCE: Agricultural Statistics, 1946, United States Department of Agriculture.

offer information on this subject were questioned as to their attitude. Many said they had not considered the subject, but none had any objections, although, most of the growers who produced primarily for the fresh market indicated they would not be interested.

Potential Volume

The purpose of this section is to estimate the potential volume of commercial vegetable production in the area sampled, and to apply the figures applicable there to all of the Arkansas River bottom land between Tulsa and the Arkansas State line. This latter area was selected because it is the present major vegetable producing area in Oklahoma. Estimates on acreage and tonnage are to the nearest hundred.

The sampled area. There were 5,349 acres of cropland in the sample. The sampling rate was one out of six, so the expanded figure was 32,094 acres. Twenty-five percent of this can be deducted due to the unfavorable attitude of some farm operators, or the type of farm, leaving 24,071 acres.

The suggested acreage, for the present, of 55 acres of commercial vegetables on a farm with 135 acres of cropland is 41 percent of the total cropland. This percentage applied to 24,071 acres gives 9,869 acres. It is estimated[49] that 25 percent of this acreage would be planted to two vegetable crops each year, resulting in a total annual vegetable acreage of 12,300 acres in this area. Using the data presented in Appendix Table 4,

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[49] This estimate was arrived at after consultation with various agricultural authorities familiar with this area, from data obtained in the sample, and from observation of this area.

it is estimated that this acreage would produce 23,700 tons of vegetables, (Table 27) which if canned, would total 1,260,600 cases.[50]

If 85 acres (63 percent of the total cropland) on the recommended size farm were devoted to vegetable crops, the result would be 15,165 acres. Expanded by 25 percent to allow for that land planted to two crops each year, the resulting annual vegetable acreage would be 19,000 acres. The resulting production would be 36,400 tons of vegetables, which would result in a canning pack of 1,937,100 cases.

Further estimates based on the information in Appendix Table 4 indicate that the estimated potential volume in the area sampled would require 684 days of single-line cannery operation[51] at the present suggested acreage of 55 acres of vegetable crops per farm, and 1,051 days of single line cannery operation at the maximum suggestion of 85 acres of vegetable crops. Estimates on individual vegetable crops are presented in the worksheet in the Appendix.

The estimates on canned pack and days of cannery operation do not allow for that part of the production which will be sold on the fresh market, which should be deducted. This volume will depend on the future efficiency of concentration markets and other channels for fresh vegetables. At present, The Bixby Truck Growers Association handles approximately 2,500 tons of fresh vegetables annually. However, it is believed this organization handles by far the largest fresh market volume in the Arkansas River bottom, thus the tonnage indicated here is not at present representative of

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[50] See worksheet in Appendix.

[51] A single-line cannery is a plant which has only one production or processing line.

Table 27. Potential Vegetable Acreage, Production and Amount of Canning Operation Required for Two Suggested Acreages and for Two Areas

	Unit	Sampled Area	Arkansas River Bottom
Cropland:			
Total [1]	Acres	32,094	96,282
Available for vegetables	Acres	24,071	72,211
Suggested vegetable acreages:			
41 percent [4]	Acres	9,869	29,606
Plus 25 percent [2]	Acres	12,300	37,000
63 percent [5]	Acres	15,165	45,495
Plus 25 percent [2]	Acres	19,000	56,900
Resulting vegetable production:			
41 percent 4	Tons	23,600	71,000
	Cases [3]	1,260,600	3,781,800
63 percent 5	Tons	36,400	109,200
	Cases [3]	1,937,100	5,811,300
Amount of single-line canning operation required: [6]			
41 percent 4	Days	684	2,053
63 percent 5	Days	1,051	3,154

[1] Under the control of operators who now grow vegetables or who are likely to enter into vegetable production.

[2] To allow for acreage planted to two crops each year.

[3] Cases of 24 No. 2 cans.

[4] Percentage of cropland which would coincide with commercial vegetable acreage suggested at present.

[5] Percentage of cropland which would coincide with commercial vegetable acreage suggested for the future.

[6] A single-line cannery is a plant which has only one production or processing line.

other parts of the Arkansas River bottom. The trend of fresh market production in this bottom is definitely upward and will likely continue so, although the steepness of the trend is unpredictable. As stated above, it will depend to a great extent on the efficiency of the marketing channels through which the vegetables must pass.

The Arkansas River bottom land. The percentages found in the sample and the estimates made in the preceding section will be used in arriving at estimates for this area. It is estimated that the Arkansas River bottom land between Tulsa and the Arkansas State line contains 96,282 acres of cropland.

With 41 percent of the cropland devoted to vegetable crops, and 25 percent of this planted to two crops per year, the annual acreage of vegetable crops would be 37,000 acres. The resulting production would be 71,000 tons of vegetables, which would amount to a total pack of 3,781,800 cases.

With 63 percent of the cropland devoted to vegetable crops, and allowances made for land planted to two crops per year, the annual acreage of vegetable crops would be 56,900 acres. The production resulting would be 109,200 tons of vegetables, which would amount to a total pack of 5,811,300 cases.

The days of single-line cannery operation required for this larger acreage and production would be 2,053 days at the lower acreage suggested and 3,154 days at the maximum figure.

CHAPTER V. SUMMARY AND CONCLUSIONS

Commercial vegetable production has never existed on an extensive scale in Oklahoma, but has been confined to regions particularly adapted to vegetable crops. Vegetable crops are very important in the areas where they are grown. Vegetables for the fresh market (exclusive of potatoes and sweet potatoes) have averaged a little over one million dollars in receipts to growers for the period 1924-1941; since 1941 this figure has doubled. Vegetables for processing were of very minor importance until 1942; the average annual receipts to growers since then has been well over two million dollars per year. The value of commercial vegetables (exclusive of potatoes and sweet potatoes) increased from 0.5 percent of all crops in 1924 to 3.5 percent of all crops in 1944.

The greatest concentration of commercial vegetable crops is on the river bottom lands of the eastern part of the State. Most productive of these is the Arkansas River bottom and this region is also where the greatest potentiality for increased production exists.

A sample was taken in the Arkansas River bottom in Tulsa and Wagoner counties in 1947 for the purpose of determining the type of farms and the overall picture of agriculture in the area. The results of this sample show that 56 percent of the farms in the sample included commercial vegetables in their organization in 1946 and 1947, almost all of this percentage including vegetables both years. These farms accounted for 71 percent of the cropland in the sample. These conditions will make an increase in vegetable production easier and more successful than would be the case in an area in which little or no vegetable crops had been produced previously. There would be few problems in shifting from the present system

of farming in this area to one in which vegetables would be the main enterprise.

Fifty-five acres of vegetable crops on a 160 acre farm would be the maximum acreage suggested for the present and it would be advisable to grow as much of this under contract as possible. As the processing industry is developed, it may be profitable for the farm operator to increase this to as much as 85 acres.

Field corn and alfalfa fit well into a system for this area which includes a large percentage of vegetable crops. Cotton competes for labor to such an extent that only a small acreage should be included in the individual farm organization, and it is probable that many operators will exclude it entirely.

Swine seem to be the livestock enterprise best suited to this system from the standpoint of the comparatively small amount of land and labor required, and because it is complementary to the field corn enterprise.

The marketing of vegetables has not been as efficient as is desirable and so has not been conducive to large increases in production. The number of market outlets for fresh vegetables has increased since 1940 and the efficiency of fresh market outlets has increased, but many improvements are still needed. The number of processing outlets has increased since 1944, thus affording better opportunities for vegetable production for processing, but these outlets have not been used to any degree approaching capacity.

The production of vegetables will be influenced to a great extent by the efficiency of the outlets through which they are marketed. The comparative efficiency of the fresh market outlets and the processing outlets will affect the acreage devoted to vegetables for each.

The efficiency of processing outlets will depend largely upon the number of months they will be able to operate during the year. This will in turn depend largely upon the variety of vegetable crops which are produced and the length of the combined harvesting seasons of these crops.

The unfavorable attitude of some farm operators, who control 19.6 percent of the cropland in the sample, will keep a large part of the land which could grow vegetables out of production. The production of vegetables which would result from the acreage suggested for the present would be 23,700 tons in the area sampled; with the development of additional outlets for vegetables this could be increased to 36,400 tons. These same figures for the Arkansas River bottom between Tulsa and the Arkansas State line would be 71,000 tons and 109,200 tons, respectively.

APPENDIX

Appendix Table 1. Relative per Acre Returns for Cotton, Alfalfa Hay, and Selected Vegetable Crops, Bottom Land Soils, Eastern Oklahoma

Item	Cotton	Alfalfa Hay	Spinach	Water-melons	Snap Beans
Yields	250 Lbs. lint 425 Lbs. seed	5 Ton	1 3/4 Ton	250 No.	1 1/2 Ton
Price per unit	11.8 Cent, lint $ 55.93 Ton seed	$ 24.00	$ 57.00	20 Cent each	$ 70.00
Gross value per acre	$ 36.71	$ 72.00	$ 99.75	$ 50.00	$ 105.00
Major variable cash costs:					
Seed	$ 1.04	$ 1.26	$ 1.40	$ 4.00	$ 8.00
Ginning, bagging, ties	3.38	-	-	-	-
Combining, threshing, baling, etc.	-	13.50	-	-	-
Hauling to market	0.78	-	8.75	-	$ 11.25
Fertilizer	-	-	6.80	3.40	5.10
Total	5.20	14.76	16.95	7.40	24.35
Returns over direct cash costs	$ 31.51	$ 57.24	$ 82.80	$ 42.60	$ 80.65
Total labor required per acre:					
Man hours	44.2	9.0	50.0	36.4	67.0
Tractor hours	5.9	4.1	1.8	2.0	2.0
Truck hours	0.8	3.2	N.A.	N.A.	N.A.
Other expenses:					
Harvest:	675 @ $1.75 cwt.	-	-	-	-
Man labor	11.81	-	26.25	-	30.00
Tractor	0.50	-	-	-	-
Total	$ 12.31	1/	$ 26.25	2/	$ 30.00
Returns above major harvest expense	$ 19.20	$ 57.24	$ 56.55	$ 42.60	$ 50.65
Preharvest:					
Man labor	3.87	-	1.50	6.15	2.10
Tractor	2.45	-	0.90	1.00	1.00
Total	6.32	-	2.40	7.15	3.10
Returns above major expenses	12.88	57.24	54.15	35.45	47.55
Gross value with parity price for cotton 3/	57.91	-	-	-	-
Returns over direct cash costs	52.71	-	-	-	-
Returns above major harvest expenses	40.40	-	-	-	-
Returns above major expenses	34.08	-	-	-	-

1/ Included in custom charges. 2/ Sold from field. 3/ Cotton lint at 19.9 Cents per pound (basis 478 pounds to bale) and cottonseed $38.40 Ton.

Appendix Table 2. Normal Monthly and Annual Precipitation in Inches for Selected Weather Stations in Eastern Oklahoma 1

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual
	(Inches)												
Tulsa	1.78	1.51	2.76	4.10	5.27	4.86	3.05	3.43	3.45	3.68	2.40	2.33	38.22
Muskogee	2.72	2.11	3.06	4.57	4.69	4.59	2.66	3.39	3.86	4.33	3.05	2.43	41.46
Webbers Falls	2.65	2.17	3.02	4.45	5.38	4.50	3.49	3.36	3.75	3.95	2.84	2.60	42.16

SOURCE: Climatological Data, Oklahoma Section, 1946, United States Department of Commerce.

1 All stations selected are in or adjacent to the Arkansas River bottom.

Appendix Table 3. Normal Monthly and Annual Mean Temperatures in Degrees Fahrenheit for Selected Weather Stations in Eastern Oklahoma 1

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual
						(Degrees)							
Tulsa (Airport)	35.3	39.1	49.4	58.9	67.3	76.5	81.1	80.1	72.9	61.6	48.9	38.8	59.2
Muskogee	38.9	43.1	51.2	61.4	69.0	78.0	82.5	82.5	75.1	63.6	51.0	41.5	61.5
Webbers Falls	39.6	42.8	52.4	61.7	69.6	78.2	82.5	84.4	75.4	63.1	50.6	41.7	61.8

SOURCE: Climatological Data, Oklahoma Section, 1946, United States Department of Commerce.

1 All stations selected are in or adjacent to the Arkansas River bottom.

Appendix Table 4. Approximate Yield per Acre of Selected Vegetable Crops, Cases Packed per Ton of Raw Product, Daily Acreage to Supply a Single-Line Cannery, and Required Acreages for Indicated Seasonal Packs

Vegetable	Yield Per Acre 1	Cases Packed Per Ton	Cases Packed Per Acre	Daily Supply	Seasonal Operations Pack	Seasonal Operations Acreage
	(Tons)	(Cases)	(Cases)	(Acres)	(Cases)	(Acres)
Asparagus	1.0	50	50	30	30,000	600
					50,000	1,000
					100,000	2,000
Beans, snap	1.0	80	80	18	30,000	375
					50,000	625
					100,000	1,250
Beans, lima	.5	40	20	125	30,000	1,500
					50,000	2,500
					100,000	5,000
Sweet corn	2.5	25	63	45	30,000	475
					50,000	800
					100,000	1,600
Peas	.8	100	80	30	30,000	375
					50,000	625
					100,000	1,250
Spinach	2.0	65	130	10	30,000	230
					50,000	380
					100,000	770
Tomatoes	5.0	40	200	12	30,000	150
					50,000	250
					100,000	500

SOURCE: Computed from data presented in:
Columbia Basin Joint Investigation, Agricultural Processing Industries, United States Department of the Interior.

[1] If yields per acre are higher or lower, the cases packed per acre, daily supply, and required acreage will vary accordingly.

Worksheet for Estimating Total Production and Amount of Operation Required for Two Suggested Acreages in the Area Sampled 1/

	1	2	3	4	5	6	7	8	9	10	11	12
	Estimated Percentage of Total Vegetable Acreage 2/	Acreage--41 Percent 3/ (Col. 1 X Total of Col. 2)	Acreage--63 Percent 4/ (Col. 1 X Total of Col. 3)	Yield 8/ Per Acre	Production 5/--41 Percent (Col. 2 X Col. 4)	Production 5/--63 Percent (Col. 3 X Col. 4)	Cases 6/--41 Percent (Col. 5 X Col. 9) (1,000 Cases)	Cases 6/--63 Percent (Col. 6 X Col. 9) (1,000 Cases)	Cases Per Ton (Cases)	Daily Supply (Acres)	Operation Required 7/--41 Percent (Col. 2 ÷ Col. 10) (Days)	Operation Required 7/--63 Percent (Col. 3 ÷ Col. 10) (Days)
	(Percent)	(Acres)	(Acres)	(Tons)	(Tons)	(Tons)						
Asparagus	4.7	580	891	1.0	580	891	29.0	44.6	50	30	19.3	29.7
Beans, snap	14.1	1,739	2,673	1.0	1,739	2,673	139.1	213.8	80	18	96.6	148.5
Beans, lima	11.8	1,456	2,237	.5	728	1,118	29.1	44.7	40	125	11.6	17.9
Sweet corn	17.6	2,171	3,336	2.5	5,428	8,340	135.7	208.5	25	45	48.2	74.1
Peas	14.1	1,739	2,673	.8	1,391	2,138	139.1	213.8	100	30	58.0	89.1
Spinach	30.6	3,775	5,800	2.5	9,437	14,500	615.4	942.5	65	10	377.5	580.0
Tomatoes	7.1	876	1,346	5.0	4,380	6,730	175.2	269.2	40	12	73.0	112.2
Total	100.0	12,336	18,956	--	23,683	36,390	1,260.6	1,937.1	--	--	684.2	1,051.5

1/ Figures for the Arkansas River bottom were obtained by multiplying these results by three.

2/ This estimate was made for the sole purpose of obtaining a total estimate of tons, cases, and days of operation.

3/ Percentage of cropland which would coincide with commercial vegetable acreage suggested at present.

4/ Percentage of cropland which would coincide with commercial vegetable acreage suggested for the future.

5/ Production which would result if indicated percentages of cropland were used and yields in Column 4 were obtained.

6/ Cases which would result from indicated production.

7/ Days of single-line cannery operation which would be required to process the indicated production.

8/ See Appendix Table 4.

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