AN ANALYSIS OF OKLAHOMA COUNTRY ELEVATOR WHEAT RECEIPTS FOR THE WHEAT RECEIVING SEASONS, 1949-1955.

By

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CHAPTER I

THE PROBLEM AREA

Introduction

Farmers and country elevator operators generally agree that wheat harvesting and marketing have undergone sweeping changes in recent years. A combination of technological advancements of a qualitative as well as a quantitative character along with governmental action programs of various types appears to have contributed heavily to these changes. The accumulative net effect of such changes upon commercial country elevator wheat receiving operations, including storage and transportation, is extremely difficult to measure. However, they have created problems associated with the handling of wheat, particularly during the harvest season.

The present study is an attempt to determine the most important characteristics of the farm-to-elevator wheat delivery pattern as indicated by an analysis of daily wheat receipts of country elevators. Specifically, an attempt will be made to determine: (1) the seasonal distribution and concentration of the wheat delivery pattern, and (2) the load-size characteristics of wheat deliveries to local country elevators.

This study provides elevator operators with information concerning the wheat delivery pattern and possible effects of load-size characteristics on their wheat receiving operations. It may also assist country elevator managers in evaluating wheat storage requirements associated

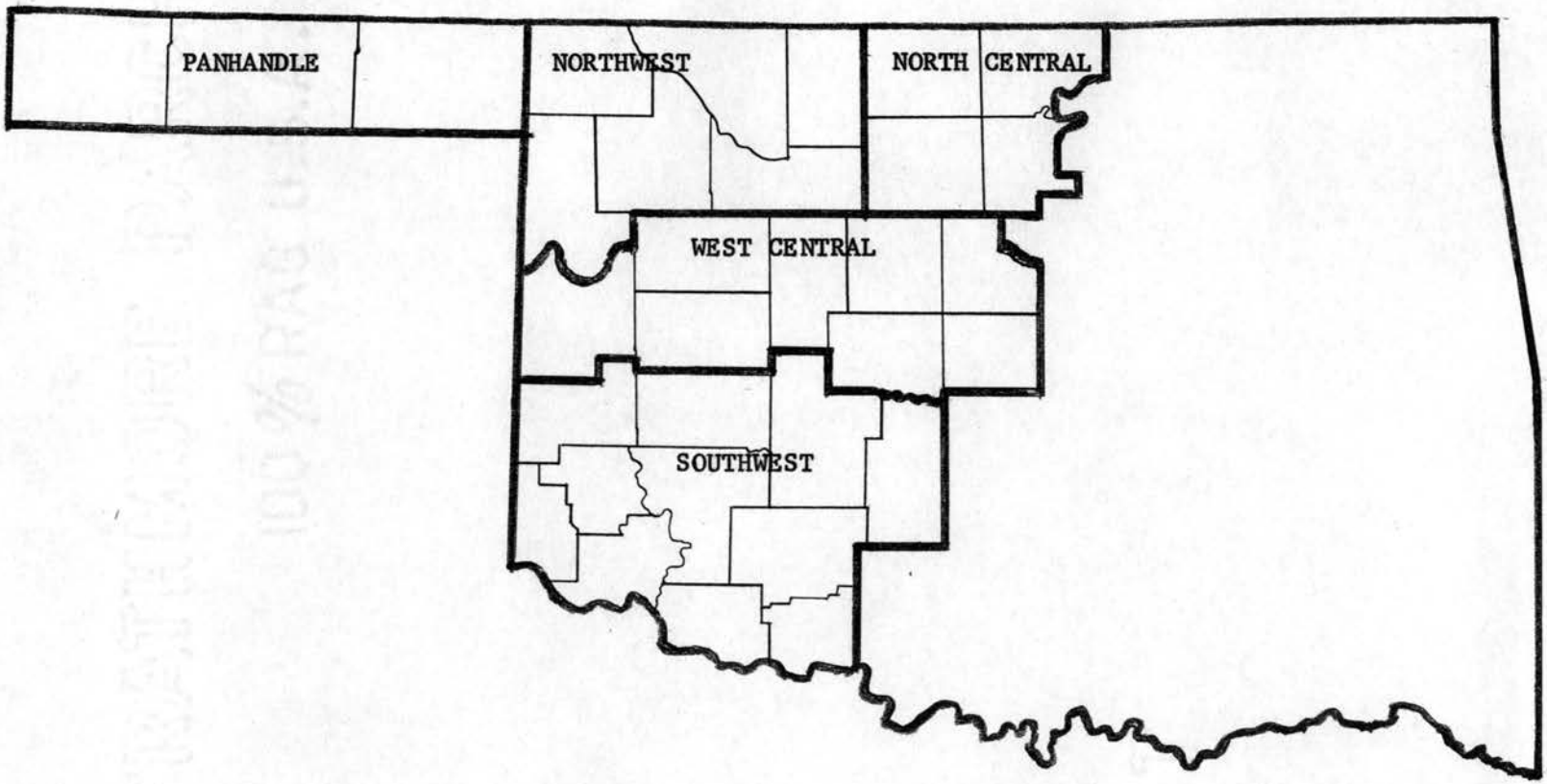

Figure 1. Sub-area Divisions of the Major Wheat Producing Region of Oklahoma.

with wheat deliveries during the harvest season. While transportation facilities and load-size characteristics may lie outside the control of elevator operators, the information in this study may lead to more objective evaluations of the problems involved in the movement of wheat at local country elevators during the peak of harvest season.

Time Period and Area of Study

The study includes the crop years 1949 through 1955. These years were selected for several reasons. Both the smallest and largest Oklahoma wheat crops of recent years were harvested during this period. The 1955 crop was the smallest since 1916, while the 1952 crop was the largest on record. Secondly, during these years grain storage facilities in Oklahoma have grown rather rapidly, particularly storage for wheat. Thirdly, country elevators frequently do not keep daily wheat receipts for long periods of time and records prior to 1949 were not expected to be available for sampling purposes. This latter assumption was based in part on preliminary survey work.

The area selected for study represents the major wheat producing region of Oklahoma. Ninety-five per cent of the wheat production and storage are located within this area. This wheat region was divided into sub-areas for detailed analysis. The five sub-areas (Figure 1) differ in one or more of the following sets of items: (a) production, climate, soil, topographical and geographical characteristics; (b) transportation facilities, including differences in location involving the freight-rate structure; and (c) general wheat storage conditions such as temperature, moisture, and other factors affecting the costs of operating commercial wheat storage facilities.

TABLE I

DISTRIBUTION OF WHEAT STORAGE FACILITIES AND SIZE OF SAMPLE BY AREA AND ELEVATOR SIZE FOR THE MAJOR WHEAT PRODUCING REGION OF OKLAHOMA*

AREA	LESS THAN 25,000				25,000 TO 50,000				50,000 TO 100,000				100,000 TO 250,000				250,000 AND OVER				TOTALS			
	NO. OF ELEVATORS			NO. IN SAMPLE	NO. OF ELEVATORS			NO. IN SAMPLE	NO. OF ELEVATORS			NO. IN SAMPLE	NO. OF ELEVATORS			NO. IN SAMPLE	NO. OF ELEVATORS			NO. IN SAMPLE	TOTAL ELEVATORS			TOTAL SAMPLE
	CRS	ASC	T		CRS	ASC	T		CRS	ASC	T		CRS	ASC	T		CRS	ASC	T		CRS	ASC	T	
PANHANDLE	17	16	20	2	17	18	18	2	7	7	7	1	6	6	6	1	7	7	7	1	54	54	58	7
NORTHWEST	21	23	23	2	7	7	9	1	5	6	6	1	17	18	18	2	16	15	16	2	66	69	72	8
NORTH CENTRAL	38	40	44	4	9	9	11	1	6	6	6	1	17	20	20	2	26	26	26	3	96	101	107	11
WEST CENTRAL	39	42	41	4	12	12	11	1	12	15	16	2	10	11	11	1	20	23	23	2	93	103	102	10
SOUTHWEST	49	51	61	6	15	16	19	1	12	12	12	1	19	22	22	2	14	16	16	2	109	117	130	12
TOTAL	164	172	189	18	60	62	68	6	42	46	47	6	69	77	77	8	83	87	88	10	418	444	469	48

* C. R. S. - FEDERAL STATE CROP REPORTING SERVICE DATA OCT. 1, 1954

A. S. C. - AGRICULTURAL STABILIZATION AND CONSERVATION SERVICE SURVEY DATA JANUARY 1, 1955

T. - TOTAL, DERIVED BY COMPILING BOTH DATA SOURCES

Method of Procedure

Two lists of grain storage facilities were combined and stratified according to size.[1] While it was known that many of the storage facilities indicated in this combined list might not be operating as commercial country elevator wheat receiving points, they were included for sampling purposes because of insufficient information for specific identification. Only those firms at Enid and Oklahoma City reporting storage in excess of 250,000 bushels were excluded from the list. These storage facilities were excluded because they were likely to be more important as terminal market and milling storage facilities than as country receiving points.

For sampling purposes the remaining storage facilities were assumed to be operating as commercial country elevator wheat receiving points. A ten percent random sample was drawn from each of the various size groups within each sub-area. The size of sample included consideration of expected individual firm storage facilities that were not operating as commercial wheat receiving points as one of their usual business operations. It also included expectations of refusals or lack of available records for any reason. No substitutions were permitted under the sampling procedure. While many elevator operations

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[1]The Federal-State Crop Reporting Service, AMS, USDA, Oklahoma City, provided one list along with their most recent reported storage facilities (October 1, 1954); the Agricultural Stabilization and Conservation Service of the USDA provided the results of a survey by the State A.S.C. offices dated January 1, 1955. (See Table I).

TABLE II

NUMBER AND PERCENTAGE DISTRIBUTION OF THE EFFECTIVE SAMPLE BY AREA AND ELEVATOR SIZE CLASSIFICATION.*

	Elevator-Size Classifications											
	Less than 25,000 bu.		25,000 to 50,000 bu.		50,000 to 100,000 bu.		100,000 to 250,000 bu.		250,000 bu. and over			
	No. of Elev.	Percent of Total	No. of Elev.	Percent of Total	No. of Elev.	Percent of Total	No. of Elev.	Percent of Total	No. of Elev.	Percent of Total	Totals	
Panhandle	1	5.0	2	11.1	1	14.3	1	16.7	1	14.3	6	10.3
Northwest	1	4.3	1	11.1	1	16.7	2	11.1	2	12.5	7	9.7
North Central	1	2.3	1	9.1	1	16.7	2	10.0	3	11.5	8	7.5
West Central	3	7.3	0	0	2	12.5	1	9.1	2	8.7	8	7.8
Southwest	2	3.3	1	5.3	1	8.3	2	9.1	1	6.3	7	5.4
Totals	8	4.2	5	7.4	6	12.8	8	10.4	9	10.2	36	7.7

*The "effective" sample consisted of the 36 elevators from which data were secured and used in this study.

are relatively large and may involve one or more "houses" at a specific location, such firms were considered as a single unit so long as they operated as a unit under single management and were not geographically separated.

A total of 36 of the 48 elevators in the original sample provided data for this study.

Information and data from 12 elevators in the sample, but not included in this study, were not available for use. Four of these elevators reported their records were "not available". This usually meant that it was a general policy of some firms to destroy such records at the end of the year or, as in one or two cases, no filing system was set up for the maintenance of such records and they were presumed to be lost.

Only three elevators refused to cooperate; operator-managers of these elevators would not permit the use of their records even if available. Three elevators indicated they did not handle wheat. One of these handled only feed grains because of inadequate railroad siding facilities for handling large volumes of wheat. The other two operated as feed mixing and grinding establishments and received wheat only for feed grain and mixing purposes. Both of these firms indicated they did not operate as commercial wheat receiving points.

One elevator had become a private storage facility and was not used as a regular commercial wheat receiving point. The remaining firm was found not to have been in commercial use for several years. It was no longer in existence.

The 36 elevators from which data were obtained represent a 7.7 percent sample of the total original population (Table II). Only one

area failed to be represented by every elevator-size classification. This occurred in the west central area.

The actual percentage distributions of the sample by elevator size varied from 4.2 percent for the smallest size elevators to 12.8 percent for the 50,000 to 100,000 bushel size elevator class. The sample percentage by areas varied from 5.4 percent for the southwest to 10.3 percent for the panhandle area. A fairly even distribution of the sample in terms of actual numbers was obtained for both elevator size and sub-area group classifications.

CHAPTER II

THE PEAK WHEAT DELIVERY SEASON

Daily wheat receipts from sampled elevators were accumulated by harvest year and area from May 23, the earliest date at which "new wheat" was received, through July 31 for the seven-year period 1949-1955. This period proved to be an adequate first approximation for estimating the peak delivery season characteristics of each area and will be referred to in the remainder of this report as "the wheat receiving season".

An average of the receipts from sampled elevators for the seven-year period was computed for each area by days for the 70-day period, May 23-July 31. These averages are shown graphically in Appendix A, Figures 1 through 6. Wheat deliveries begin in the southwest area around May 25, followed by deliveries in both the west central and north central areas approximately six days later. These two areas precede the northwest area by 2-4 days while the panhandle follows this latter area by 10-12 days.

For purposes of obtaining an estimate of the length of the peak wheat delivery season, and to define this period precisely, percentages of total annual deliveries (harvest year basis) were computed. In all areas and in all years, the first five percent of the harvest year deliveries were received in a period ranging from 2 to 15 days. This period was excluded from subsequent computations because it did not adequately represent the peak volume concentration period.

TABLE III

LENGTH OF "PEAK WHEAT DELIVERY SEASONS" IN DAYS BY YEARS AND AREAS, 36 ELEVATORS, OKLAHOMA, 1949-1955.

Years	Panhandle Area: Date Percentages of Total were Rec. 5%	Panhandle Area: Date Percentages of Total were Rec. 55%	Panhandle Area: No. of Days	Northwest Area: Date Percentages of Total were Rec. 5%	Northwest Area: Date Percentages of Total were Rec. 55%	Northwest Area: No. of Days	North Central Area: Date Percentages of Total were Rec. 5%	North Central Area: Date Percentages of Total were Rec. 55%	North Central Area: No. of Days
1949	June 20	Jan. 17	211	June 15	June 20	5	June 7	June 20	13
1950	June 15	July 7	22	June 14	June 24	10	June 9	June 17	8
1951	June 30	July 18	18	June 17	June 28	11	June 17	June 27	10
1952	June 18	June 28	10	June 9	June 15	6	June 9	June 13	4
1953	June 15	June 30	15	June 8	June 14	6	June 8	June 13	5
1954	June 18	June 26	8	June 7	June 14	7	June 5	June 17	12
1955	June 30	July 18	18	June 6	June 25	19	June 2	June 11	9
			302			64			61

Years	West Central Area: Date Percentages of Total were Rec. 5%	West Central Area: Date Percentages of Total were Rec. 55%	West Central Area: No. of Days	Southwest Area: Date Percentage of Total were Rec. 5%	Southwest Area: Date Percentage of Total were Rec. 55%	Southwest Area: No. of Days
1949	June 12	July 7	25	June 5	June 19	14
1950	June 9	June 20	11	May 31	June 9	9
1951	June 15	June 25	10	June 2	June 26	24
1952	June 7	June 14	7	June 1	June 10	9
1953	June 3	June 13	10	May 28	June 13	6
1954	June 3	June 14	11	May 31	June 7	7
1955	June 1	June 25	24	May 30	June 8	9
			98			78

The 50 percent of total receipts between the first 5 and 55 percent appeared to be the most important volume period for all years and areas and provided the basis for this analysis (Table III). In the remainder of this report this period shall be referred to as "the peak wheat delivery season".

TABLE IV

AVERAGE, RANGE, AND VARIATION IN DAYS REQUIRED ANNUALLY BY ALL AREAS TO DELIVER FROM 5 TO 55 PERCENT OF THE ANNUAL WHEAT RECEIPTS TO SAMPLED ELEVATORS, OKLAHOMA, 1949-1955.*

Years	Average of All Areas (Days)	Range (Days)	Variation (Days)
1949	54 (14)**	5-211	206
1950	12	8- 22	14
1951	15	10- 24	14
1952	7	4- 10	6
1953	8	5- 15	10
1954	9	7- 12	5
1955	16	9- 24	15

*Derived from Table III.

**Median

For the average of all areas, the peak wheat delivery seasons of 1952, 1953, and 1954 were relatively short compared with other years.[1] The 1952 delivery season was only seven days in length, the shortest season for any year. Significantly, this short season occurred during the crop year in which the largest Oklahoma wheat crop on record was produced.

[1]See Table IV.

Table IV indicates a tendency toward a shorter average peak wheat delivery season in recent years. However, two of the years from which these computations were made may not be truly representative data years. In 1949, data from the panhandle area indicated an unusually long delivery season. This resulted in an abnormally large average number of days for all areas for that year. Either this entire year or this area could logically be excluded for this reason. The other year, 1955, was the most unusual crop year that farmers and grain people could recall. Not only was this crop the smallest since 1916, but this year had one of the wettest harvest seasons in recent years. This latter fact contributed heavily to the relatively small crop, but more important it delayed the harvest period and resulted in a longer peak delivery season than any of the three years immediately preceding. This also resulted in a later than expected peak wheat delivery season. For these reasons, this whole year might be excluded. If these two unusual years, 1949 and 1955, were excluded, a definite trend toward shorter average peak wheat delivery seasons would exist.

The least variation in the length of the peak delivery season between areas (five days) occurred in 1954, while the greatest variation between areas (206 days) occurred in 1949.

The average length of peak delivery season over the seven-year period was shortest in the northwest and north central areas (Table V). For this latter area, not only was the average peak delivery period relatively short, but the yearly variation in the length of the peak delivery period was five days less than for any other area.

The length of peak delivery season occurring the most often in the panhandle area (the mode) was longer than the average peak delivery

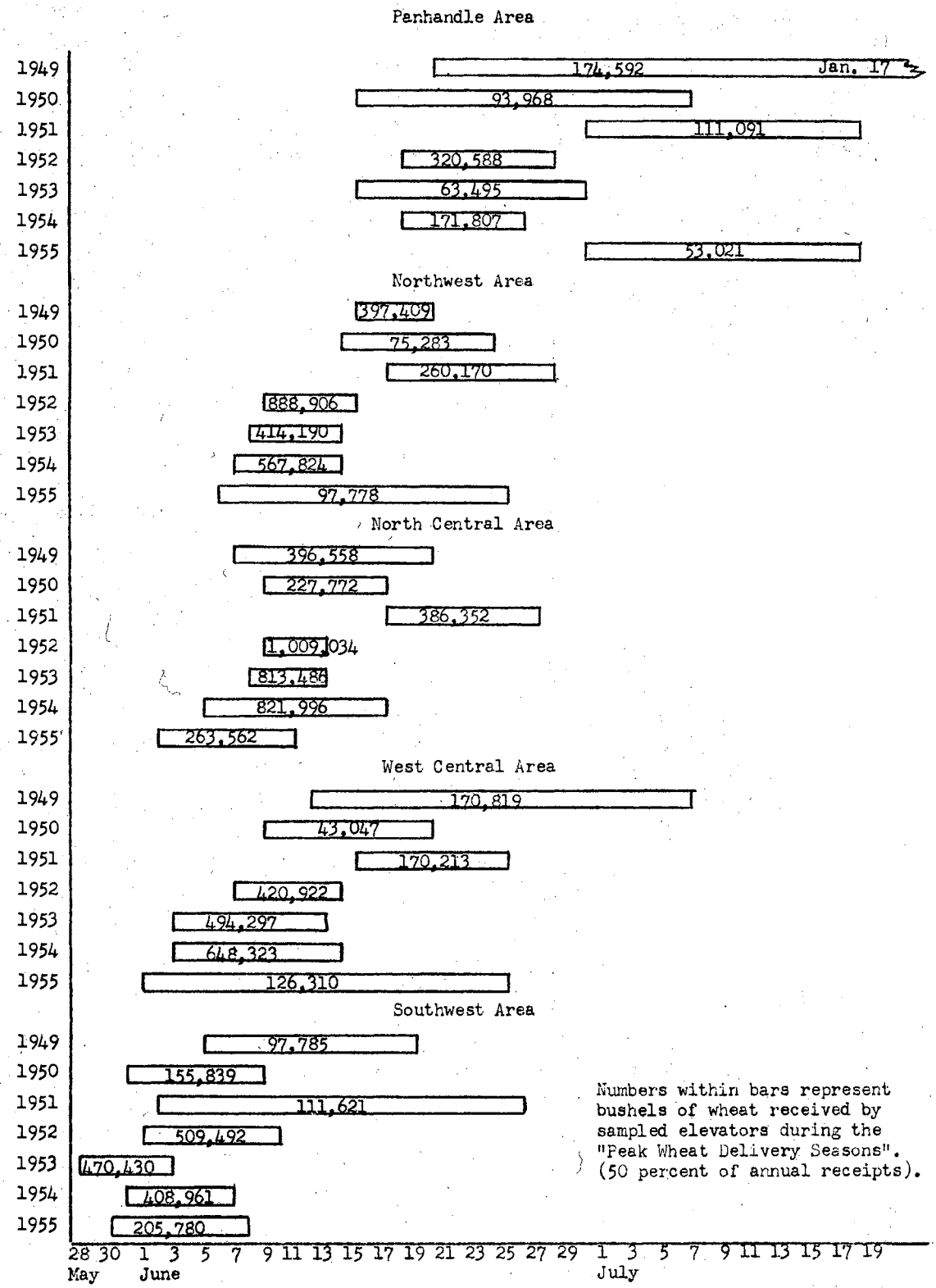

Figure 2. Distribution of the "Peak Wheat Delivery Seasons" by Areas, Oklahoma, 1949-1955.

season for any of the other areas. The greatest variation in length of peak delivery season between years, 203 days, was also in the panhandle area. This was due to an unusually long peak delivery season in 1949.

TABLE V

SEVEN YEAR AVERAGE, RANGE AND VARIATION IN DAYS REQUIRED BY EACH AREA TO DELIVER FROM 5 TO 55 PERCENT OF THE ANNUAL WHEAT RECEIPTS TO SAMPLED ELEVATORS, OKLAHOMA, 1949-1955.*

Areas	7 Year Average (Days)	Range (Days)	Variation (Days)
Panhandle	43 (18)**	8-211	203
Northwest	9	5- 19	14
North Central	9	4- 13	9
West Central	14	7- 25	18
Southwest	11	6- 24	18

* Derived from Table III

**Median and Mode

The distribution of the delivery periods for each area is shown by years in Figure 2. This figure indicates a trend toward earlier harvesting in every area except the panhandle from 1949 through 1955. It also suggests a negative relationship may exist between the size of crop and the length of the peak delivery season. For example, 888,906 bushels of wheat were delivered in six days to sampled elevators in the northwest area in 1952, a large crop year, while in the same area in 1955, a small crop year, nineteen days were required to deliver only 97,778 bushels of wheat.

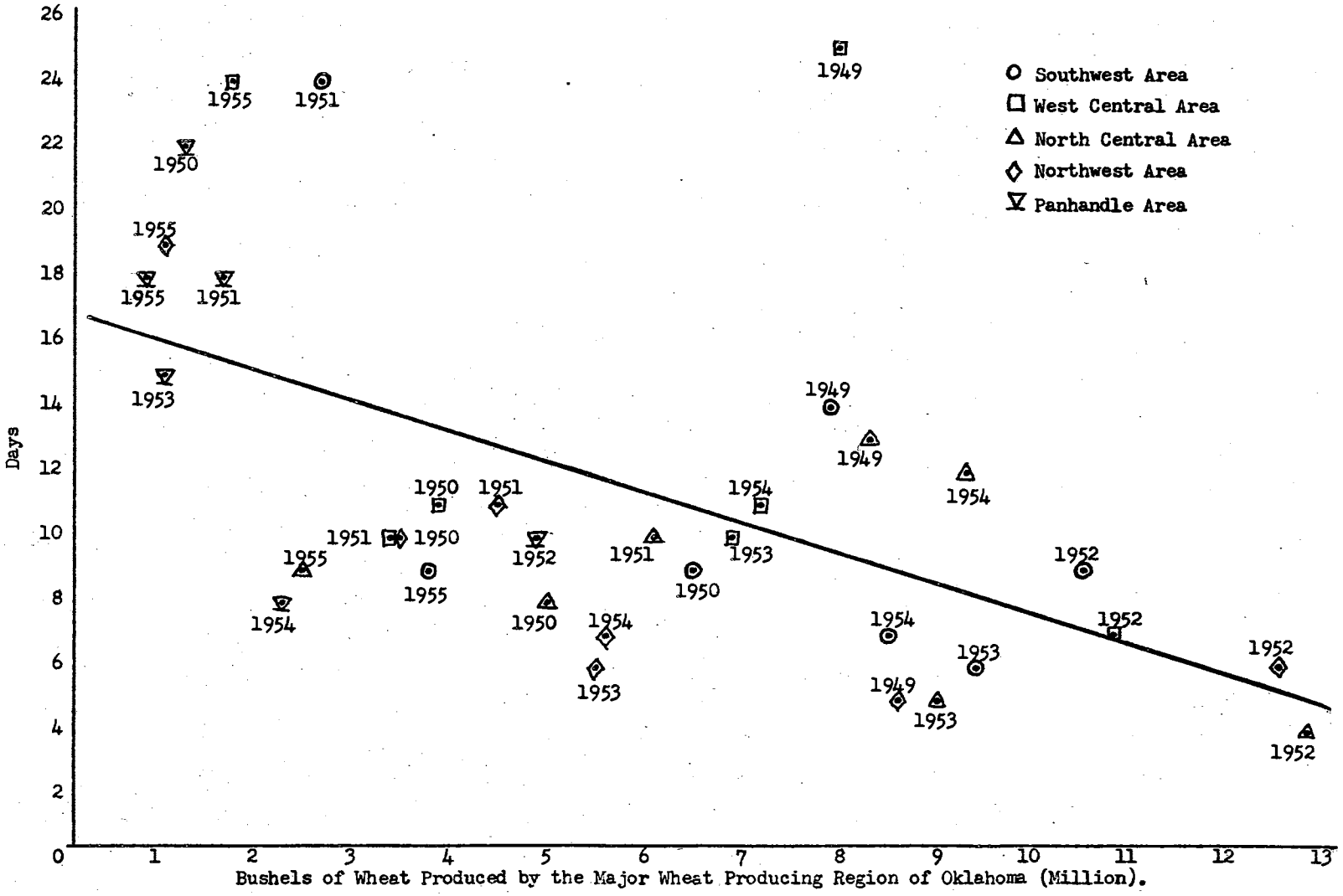

Figure 3. Regression of Crop Size on Number of Days Required to Deliver From 5 to 55 Percent of the Total Annual Receipts.

Regression analysis supports the expectation for a negative relationship between crop size and the length of the peak delivery pattern. The regression coefficient of the sampled elevators was -0.9410 which was significant at the five percent level.[2] This suggests that as the size of the crop increases by one million bushels, the length of the peak wheat delivery season decreases by 0.94 of one day. The result of the regression analysis is shown graphically in Figure 3, page 15.

The fact that large quantities of wheat have been delivered to local country elevators in a few days indicates that elevators have been able to receive and handle large quantities of wheat in a short period of time. However, this analysis does not show the number of bushels of wheat that elevators had to turn away during this period, or the manner in which they had to handle the wheat they actually received. For example, in 1952 numerous elevator operators continued to receive wheat long after their normal storage was filled to capacity. However, this was possible only by using improvised storage facilities which resulted in sizable losses of wheat. Consequently, the practice of accepting wheat beyond adequate storage and transportation facilities is not likely to be repeated.

Since wheat deliveries start first in the southwest area, trucks and railway cars are likely to be needed earlier in this section of the state. The trend toward earlier and more concentrated delivery seasons indicates the demand for shipping facilities may continue to come earlier in the year, in all areas except the panhandle. The peak

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[2]See Appendix B, Table I.

wheat delivery season in this latter area may be expected to have an unusual wheat delivery pattern if past performance is sufficient for predicting the future.

CHAPTER III

LOAD SIZE CHARACTERISTICS OF WHEAT DELIVERIES TO COUNTRY ELEVATORS

The Number and Percentage Distribution of Loads and Bushels Hauled

From the sample of elevators, daily wheat receipts were obtained for the wheat receiving seasons of the seven-year period 1949-1955. These seasons were defined to include the dates May 23 through July 31 and represented 86.6 percent of the total bushels of wheat received by the elevators in the sample.

The individual load receipts were separated into five load-size categories. These categories were based on the number of bushels hauled per load as recorded on the receipt tickets. No information was available on actual truck sizes used for these deliveries, but it appeared that load size did provide a rough measure of truck size. The load-size categories used were: 0-50 bu., 50.1-100 bu., 100.1-150 bu., 150.1-200 bu., and 200.1 bu.-and above. The number and percentage distribution of loads within each load-size group are shown in Table VI.

The largest percentage of loads was in the 50.1-100 bushel group. This group accounted for 36 percent of all loads, twice that of any load-size classification. The smallest percentage of loads was in the 100.1-150 bushel group. Each of three load-size groups, 0-50 bu., 150.1-200 bu., and 200.1 bu.-and above, accounted for approximately the same percentage of total loads.

TABLE VI

NUMBER AND PERCENTAGE DISTRIBUTION, BY LOAD SIZE, OF LOADS RECEIVED BY 36 ELEVATORS, OKLAHOMA, 1949-1955.

Load-Size Groups (Bushels)	Number of Loads	Percentage of Total
0 - 50	31,307	17.6
50.1-100	63,860	36.0
100.1-150	21,124	11.9
150.1-200	31,362	17.7
200.1-Above	29,881	16.8
	177,534	

Source: Appendix C, Table I.

The average size of load for each load-size group was estimated from receipts of selected elevators.[1] These averages were used to estimate the distribution of bushels received among load-size groups.[2] Both estimates are included in Table VII.

The largest load-size classification, representing 16.8 percent of the total loads received, accounted for approximately one-third of all wheat received. The smallest load-size classification, representing approximately the same percentage of loads, accounted for only 5.2 percent of the bushels received.

Approximately 60 percent of the wheat was received in loads within the two largest load-size groups. However, these two groups accounted for only 34.5 percent of all loads. The two smallest load-size groups accounted for 28 percent of the total bushels received, but represented more than 50 percent of all loads.

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[1] See Appendix C for this estimating procedure.

[2] The total of 20,886,725 bushels estimated by this procedure was 3.55 percent greater than the tabulated total of 20,170,750 bushels.

TABLE VII

ESTIMATED AVERAGE SIZE OF LOAD; NUMBER AND PERCENTAGE DISTRIBUTION, BY LOAD SIZE, OF BUSHELS RECEIVED BY 36 ELEVATORS, OKLAHOMA, 1949-1955.

Load-Size Groups (Bushels)	Estimated Average Size Load Received (Bushels)	Estimated Number of Bushels Received	Percentage of Total
0 - 50	35	1,095,745	5.2
50.1-100	75	4,789,500	22.9
100.1-150	125	2,640,500	12.7
150.1-200	175	5,488,350	26.3
200.1-Above	230	6,872,630	32.9
Total	117	20,886,725	100.0

Source: Derived from Table VI, and Appendix D, Table I.

The Effects of Elevator Size and Location on the Load-Size Delivery Pattern

An analysis was made to determine the effect of elevator size and geographical area upon the distribution of size of load received. The percentage distributions of loads by elevator-size and load-size classifications were used in this analysis and are shown in Table VIII.

Percentage figures were used, rather than the actual number of loads, for two reasons. First, some of the sample elevators did not have complete records for all years. While the number of such cases was not large, the percentage figures may represent a more accurate estimate of the distribution of loads for purposes of this analysis. Second, and perhaps more important, an unequal number of elevators were represented in each area and elevator-size classification. This was due primarily to purpose rather than chance. The original ten percent sample was drawn from elevators of specific sizes within each area, and

TABLE VIII

PERCENTAGE DISTRIBUTION OF LOADS WITHIN AREAS, BY LOAD-SIZE GROUP AND ELEVATOR-SIZE CLASSIFICATION, OKLAHOMA, 1949-1955.*

Areas	Load-Size Groups (Bushels)	Elevator-Size Classifications (1,000 Bushels) 0 to 25 %	25 to 50 %	50 to 100 %	100 to 250 %	250 and Above %
Panhandle Area	0 - 50	12.4	18.3	11.7	18.1	12.1
	50.1-100	18.7	34.6	34.4	37.6	29.2
	100.1-150	9.7	16.5	5.8	14.1	15.3
	150.1-200	23.7	19.9	24.1	16.8	27.4
	200.1-Above	35.5	10.7	24.0	13.4	16.0
Northwest Area	0 - 50	26.3	4.8	21.4	21.9	18.0
	50.1-100	46.6	20.6	42.6	42.4	44.2
	100.1-150	10.4	9.0	12.4	10.7	9.3
	150.1-200	9.6	25.6	16.5	13.9	15.2
	200.1-Above	7.1	39.9	7.0	11.1	13.3
North Central Area	0 - 50	14.5	23.8	17.4	7.7	12.1
	50.1-100	36.1	45.1	43.3	27.1	34.4
	100.1-150	13.6	10.8	12.5	16.4	13.3
	150.1-200	20.1	12.8	15.9	24.3	22.2
	200.1-Above	15.7	7.4	10.8	24.5	18.1
West Central Area	0 - 50	28.7	--	12.1	23.3	16.2
	50.1-100	43.5	--	36.1	34.5	37.9
	100.1-150	9.3	--	11.0	9.8	13.1
	150.1-200	11.2	--	17.7	13.5	18.0
	200.1-Above	7.3	--	23.2	18.9	14.9
Southwest Area	0 - 50	26.7	21.0	27.4	19.3	6.7
	50.1-100	28.4	22.2	31.2	26.4	10.0
	100.1-150	11.6	14.0	12.5	11.1	9.3
	150.1-200	17.0	14.2	14.4	18.3	20.8
	200.1-Above	16.3	28.6	14.5	24.9	53.2

Source: Appendix E, Table I.

*Data in this table represent wheat receipts from May 23 through July 31.

no attempt was made to obtain an equal number of elevators for each size and area (Table I).

The results of the analysis-of-variance computations for each load-size group are summarized in Table IX. None of the computed F values were statistically significant at the five percent level.

TABLE IX

F VALUES OBTAINED FROM ANALYSIS OF VARIANCE COMPUTATIONS OF THE PERCENTAGE DISTRIBUTION OF SPECIFIC SIZED LOADS BETWEEN AREAS AND BETWEEN ELEVATOR SIZES, 36 OKLAHOMA ELEVATORS, 1949-1955.

Load-Size Groups (Bushels)	Computed F Values*	
	Elevator Size	Area
0 - 50	0.968	0.768
50.1-100	0.371	2.862
100.1-150	0.384	0.885
150.1-200	0.528	2.037
200.1-Above	0.299	0.858

*F_{05} for both elevator size and area, 3.01.

Source: Appendix F, Tables I through V.

Therefore, the conclusion may be drawn that for each load-size group, neither elevator size nor area had a significant effect. However, the lack of statistical significance may be the result of small sample sizes.

An analysis was then made of the relationship of load sizes and elevator sizes using pooled data for all areas.[3] Statistical least-squares regressions were computed for this analysis. The signs of the regression coefficients (b) indicated a negative relationship between

[3]See Appendix E, Table II for pooled data.

elevator size and the percentage of loads within the 0-50 bu. and 50.1-100 bu. groups (Table X). There also appeared to be a positive relationship between elevator size and the percentage of loads within the 150.1-200 bu. and 200.1 bu.-and above groups. Table X shows the regression coefficients, t values and r^2 values of each load-size group.

TABLE X

DISTRIBUTION OF REGRESSION COEFFICIENTS, t VALUES AND r^2 VALUES FOR THE REGRESSION OF LOAD SIZE ON ELEVATOR SIZE, OKLAHOMA, 1949-1955.

Size of Load (Bu.)	b	t	r^2
0 - 50	-0.0338	-2.7933	0.7196
50.1-100	-0.0188	-2.6479	0.6993
100.1-150	0.0038	1.0857	0.2799
150.1-200	0.0179	3.3148*	0.7848
200.1-Above	0.0310	4.4927*	0.8688

*Significant at the 5 percent level.

Source: See Appendix C, Tables I through V for statistical computations.

Only the two larger load-size groups had regression coefficients which were statistically significant at the five percent level. These coefficients indicated a direct relationship between elevator size and the percentage of loads in the larger load-size groups. In the two smaller load-size groups, the negative relationship between elevator size and the percentage of loads was not statistically significant at the five percent level. However, the lack of statistical significance may be due to the small number of elevator-size classifications, since there were only three degrees of freedom.

A tabulation of load-size groups at various elevator sizes substantiates the inference that there is a direct relationship between

elevator size and the two largest load-size groups (Table XI). These tabulations also infer that an inverse relationship exists between elevator size and the two smallest load-size groups, even though statistical computations did not verify this relationship.

TABLE XI

PERCENTAGE DISTRIBUTION OF LOADS BY LOAD-SIZE GROUP AND ELEVATOR-SIZE CLASSIFICATION, OKLAHOMA, 1949-1955.*

Load-Size Groups (Bushels)	Elevator-Size Classifications (1,000 Bushels)					
	0-25	25-50	50-100	100-250	250-Above	All Elevators
	%	%	%	%	%	%
0 - 50	26.6	19.3	18.9	17.5	13.6	17.6
50.1-100	39.3	37.3	39.7	34.2	34.2	36.0
100.1-150	10.3	12.1	11.8	12.5	12.0	11.9
150.1-200	13.3	16.7	16.7	17.7	19.9	17.7
200.1-Above	10.5	14.6	12.9	18.1	20.3	16.8
All Loads	13.0	6.0	16.8	28.5	35.7	100.0

Source: Appendix E, Table II.

*Data in this table represent wheat receipts from May 23 through July 31.

The percentage of loads received within the 0-50 bu. load-size group ranged from a high of 26.6 percent in the 0-25,000 bu elevator-size class to a low of 13.6 percent in the 250,000 bu.-and above class. The percentage of loads received within the 50.1-100 bu. load-size group ranged from a high of 39.3 percent in the smallest elevator-size class to a low of 34.2 percent in the largest elevator-size class.

A graphic representation of the percentage distribution of loads within load-size groups by elevator-size classifications is shown in Figure 4. The percentage of loads received in the 50.1-100 bu. load-size group is far above all the other load-size groups for each

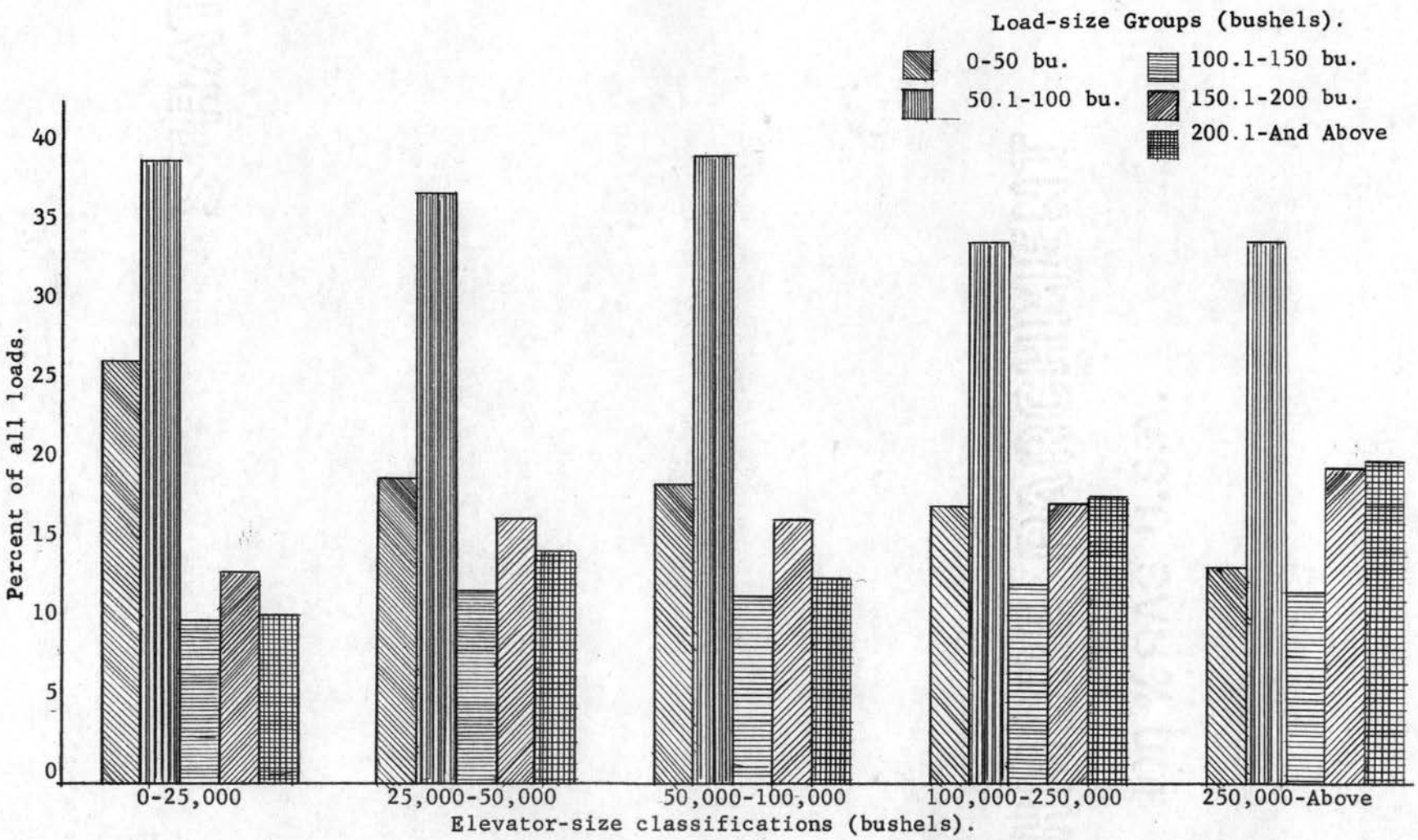

Figure 4. Percentage distribution of loads within load-size groups by elevator-size classifications.

elevator size.[4] The percentage of loads in the smallest load-size group tends to decrease with an increase in elevator size, while the percentage of loads in the two largest load-size groups tend to increase with an increase in elevator size. The percentage of loads in the median load-size group, 100.1-150 bu., is relatively constant for all elevator-size classifications.

Table XII shows the percentage distribution of loads by load-size group for each area of the state. The north central area had the greatest percentage of all loads, 31.9 percent, while the panhandle area had the lowest percentage of all loads, 7.0 percent. The percentages of all loads received by the remaining three areas were: northwest, 26.2 percent; west central, 19.2 percent; and southwest, 15.7 percent.

A comparison, by areas, of the percentage distribution of loads received within specific load-size groups indicates that small loads, 0-50 and 50.1-100 bushels, tend to be concentrated in the west central and northwest areas while large loads, 150.1-200 and 200.1 bu.-and above, tend to be concentrated in the southwest, panhandle, and north central areas.

Significantly, the north central area ranked lowest in the percentage of total loads received in the smallest load-size group. This area ranked third for the 50.1-100 bu. group and ranked first, along with the panhandle area, in the percentage of loads received in the 100.1-150 bu.

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[4]This is not to be confused with the importance of each load-size group in respect to the number of bushels of wheat represented by each group.

load-size group. For the two largest load-size groups, the north central area ranked second. The pattern of the percentage distribution of loads received indicated a tendency for loads to be in the three larger load-size groups.

TABLE XII

PERCENTAGE DISTRIBUTION OF LOADS BY LOAD-SIZE GROUP AND AREA OF STATE, OKLAHOMA, 1949-1955.*

Load-Size Groups (Bushels)	Areas of Oklahoma					
	Panhandle	Northwest	North Central	West Central	Southwest	All Areas
	%	%	%	%	%	%
0 - 50	15.5	20.2	13.3	21.2	18.8	17.6
50.1-100	33.8	42.4	35.4	39.4	23.1	36.0
100.1-150	13.6	10.6	13.6	11.0	11.0	11.9
150.1-200	21.5	15.0	20.6	14.8	18.0	17.7
200.1-Above	15.6	11.8	17.1	13.6	29.1	16.8
All Loads	7.0	26.2	31.9	19.2	15.7	100.0

Source: Appendix E, Table III.

*Data in this table represent wheat receipts from May 23 through July 31.

The southwest ranked considerably above all other areas in the percentage of loads in the largest load-size group. This area was also unique in that it ranked unusually low in the percentage of loads in the 50.1-100 bu. load-size group.

The panhandle area was comparable with the north central area in many respects. This area ranked relatively low in the percentage of loads in the two smallest load-size groups. The percentage of loads of 100.1 bushels or above was relatively high compared with other areas and the percentage of loads in the 150.1-200 bu. load-size group was the highest of all areas.

The percentage distribution of loads in the northwest area indicates a tendency for loads to be concentrated in the smaller load-size groups. The 50.1-100 bu. load-size group ranked the highest and the 0-50 bu. load-size group was second only to the southwest area in the percentage of loads received. Significantly, this area ranked lowest in percentage of loads received in both the 100.1-150 bu. and the 200.1 bu.-and above groups and ranked relatively low for the 150.1-200 bu. load-size group.

The west central area apparently has many of the characteristics of the northwest area. It ranked relatively high in the percentage of loads in the two smaller load-size groups. This area ranked highest in the percentage of loads in the smallest load-size group and was second only to the northwest area in the 50.1-100 bu. load-size group. Significantly, this area ranked lowest in the percentage of loads in the 150.1-200 bu. load-size group and second from the lowest in the 200.1 bu.-and above load-size group.

The Effect of Crop Size on the Percentage Distribution of Size of Loads Received by Country Elevators

An attempt was made to determine the effect of crop size on load size at country elevators. Using annual (1949-1955) estimates of production and the percentage of total receipts in each load-size group, statistical least-squares regressions were computed for each of the groups.[5] The results of these computations are shown in Table XIII.

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[5]See Appendix H, Tables I through V.

TABLE XIII

DISTRIBUTION OF REGRESSION COEFFICIENTS, t VALUES AND r^2 VALUES FOR THE REGRESSION OF LOAD SIZE ON CROP SIZE, OKLAHOMA, 1949-1955.

Size of Load (bu.)	b	t	r^2
0 - 50	-.1813	-4.1582*	.7750
50.1-100	.0310	0.6365	.0745
100.1-150	-.0204	-1.2993	.2495
150.1-200	.0512	3.1801*	.6648
200.1-Above	.1198	1.7591	.3818

*Significant at the 5 percent level.

Only two load-size groups, 0-50 bu. and 150.1-200 bu., had regression coefficients significantly different from zero. For these two load-size groups, a significant proportion of the variation in percentage of loads was associated with the size of crop.

There was a negative relationship between crop size and the percentage of loads in the 0-50 bu. group. Approximately 77 percent of the variation in the percentage of loads from year to year was associated with crop size.

A positive relationship was found between crop size and the percentage of loads in the 150.1-200 bu. group. Approximately 66 percent of the variation in the percentage of loads in this group was associated with crop size. For the largest load-size group, 200.1bu.-and above, the regression coefficient was larger than for the 150.1 to 200 bushel load-size group, but the variation about the mean was so large that it was not statistically significant.

The results of the regression analyses suggest a tendency for crop

size to have some effect on size of load received by country elevators.[6] During years when total production is relatively small, elevators may expect a higher percentage of total loads received to be in the 0-50 bu. load-size group. During years of relatively large crops, the percentage of loads in the larger size groups may tend to increase.

[6]Graphic representation of the individual load-size regressions are shown in Appendix H, Figures 1 through 5.

CHAPTER IV

SUMMARY

In Oklahoma, wheat harvesting and marketing have undergone sweeping changes in recent years, but country elevators have continued to function as receiving points. This study is concerned with the characteristics of the seasonal wheat receiving pattern and is based on an analysis of daily wheat receipts at country elevators.

It is recognized that daily wheat receipts may not show the number of bushels of wheat that an elevator operator may have to turn away or the manner in which the wheat received may have to be handled. However, information on the various attributes of the wheat receiving pattern may permit a better allocation of resources in the wheat economy in future years.

Seasonal wheat deliveries in Oklahoma begin in the southwest area around May 25. Deliveries usually begin in the west central and north central areas about 6 days later, and in the northwest area approximately 8-10 days later. Deliveries in the panhandle area are usually 10-12 days later than deliveries in the northwest area. The heavy demand for handling and shipping facilities is likely to occur first in the southwest area then, with a few days lag, in each adjoining area. There may be as many as 18-22 days between the southwest and panhandle areas in the periods of greatest demand for handling-storage-shipping facilities.

A comparison was made of the average length of "peak wheat delivery seasons" for all areas by years. This comparison indicates

that the average "peak wheat delivery seasons" of 1952, 1953 and 1954 were relatively short. The shortest average peak delivery season of seven days occurred in 1952, a year in which the largest Oklahoma wheat crop on record was produced. These averages also indicate some tendency toward a shorter average "peak wheat delivery season" in recent years. These data do not appear to be sufficient to indicate a definite trend; however, if this tendency toward shorter peak delivery seasons continues, the peak requirements for wheat transportation and storage facilities may occur over a shorter period of time.

A comparison of the average length of the peak delivery seasons for all years by areas indicates that the northwest and north central areas had the shortest average peak delivery season. The north central area not only had a relatively short average peak delivery season but the variation between years in the length of the delivery period was five days less than for any other area.

The panhandle area had the longest average peak delivery season. However, the seven-year average for this area was affected by the exceptionally long delivery season of 1949. The length of season occurring most often in the panhandle area (the mode) was longer than the average season for any of the other areas. The greatest variation in length of delivery season between years, 203 days, was also in the panhandle area. This area appeared to have the least consistent, or most erratic, wheat delivery seasonal pattern of any area.

In every area except the panhandle, there appeared to be a trend toward earlier wheat receipts at country elevators. This suggests that peak wheat handling, storing, and shipping facility requirements may occur somewhat earlier in future years.

There was a negative relationship (b = -0.9410) between the size of crop and the length of the delivery season. As the size of the crop increases by one million bushels, the length of the peak wheat delivery season decreases by 0.94 of one day. The r^2 value of 0.3057 indicates that 30.57 percent of the annual variation in length of the peak delivery season is related to variations in the size of the wheat crop. The regression analysis infers that elevator operators can expect a larger quantity of wheat to be delivered in a shorter period of time during years of bumper crops.

Wheat was received by elevators in all size loads. However, 36 percent of the loads received by sampled elevators during the "wheat receiving season" was in the 50.1-100 bushel load-size group. The 100.1-150 bushel group had the smallest percentage of loads, 11.9 percent. Each of the three load-size groups, 0-50, 150.1-200, and 200.1 bushels-and above, accounted for about one-sixth of the loads received at sampled elevators.

Almost 60 percent of the total bushels of wheat received by sample elevators was in the two largest load-size groups. These two groups accounted for 34.5 percent of all loads received. Approximately one-third of all wheat received was accounted for by the largest load-size group. This group represented 16.8 percent of the loads.

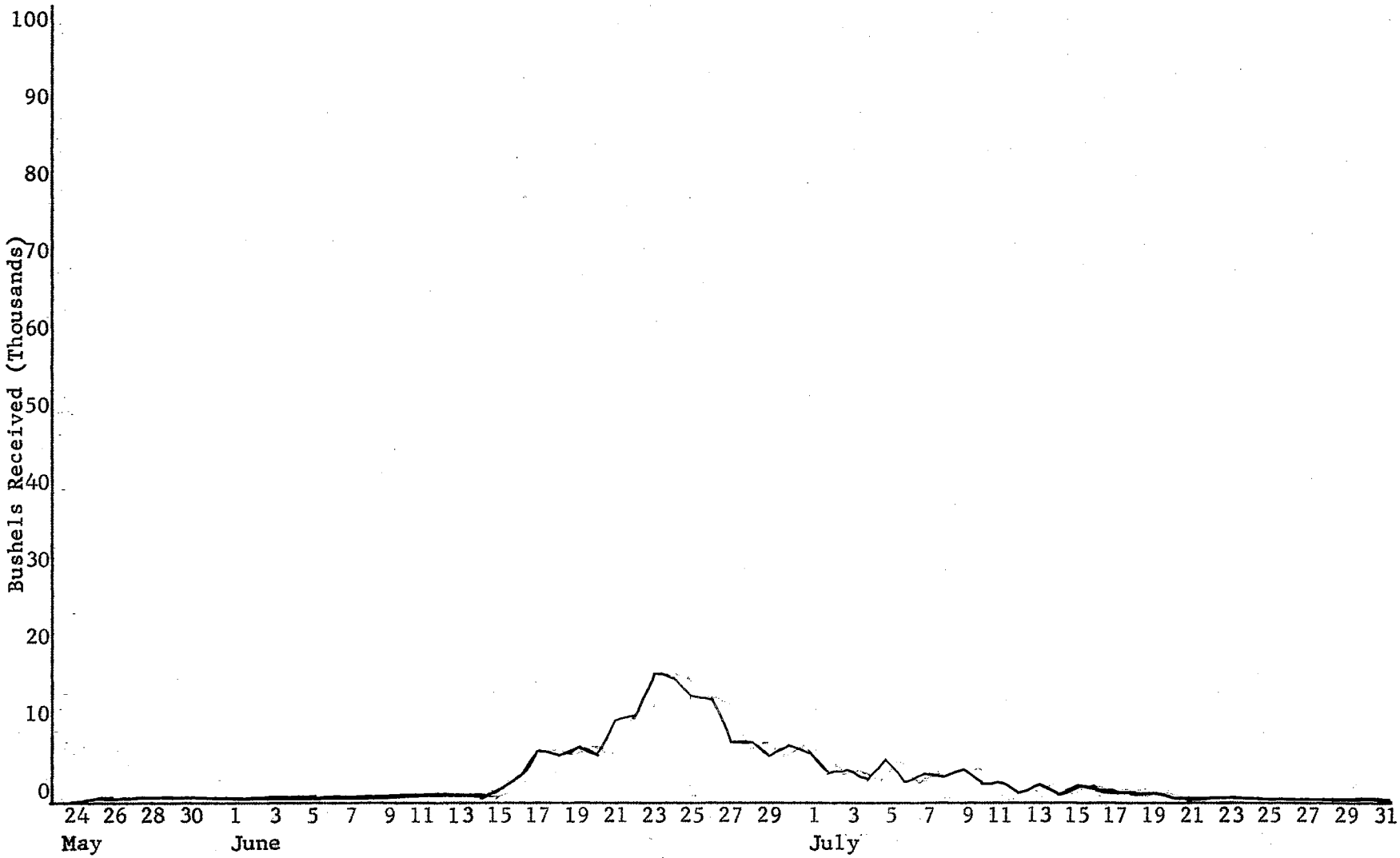
Over 53 percent of all loads was received in the two smallest load-size groups, but these loads accounted for only 28 percent of the total bushels received. About 17.6 percent of all loads was in the 0-50 bushel load-size group and accounted for only 5.2 percent of the total bushels received.

Neither area nor elevator size had a statistically significant effect upon the size of load received by country elevators in the sample. However, the size of sample was small. When the data were pooled for each elevator-size classification, regression analyses indicated a positive relationship between elevator size and the percentage of loads in the two largest load-size groups. Moreover, there appeared to be a negative relationship between elevator size and the percentage of loads in the two smallest load-size groups. These regression coefficients were not statistically significant at the five percent level, but percentage figures suggest that this relationship exists. These analyses indicate that large size loads tend to be received at large size elevators and small size loads tend to be received at small size elevators.

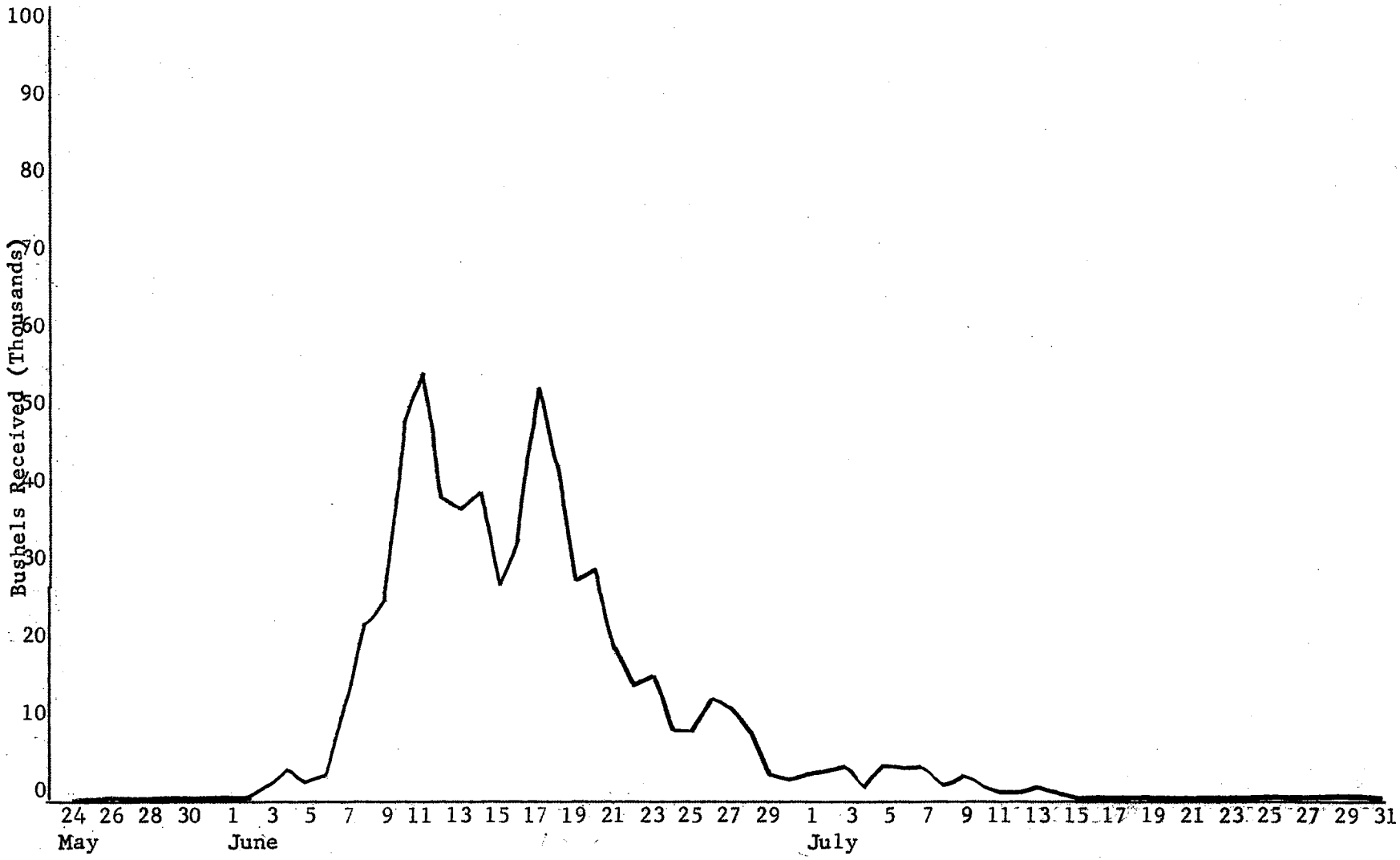
The percentage distribution of specific size loads indicates that small loads tend to be concentrated in the west central and northwest areas. Large loads tend to be concentrated in the southwest, panhandle, and north central areas.

There was a negative relationship between the size of crop and the percentage of loads in the smallest load-size group, and a positive relationship between crop size and the percentage of loads in the 150.1-200 bu. group. When a bumper crop is harvested, elevator operators may expect a larger percentage of large loads than during years when a small crop is harvested.

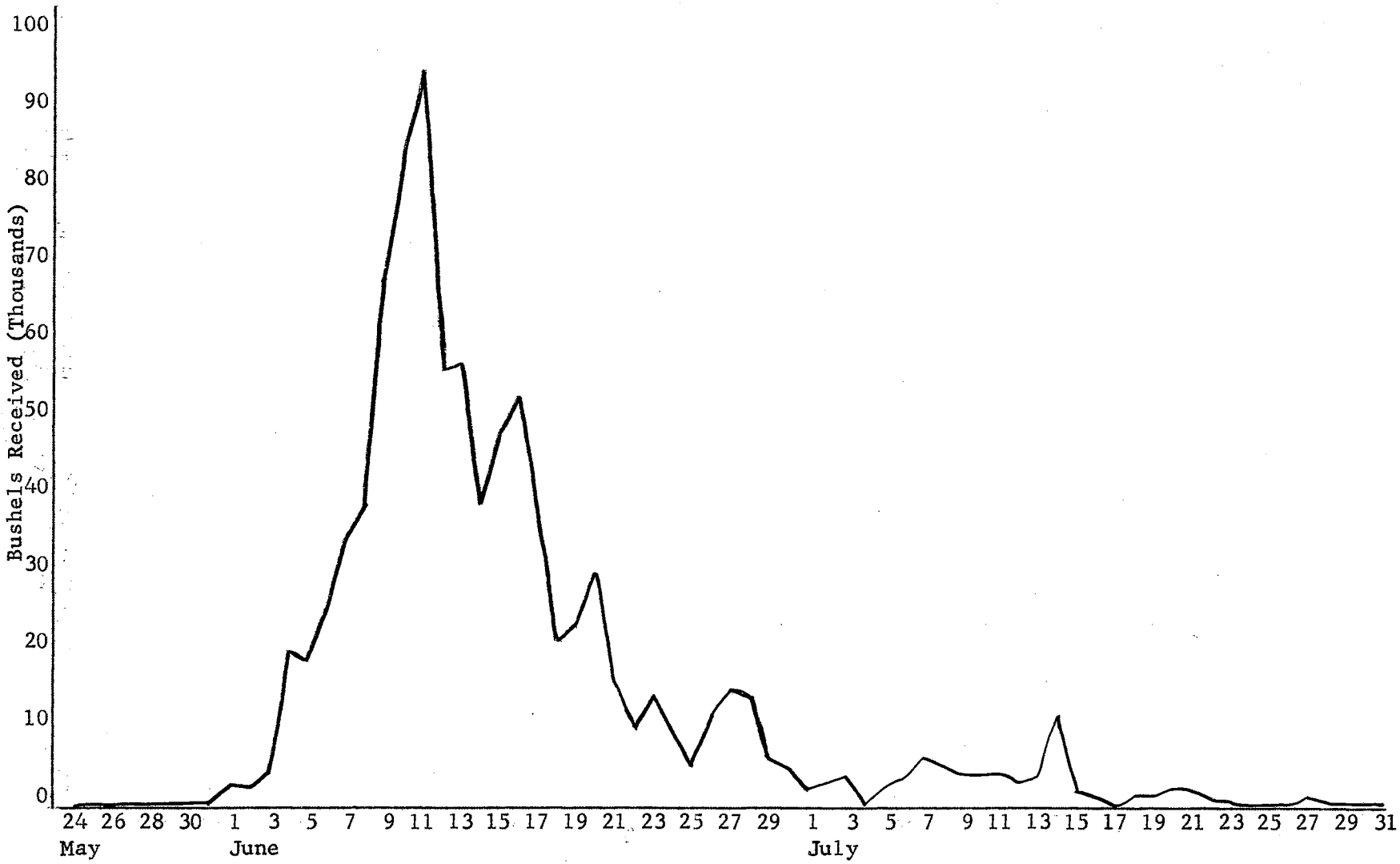
APPENDIXES



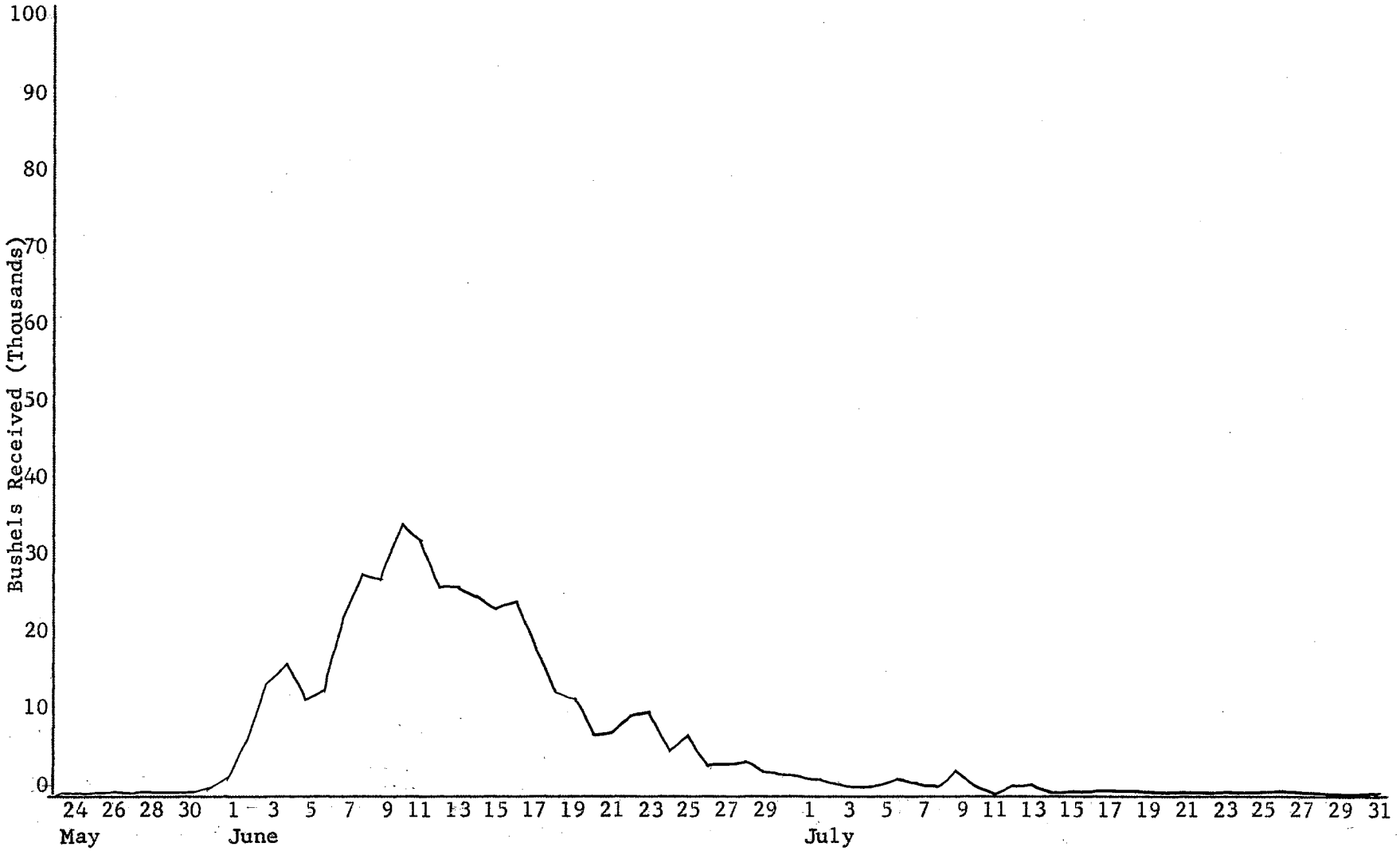
Appendix A, Figure 1. Daily Averages of Wheat Receipts by Sample Elevators, Panhandle, Oklahoma, Wheat Receiving Seasons, 1949-1955.



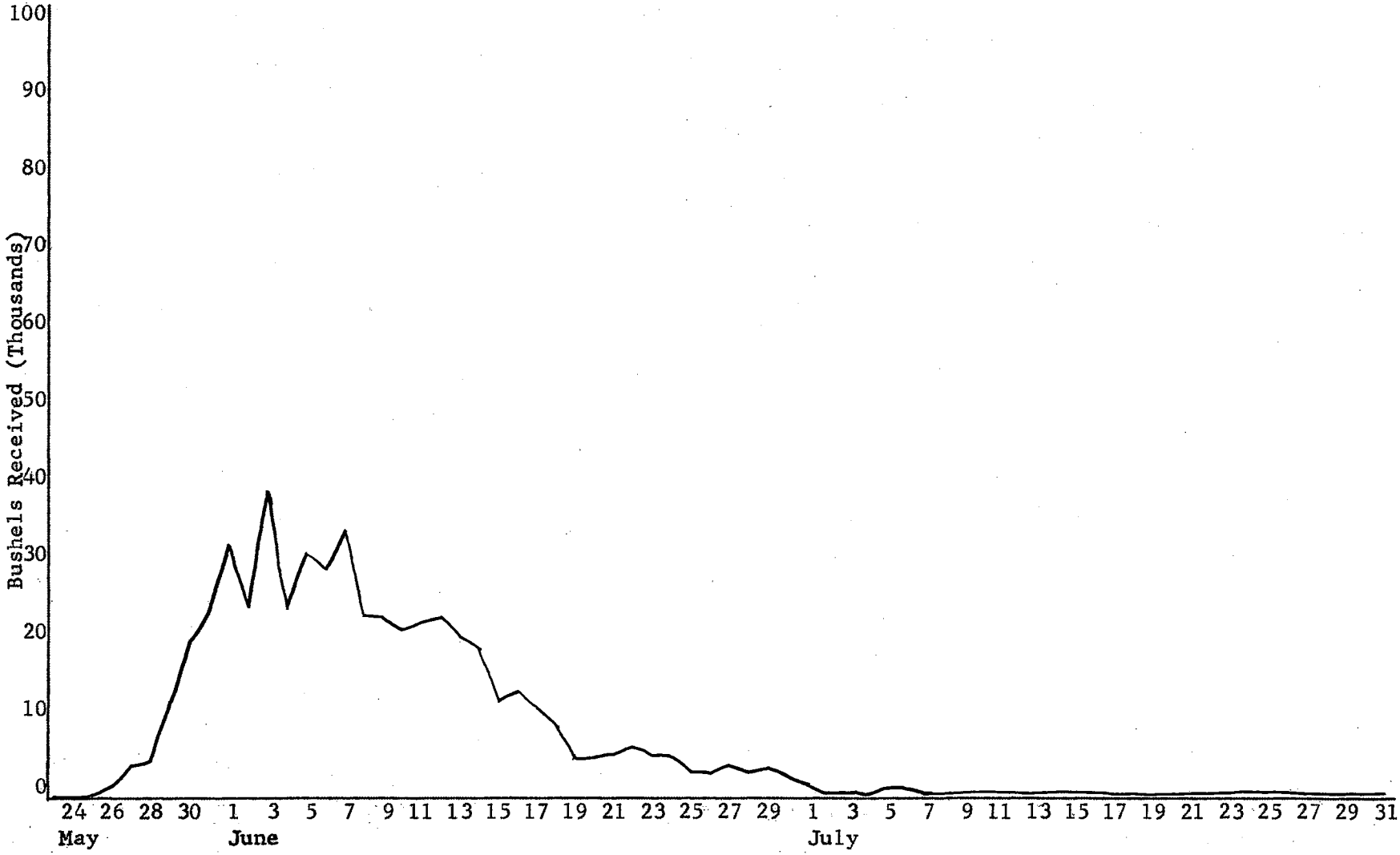
Appendix A, Figure 2. Daily Averages of Wheat Receipts by Sample Elevators, Northwest Oklahoma, Wheat Receiving Seasons, 1949-1955.



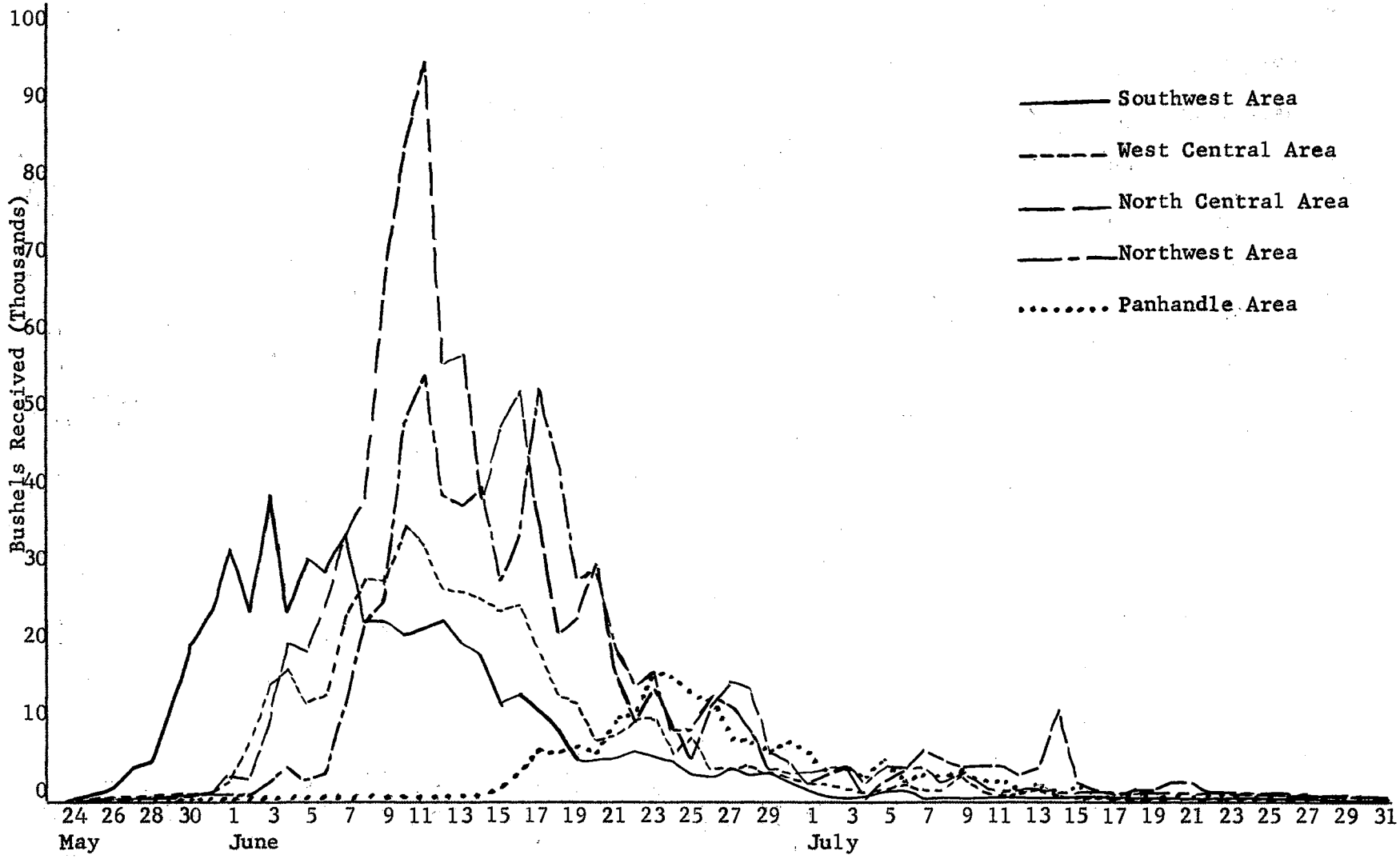
Appendix A, Figure 3. Daily Averages of Wheat Receipts by Sample Elevators, North Central Oklahoma, Wheat Receiving Seasons, 1949-1955.



Appendix A, Figure 4. Daily Averages of Wheat Receipts by Sample Elevators, West Central Oklahoma, Wheat Receiving Seasons, 1949-1955.



Appendix A, Figure 5. Daily Averages of Wheat Receipts by Sample Elevators, Southwest Oklahoma, Wheat Receiving Seasons, 1949-1955.



Appendix A, Figure 6. Daily Averages of Wheat Receipts by Sample Elevators, All Areas, Oklahoma, Wheat Receiving Seasons, 1949-1955.

APPENDIX B, TABLE I

REGRESSION OF DAYS REQUIRED TO DELIVER FROM 5 TO 55 PERCENT OF THE ANNUAL WHEAT RECEIPTS ON SIZE OF CROP HARVESTED, OKLAHOMA, 1949-1955.

Areas	Years	Million Bushels X	Days Y	Area	Years	Million Bushels X	Days Y
Panhandle	1950	1.3	22	West			
	1951	1.7	18	Central	1949	8.0	25
	1952	4.9	10		1950	3.9	11
	1953	1.1	15		1951	3.5	10
	1954	2.3	8		1952	10.8	7
	1955	.9	18		1953	6.9	10
					1954	7.2	11
Northwest	1949	8.6	5		1955	1.8	24
	1950	3.4	10				
	1951	4.5	11	Southwest	1949	7.9	14
	1952	12.5	6		1950	6.5	9
	1953	5.5	6		1951	2.7	24
	1954	5.6	7		1952	10.5	9
	1955	1.1	19		1953	9.4	6
North					1954	8.5	7
Central	1949	8.3	13		1955	3.8	9
	1950	5.0	8				
	1951	6.1	10				
	1952	12.8	4				
	1953	9.0	5				
	1954	9.3	12				
	1955	2.5	9				

$a = 17$

$b = -0.9410$

$s_b = 0.2515$

$s_{y.x} = 4.93$

d.f. = 32

$\hat{Y} = a + bX$

$\hat{Y} = 17 + (-0.9410)(X)$

$t = \frac{b}{s_b} = -3.741$

$t_{05} = 2.036$

Sources

Size of crop: Material published by the Crop Reporting Service, United States Department of Agriculture.

Days: Obtained from a survey of sample elevators.

APPENDIX C, TABLE I

LOADS OF WHEAT DELIVERED TO SAMPLE ELEVATORS BY SPECIFIC LOAD-SIZE GROUPS, FROM MAY 23 THROUGH JULY 31, BY YEARS WITHIN AREAS, OKLAHOMA, 1949-1955.

Years	Areas	Load-Size Groups (Bushels) 0-50	50.1-100	100.1-150	150.1-200	200.1-Above	Total
1949	Southwest	317	519	209	286	306	
	West Central	830	1,051	320	306	109	
	North Central	847	1,730	968	1,270	686	
	Northwest	1,481	2,572	768	950	437	
	Panhandle	122	346	122	323	349	
	Sub-total	3,597	6,218	2,387	3,135	1,887	17,224
	Percent of total	20.9	36.1	13.9	18.2	10.9	
1950	Southwest	632	897	332	540	521	
	West Central	369	408	83	70	28	
	North Central	937	2,183	747	873	358	
	Northwest	627	622	157	123	64	
	Panhandle	199	385	197	246	125	
	Sub-total	2,764	4,495	1,516	1,852	1,096	11,723
	Percent of total	23.6	38.3	12.9	15.8	9.3	
1951	Southwest	682	744	268	327	234	
	West Central	844	1,448	370	501	200	
	North Central	1,357	2,677	1,002	1,224	592	
	Northwest	1,386	2,220	587	681	333	
	Panhandle	267	496	209	237	177	
	Sub-total	4,536	7,585	2,436	2,970	1,536	19,063
	Percent of total	23.8	39.8	12.8	15.6	8.0	

APPENDIX C, TABLE I (Continued)

Years	Areas	Load-Size Groups (Bushels) 0-50	50.1-100	100.1-150	150.1-200	200.1-Above	Total
1952	Southwest	1,088	1,650	702	1,325	2,218	
	West Central	1,292	3,253	725	1,014	1,094	
	North Central	927	4,048	1,561	2,619	3,366	
	Northwest	1,533	6,768	1,404	2,339	2,525	
	Panhandle	511	1,523	519	1,001	815	
	Sub-total	5,351	17,242	4,911	8,298	10,018	45,820
	Percent of total	11.7	37.6	10.7	18.1	21.9	
1953	Southwest	845	1,014	550	1,014	2,103	
	West Central	1,554	2,859	964	1,363	1,178	
	North Central	1,114	3,744	1,523	2,639	2,034	
	Northwest	1,543	2,609	723	966	655	
	Panhandle	249	329	131	153	60	
	Sub-total	5,305	10,555	3,891	6,135	6,030	31,916
	Percent of total	16.6	33.1	12.2	19.2	18.9	
1954	Southwest	1,059	1,139	619	1,031	1,846	
	West Central	1,518	3,493	985	1,522	1,862	
	North Central	1,161	4,152	1,265	2,284	2,141	
	Northwest	1,750	3,990	972	1,728	1,388	
	Panhandle	439	958	384	500	313	
	Sub-total	5,927	13,732	4,225	7,065	7,550	38,499
	Percent of total	15.4	35.7	11.0	18.3	19.6	

APPENDIX C, TABLE I (Continued)

Years	Areas	Load-Size Groups (Bushels) 0-50	50.1-100	100.1-150	150.1-200	200.1-Above	Total
1955	Southwest	626	514	391	517	912	
	West Central	801	893	293	276	164	
	North Central	1,190	1,551	663	736	520	
	Northwest	1,084	940	295	192	86	
	Panhandle	126	135	116	186	82	
	Sub-total	3,827	4,033	1,758	1,907	1,764	13,289
	Percent of total	28.8	30.3	13.2	14.4	13.3	
	Grand Total	31,307	63,860	21,124	31,362	29,881	177,534

APPENDIX D

OBTAINING AVERAGE LOAD SIZE FROM SELECTED ELEVATORS

Two elevators were used for obtaining estimates of average load sizes. The elevators selected were chosen as being representative of other elevators in the sample. The receipts of only two years, 1952 and 1955, were used in computing the average load sizes. The receipts of 1952 were used to represent a large crop year, while the 1955 receipts were used to represent a small crop year. Only the loads received from May 23 through July 31 were used in deriving these averages. See Appendix D, Table I.

The average of actual receipts was used rather than the median of the range to account for skewness in the distribution that might exist in the actual loads received.

The average sizes of loads for the middle three groups were not significantly different from the median, therefore the median was used for these three groups. However, the distribution of bushels received in the 0-50 bu. load-size group had a definite skewness toward the upper end of this group. The population average selected for this group was 35 bushels. Since the 200.1 bu.-and above load-size group was an open ended class, the computed average was rounded to 230 bushels and this figure was used as the population average for this group.

APPENDIX D, TABLE I

AVERAGE BUSHELS PER LOAD HAULED WITHIN LOAD-SIZE GROUPS, TWO ELEVATORS, OKLAHOMA, 1952 AND 1955

Elevator and Year	Load Size Limits (Bushels)									
	0-50		50.1-100		100.1-150		150.1-200		200.1-Above	
	Number of Loads	Number of Bushels	Number of Loads	Number of Bushels	Number of Loads	Number of Bushels	Number of Loads	Number of Bushels	Number of Loads	Number of Bushels
Elevator A										
1952	344	12,783	585	42,507	148	17,283	234	41,968	276	65,345
1955	211	7,260	190	14,429	72	9,032	71	12,372	52	12,128
Elevator B										
1952	157	6,339	827	65,449	181	23,673	347	60,405	400	89,832
1955	230	7,419	205	13,395	54	6,675	23	3,970	14	3,188
Total	942	33,801	1,807	135,780	455	56,663	675	118,715	742	170,493
Average Size of Load (Bushels)	35.88		75.14		124.53		175.87		229.77	

APPENDIX E, TABLE I

NUMBER AND PERCENTAGE DISTRIBUTION OF LOADS WITHIN AREAS, BY LOAD-SIZE GROUP AND ELEVATOR-SIZE CLASSIFICATION, 36 OKLAHOMA ELEVATORS, 1949-1955.

Areas	Load-Size Groups (Bushels)	Elevator-Size Classifications (1,000 bushels)									
		0-25		25-50		50-100		100-250		250-Above	
		Number of Loads	Percent of Area Total	Number of Loads	Percent of Area Total	Number of Loads	Percent of Area Total	Number of Loads	Percent of Area Total	Number of Loads	Percent of Area Total
Panhandle Area	0 - 50	37	12.4	490	18.3	210	11.7	790	18.1	386	12.1
	50.1-100	56	18.7	925	34.6	619	34.4	1,637	37.6	935	29.2
	100.1-150	29	9.7	442	16.5	104	5.8	612	14.1	491	15.3
	150.1-200	71	23.7	532	19.9	433	24.1	733	16.8	877	27.4
	200.1-Above	106	35.5	287	10.7	431	24.0	583	13.4	514	16.0
	Total	299		2,676		1,797		4,355		3,203	
Northwest Area	0 - 50	657	26.3	83	4.8	1,951	21.4	4,181	21.9	2,532	18.0
	50.1-100	1,165	46.6	353	20.6	3,882	42.6	8,092	42.4	6,229	44.2
	100.1-150	260	10.4	154	9.0	1,129	12.4	2,047	10.7	1,316	9.3
	150.1-200	240	9.6	439	25.6	1,503	16.5	2,659	13.9	2,138	15.2
	200.1-Above	177	7.1	684	39.9	638	7.0	2,117	11.1	1,872	13.3
	Total	2,499		1,713		9,103		19,096		14,087	
North Central Area	0 - 50	257	14.5	1,366	23.8	1,744	17.4	1,005	7.7	3,161	12.1
	50.1-100	640	36.1	2,583	45.1	4,339	43.3	3,517	27.1	9,006	34.4
	100.1-150	241	13.6	620	10.8	1,255	12.5	2,129	16.4	3,484	13.3
	150.1-200	356	20.1	733	12.8	1,594	15.9	3,158	24.3	5,804	22.2
	200.1-Above	279	15.7	426	7.4	1,082	10.8	3,184	24.5	4,726	18.1
	Total	1,773		5,728		10,014		12,993		26,181	

APPENDIX E, TABLE I (Continued)

Areas	Load-Size Groups (Bushels)	Elevator-Size Classifications (1,000 bushels) 0-25 Number of Loads	0-25 Percent of Area Total	25-50 Number of Loads	25-50 Percent of Area Total	50-100 Number of Loads	50-100 Percent of Area Total	100-250 Number of Loads	100-250 Percent of Area Total	250-Above Number of Loads	250-Above Percent of Area Total
West Central Area	0 - 50	3,710	28.7	-	-	570	12.1	902	23.3	2,026	16.2
	50.1-100	5,614	43.5	-	-	1,704	36.1	1,339	34.5	4,748	37.9
	100.1-150	1,205	9.3	-	-	518	11.0	379	9.8	1,638	13.1
	150.1-200	1,445	11.2	-	-	836	17.7	524	13.5	2,247	18.0
	200.1-Above	946	7.3	-	-	1,098	23.2	732	18.9	1,859	14.9
	Total	12,920		-	-	4,726		3,876		12,518	
Southwest Area	0 - 50	1,492	26.7	118	21.0	1,170	27.4	1,976	19.3	493	6.7
	50.1-100	1,587	28.4	125	22.2	1,333	31.2	2,699	26.4	733	10.0
	100.1-150	650	11.6	79	14.0	533	12.5	1,131	11.1	678	9.3
	150.1-200	948	17.0	80	14.2	617	14.4	1,875	18.3	1,520	20.8
	200.1-Above	911	16.3	161	28.6	622	14.5	2,549	24.9	3,897	53.2
	Total	5,588		563		4,275		10,230		7,321	

*Data in this table represent wheat receipts from May 23 through July 31.

APPENDIX E, TABLE II

NUMBER AND PERCENTAGE DISTRIBUTION OF LOADS BY LOAD-SIZE GROUP AND ELEVATOR-SIZE CLASSIFICATION, 36 OKLAHOMA ELEVATORS, 1949-1955.*

Load-Size Groups (Bushels)	Elevator-Size Classifications (1,000 Bushels)											
	0-25		25-50		50-100		100-250		250-Above		Total	
	Number of Loads	Percent of Total	Number of Loads	Percent of Total	Number of Loads	Percent of Total	Number of Loads	Percent of Total	Number of Loads	Percent of Total	Number of Loads	Percent of Total
0 - 50	6,153	26.6	2,057	19.3	5,645	18.9	8,854	17.5	8,598	13.6	31,307	17.6
50.1-100	9,062	39.3	3,986	37.3	11,877	39.7	17,284	34.2	21,651	34.2	63,860	36.0
100.1-150	2,385	10.3	1,295	12.1	3,539	11.8	6,298	12.5	7,607	12.0	21,124	11.9
150.1-200	3,060	13.3	1,784	16.7	4,983	16.7	8,949	17.7	12,586	19.9	31,362	17.7
200.1-Above	2,419	10.5	1,558	14.6	3,871	12.9	9,165	18.1	12,868	20.3	29,881	16.8
Total	23,079	13.0	10,680	6.0	29,915	16.8	50,550	28.5	63,310	35.7	177,534	100.0

*Data in this table represent wheat receipts from May 23 through July 31.

APPENDIX E, TABLE III

NUMBER AND PERCENTAGE DISTRIBUTION OF LOADS BY LOAD-SIZE GROUP AND AREA OF STATE, 36 OKLAHOMA ELEVATORS, 1949-1955.*

Load-Size Groups (Bushels)	Areas of Oklahoma											
	Panhandle		Northwest		North Central		West Central		Southwest		Total	
	Number of Loads	Percent of Total	Number of Loads	Percent of Total	Number of Loads	Percent of Total	Number of Loads	Percent of Total	Number of Loads	Percent of Total	Number of Loads	Percent of Total
0 - 50	1,913	15.5	9,404	20.2	7,533	13.3	7,208	21.2	5,249	18.8	31,307	17.6
50.1-100	4,172	33.8	19,721	42.4	20,085	35.4	13,405	39.4	6,477	23.1	63,860	36.0
100.1-150	1,678	13.6	4,906	10.6	7,729	13.6	3,740	11.0	3,071	11.0	21,124	11.9
150.1-200	2,646	21.5	6,979	15.0	11,645	20.6	5,052	14.8	5,040	18.0	31,362	17.7
200.1-Above	1,921	15.6	5,488	11.8	9,697	17.1	4,635	13.6	8,140	29.1	29,881	16.8
Total	12,330	7.0	46,498	26.2	56,689	31.9	34,040	19.2	27,977	15.7	177,534	100.0

*Data in this table represent wheat receipts from May 23 through July 31.

APPENDIX F, TABLE I

AN ANALYSIS OF VARIANCE OF THE PERCENTAGE DISTRIBUTION OF LOADS, SIZE 0-50 BUSHELS, BETWEEN AREAS AND BETWEEN ELEVATOR-SIZE CLASSIFICATIONS, 36 OKLAHOMA ELEVATORS, 1949-1955.

	Elevator-size Classifications (bushels)					
Areas	0-25	25-50	50-100	100-250	250-Above	Sum
Panhandle	12.4	18.3	11.7	18.1	12.1	72.6
Northwest	26.3	4.8	21.4	21.9	18.0	92.4
North Central	14.5	23.8	17.4	7.7	12.1	75.5
West Central	28.7	19.9*	12.1	23.3	16.2	100.2
Southwest	26.7	21.0	27.4	19.3	6.7	101.1
Sum	108.6	87.8	90.0	90.3	65.1	441.8

*Computed by missing data technique.

Source of Variance	Degress of Freedom	Sum of Squares	Mean Square
Sizes	4	184.69	46.17
Areas	4	146.51	36.63
Discrepance	16-1 = 15	715.79	47.72
Total	24-1 = 23	1,046.99	

Sizes, F Value = 0.968 F_{05} = 3.01
Areas, F Value = 0.768 F_{05} = 3.01

Source of Percentage Figures: Obtained from a survey of sample elevators.

APPENDIX F, TABLE II

AN ANALYSIS OF VARIANCE OF THE PERCENTAGE DISTRIBUTION OF LOADS, SIZE 50.1-100 BUSHELS, BETWEEN AREAS AND BETWEEN ELEVATOR-SIZE CLASSIFICATIONS, 36 OKLAHOMA ELEVATORS, 1949-1955.

	Elevator-Size Classifications (bushels)					
Areas	0-25	25-50	50-100	100-250	250-Above	Sum
Panhandle	18.7	34.6	34.4	37.6	29.2	154.5
Northwest	46.6	20.6	42.6	42.4	44.2	196.4
North Central	36.1	45.1	43.3	27.1	34.4	186.0
West Central	43.5	35.9*	36.1	34.5	37.9	187.9
Southwest	28.4	22.2	31.2	26.4	10.0	118.2
Sum	173.3	158.4	187.6	168.0	155.7	843.0

*Computed by missing data technique

Source of Variance	Degrees of Freedom	Sum of Squares	Mean Square
Sizes	4	108.5	27.13
Areas	4	837.5	209.38
Discrepance	16-1 = 15	1,097.4	73.16
Total	24-1 = 23	2,043.4	

Sizes, F Value = 0.371 F_{05} = 3.01
Areas, F Value = 2.862 F_{05} = 3.01

Source of Percentage Figures: Obtained from a survey of sample elevators.

APPENDIX F, TABLE III

AN ANALYSIS OF VARIANCE OF THE PERCENTAGE DISTRIBUTION OF LOADS, SIZE 100.1-150 BUSHELS, BETWEEN AREAS AND BETWEEN ELEVATOR-SIZE CLASSIFICATIONS, 36 OKLAHOMA ELEVATORS, 1949-1955.

	Elevator-Size Classifications (bushels)					
Areas	0-25	25-50	50-100	100-250	250-Above	Sum
Panhandle	9.7	16.5	5.8	14.1	15.3	61.4
Northwest	10.4	9.0	12.4	10.7	9.3	51.8
North Central	13.6	10.8	12.5	16.4	13.3	66.6
West Central	9.3	11.6*	11.0	9.8	13.1	54.8
Southwest	11.6	14.0	12.5	11.1	9.3	58.5
Sum	54.6	61.9	54.2	62.1	60.3	293.1

*Computed by missing data technique

Source of Variance	Degress of Freedom	Sum of Squares	Mean Square
Sizes	4	11.52	2.88
Areas	4	26.51	6.63
Discrepance	16-1 = 15	112.36	7.49
Total	24-1 = 23	150.39	

Sizes, F Value = 0.384 F_{05} = 3.01

Areas, F Value = 0.885 F_{05} = 3.01

Source of Percentage Figures: Obtained from a survey of sample elevators.

APPENDIX F, TABLE IV

AN ANALYSIS OF VARIANCE OF THE PERCENTAGE DISTRIBUTION OF LOADS, SIZE 150.1-200 BUSHELS, BETWEEN AREAS AND BETWEEN ELEVATOR-SIZE CLASSIFICATIONS, 36 OKLAHOMA ELEVATORS, 1949-1955.

	Elevator-Size Classifications (bushels)					
Areas	0-25	25-50	50-100	100-250	250-Above	Sum
Panhandle	23.7	19.9	24.1	16.8	27.4	111.9
Northwest	9.6	25.6	16.5	13.9	15.2	80.8
North Central	20.1	12.8	15.9	24.3	22.2	95.3
West Central	11.2	14.4*	17.7	13.5	18.0	74.8
Southwest	17.0	14.2	14.4	18.3	20.8	84.7
Sum	81.6	86.9	88.6	86.8	103.6	447.5

*Computed by missing data technique

Source of Variance	Degrees of Freedom	Sum of Squares	Mean Square
Sizes	4	44.06	11.02
Areas	4	170.04	42.51
Discrepance	16-1 = 15	313.04	20.87
Total	24-1 = 23	527.14	

Sizes, F Value = 0.528 F_{05} = 3.01

Areas, F Value = 2.037 F_{05} = 3.01

Source of Percentage Figures: Obtained from a survey of sample elevators.

APPENDIX F, TABLE V

AN ANALYSIS OF VARIANCE OF THE PERCENTAGE DISTRIBUTION OF LOADS, SIZE 200.1 BUSHELS-AND ABOVE, BETWEEN AREAS AND BETWEEN ELEVATOR-SIZE CLASSIFICATIONS, 36 OKLAHOMA ELEVATORS, 1949-1955.

	Elevator-Size Classifications (bushels)					
Areas	0-25	25-50	50-100	100-250	250-Above	Sum
Panhandle	35.5	10.7	24.0	13.4	16.0	99.6
Northwest	7.1	39.9	7.0	11.1	13.3	78.4
North Central	15.7	7.4	10.8	24.5	18.1	76.5
West Central	7.3	18.6*	23.2	18.9	14.9	82.9
Southwest	16.3	28.6	14.5	24.9	53.2	137.5
Sum	81.9	105.2	79.5	92.8	115.5	474.9

*Computed by missing data technique

Source of Variance	Degrees of Freedom	Sum of Squares	Mean Square
Sizes	4	180.56	45.14
Areas	4	518.33	129.58
Discrepance 16-1	= 15	2,264.34	150.96
Total 24-1	= 23	2,963.23	

Sizes, F Value = 0.299 F_{05} = 3.01

Areas, F Value = 0.858 F_{05} = 3.01

Source of Percentage Figures: Obtained from a survey of sample elevators.

APPENDIX G, TABLE I

REGRESSION OF LOAD SIZE, 0-50 BUSHELS, ON ELEVATOR SIZE

Elevator-size Classifications (thousand bushels)	Elevator Size (thousand bushels) X	Percent of Loads* Y
0-25	12.5	26.6
25-50	37.5	19.3
50-100	75.0	18.9
100-250	175.0	17.5
250-Above	300.0	13.6
Total	600.0	95.9

*Percent of loads in the 0-50 bu. load-size group received by elevators in each elevator-size class.

$a = 23.24$

$b = -0.0338$

$s_b = 0.0121$

$s_{y.x} = 2.88$

$d.f. = 3$

$\hat{Y} = a + bX$

$\hat{Y} = 23.24 + (-0.0338)(X)$

$t = \frac{b}{s_b} = -2.7933$

$t_{05} = 3.182$

$r^2 = 0.7196$

Sources

Elevator Size: Median of elevator-size classifications.

Percent of loads: Obtained from a survey of sample elevators.

APPENDIX G, TABLE II

REGRESSION OF LOAD SIZE, 50.1-100 BUSHELS, ON ELEVATOR SIZE

Elevator-size Classifications (thousand bushels)	Elevator Size (thousand bushels) X	Percent of Loads* Y
0- 25	12.5	39.3
25- 50	37.5	37.3
50-100	75.0	39.7
100-250	175.0	34.2
250-Above	300.0	34.2
Total	600.0	184.7

*Percent of loads in the 50.1-100 bu. load-size group received by elevators in each elevator-size class.

$a = 39.20$

$b = -0.0188$

$s_b = 0.0071$

$s_{y.x} = 1.68$

$d.f. = 3$

$\hat{Y} = a + bX$

$\hat{Y} = 39.20 + (-0.0188)(X)$

$t = \frac{b}{s_b} = -2.6479$

$t_{05} = 3.182$

$r^2 = 0.6993$

Sources

Elevator Size: Median of elevator-size classifications.

Percent of loads: Obtained from a survey of sample elevators.

APPENDIX G, TABLE III

REGRESSION OF LOAD SIZE, 100.1-150 BUSHELS, ON ELEVATOR SIZE

Elevator-Size Classifications (thousand bushels)	Elevator Size (thousand bushels) X	Percent of Loads* Y
0- 25	12.5	10.3
25- 50	37.5	12.1
50-100	75.0	11.8
100-250	175.0	12.5
250-Above	300.0	12.0
Total	600.0	58.7

*Percent of loads in the 100.1-150 bu. load-size group received by elevators in each elevator-size class.

$a = 11.28$ $\quad \hat{Y} = a + bX$

$b = 0.0038$ $\quad \hat{Y} = 11.28 + (0.0038)\ (X)$

$s_b = 0.0035$ $\quad t = \frac{b}{s_b} = 1.0857$

$s_{y.x} = 0.82$ $\quad t_{05} = 3.182$

d.f. = 3 $\quad r^2 = 0.2799$

Sources

Elevator size: Median of elevator-size classifications.

Percent of loads: Obtained from a survey of sample elevators.

APPENDIX G, TABLE IV

REGRESSION OF LOAD SIZE, 150.1-200 BUSHELS, ON ELEVATOR SIZE

Elevator-size Classifications (thousand bushels)	Elevator Size (thousand bushels) X	Percent of Loads* Y
0- 25	12.5	13.3
25- 50	37.5	16.7
50-100	75.0	16.7
100-250	175.0	17.7
250-Above	300.0	19.9
Total	600.0	84.3

*Percent of loads in the 150.1-200 bu. load-size group received by elevators in each elevator-size class.

$a = 14.71$ $\quad \hat{Y} = a + bX$

$b = 0.0179$ $\quad \hat{Y} = 14.71 + (0.0179)(X)$

$s_b = 0.0054$ $\quad t = \frac{b}{s_b} = 3.3148$

$s_{y.x} = 1.27$ $\quad t_{05} = 3.182$

d.f. = 3 $\quad r^2 = 0.7848$

Sources

Elevator sizes: Median of elevator-size classifications.

Percent of loads: Obtained from a survey of sample elevators.

APPENDIX G, TABLE V

REGRESSION OF LOAD SIZE, 200.1- BUSHELS-AND ABOVE, ON ELEVATOR SIZE

Elevator-size Classifications (thousand bushels)	Elevator Size (thousand bushels) X	Percent of Loads* Y
0- 25	12.5	10.5
25- 50	37.5	14.6
50-100	75.0	12.9
100-250	175.0	18.1
250-Above	300.0	20.3
Total	600.0	76.4

*Percent of loads in the 200.1 bu.-and above load-size group received by elevators in each elevator-size class.

$a = 11.56$

$b = 0.0310$

$s_b = 0.0069$

$s_{y.x} = 1.64$

d.f. = 3

$\hat{Y} = a + bX$

$\hat{Y} = 11.56 + (0.0310)(X)$

$t = \frac{b}{s_b} = 4.4927$

$t_{05} = 3.182$

$r^2 = 0.8688$

Sources

Elevator sizes: Median of elevator-size classifications.

Percent of loads: Obtained from a survey of sample elevators.

APPENDIX H, TABLE I

REGRESSION OF LOAD SIZE, 0-50 BUSHELS, ON CROP SIZE

Years	Size of Crop (million bushels) X	Percent of Loads* Y
1949	82.1	20.9
1950	40.3	23.6
1951	37.1	23.8
1952	103.0	11.7
1953	64.0	16.6
1954	65.8	15.4
1955	20.1	28.8
Total	412.4	140.8

*Percent of loads in the 0-50 bu. load-size group.

$a = 30.79$ $\quad \hat{Y} = a + bX$

$b = -0.1813$ $\quad \hat{Y} = 30.79 + (-0.1813)\ (X)$

$s_b = 0.0436$ $\quad t = \frac{b}{s_b} = -4.1582$

$s_{y.x} = 3.05$ $\quad t_{05} = 2.571$

d.f. = 5 $\quad r^2 = 0.7750$

Sources

Size of Crop: Information published by the Crop Reporting Serivce, U.S. Department of Agriculture.

Percent of Loads: Obtained from a survey of sample elevators.

APPENDIX H, TABLE II

REGRESSION OF LOAD SIZE, 50.1-100 BUSHELS, ON CROP SIZE

Years	Size of Crop (million bushels) X	Percent of Loads* Y
1949	82.1	36.1
1950	40.3	38.3
1951	37.1	39.8
1952	103.0	37.6
1953	64.0	33.1
1954	65.8	35.7
1955	20.1	30.3
Total	412.4	250.9

*Percent of loads in the 50.1-100 bu. load-size group.

$a = 34.01$ $\quad \hat{Y} = a + bX$

$b = 0.0310$ $\quad \hat{Y} = 34.01 + (0.0310)(X)$

$s_b = 0.0487$ $\quad t = \frac{b}{s_b} = 0.6365$

$s_{y.x} = 3.41$ $\quad t_{05} = 2.571$

$d.f. = 5$ $\quad r^2 = 0.0745$

Sources

Size of crop: Information published by the Crop Reporting Service, U. S. Department of Agriculture.

Percent of Loads: Obtained from a survey of sample elevators.

APPENDIX H, TABLE III

REGRESSION OF LOAD SIZE, 100.1-150 BUSHELS, ON CROP SIZE

Years	Size of Crop (million bushels) X	Percent of Loads* Y
1949	82.1	13.9
1950	40.3	12.9
1951	37.1	12.8
1952	103.0	10.7
1953	64.0	12.2
1954	65.8	11.0
1955	20.1	13.2
Total	412.4	86.7

*Percent of loads in the 100.1-150 bu. load-size group.

$a = 13.58$ $\quad \hat{Y} = a + bX$

$b = -0.0204$ $\quad \hat{Y} = 13.58 + (-0.0204)(X)$

$s_b = 0.0157$ $\quad t = \frac{b}{s_b} = -1.2993$

$s_{y.x} = 1.10$ $\quad t_{05} = 2.571$

$d.f. = 5$ $\quad r^2 = 0.2495$

Sources

Size of Crop: Information published by the Crop Reporting Service, U. S. Department of Agriculture.

Percent of Loads: Obtained from a survey of sample elevators.

APPENDIX H, TABLE IV

REGRESSION OF LOAD SIZE, 150.1-200 BUSHELS, ON CROP SIZE

Years	Size of Crop (million bushels) X	Percent of Loads* Y
1949	82.1	18.2
1950	40.3	15.8
1951	37.1	15.6
1952	103.0	18.1
1953	64.0	19.2
1954	65.8	18.3
1955	20.1	14.4
Total	412.4	119.6

*Percent of loads in the 150.1-200 bu. load-size group.

$a = 14.06$ $\quad \hat{Y} = a + bX$

$b = 0.0512$ $\quad \hat{Y} = 14.06 + (0.0512)(X)$

$s_b = 0.0161$ $\quad t = \frac{b}{s_b} = 3.1801$

$s_{y.x} = 1.13$ $\quad t_{05} = 2.571$

$d.f. = 5$ $\quad r^2 = 0.6648$

Sources

Size of Crop: Information published by the Crop Reporting Service, U. S. Department of Agriculture.

Percent of Loads: Obtained from a survey of sample elevators.

APPENDIX H, TABLE V

REGRESSION OF LOAD SIZE, 200.1 BUSHELS-AND ABOVE, ON CROP SIZE

Years	Size of Crop (million bushels) X	Percent of Loads* Y
1949	82.1	10.9
1950	40.3	9.3
1951	37.1	8.0
1952	103.0	21.9
1953	64.0	18.9
1954	65.8	19.6
1955	20.1	13.3
Total	412.4	101.9

*Percent of loads in the 200.1 bu -and above load-size group.

$a = 7.49$

$b = 0.1198$

$s_b = 0.0681$

$s_{y.x} = 4.76$

d.f. = 5

$\hat{Y} = a + bX$

$\hat{Y} = 7.49 + (0.1198)(X)$

$t = \frac{b}{s_b} = 1.7591$

$t_{05} = 2.571$

$r^2 = 0.3818$

Sources

Size of Crop: Information published by the Crop Reporting Service, U. S. Department of Agriculture.

Percent of Loads: Obtained from a survey of sample elevators.

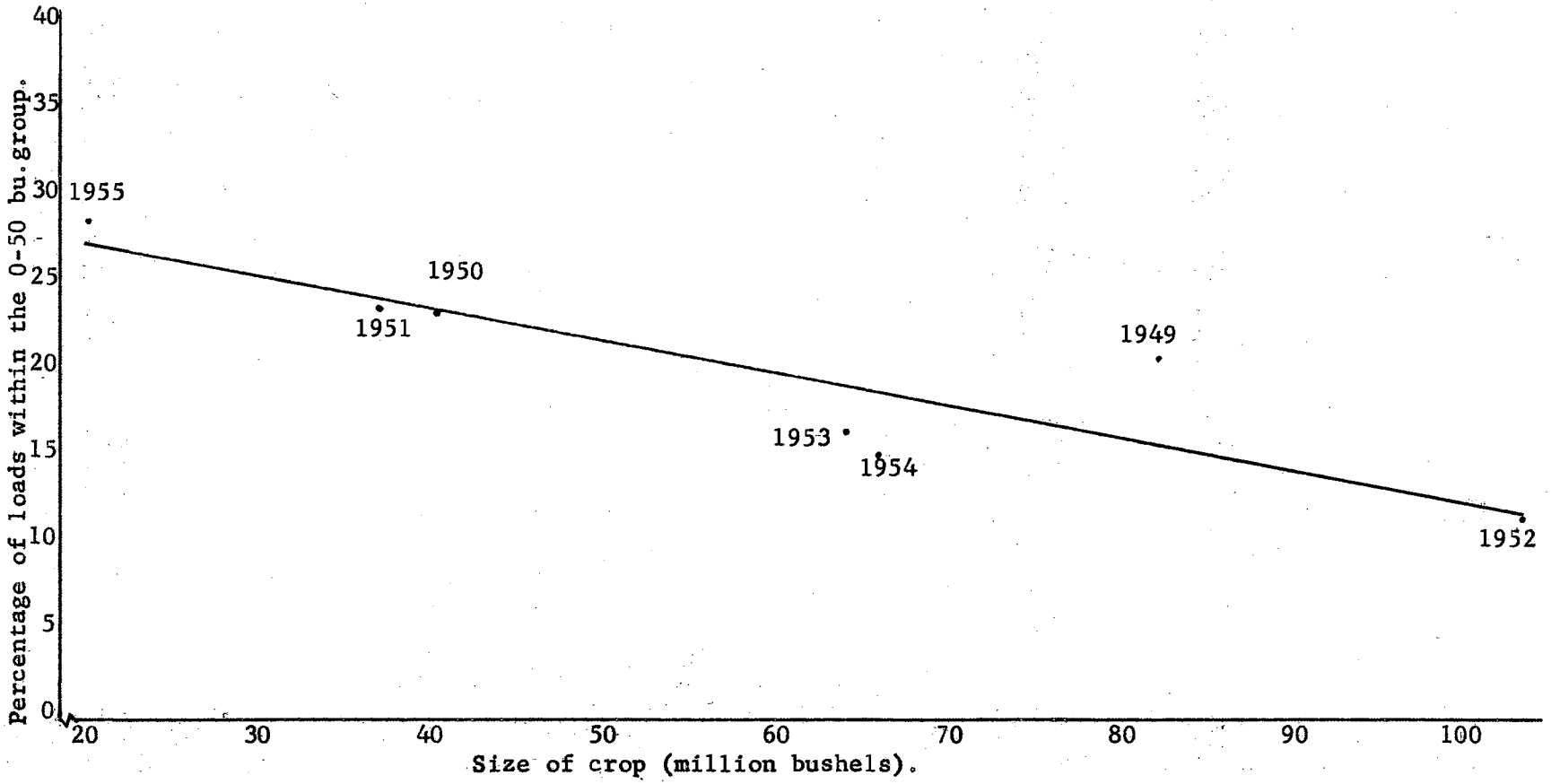


Figure 1. The Regression of Load Size 0-50 bushels on Crop Size, Oklahoma, 1949-1955.

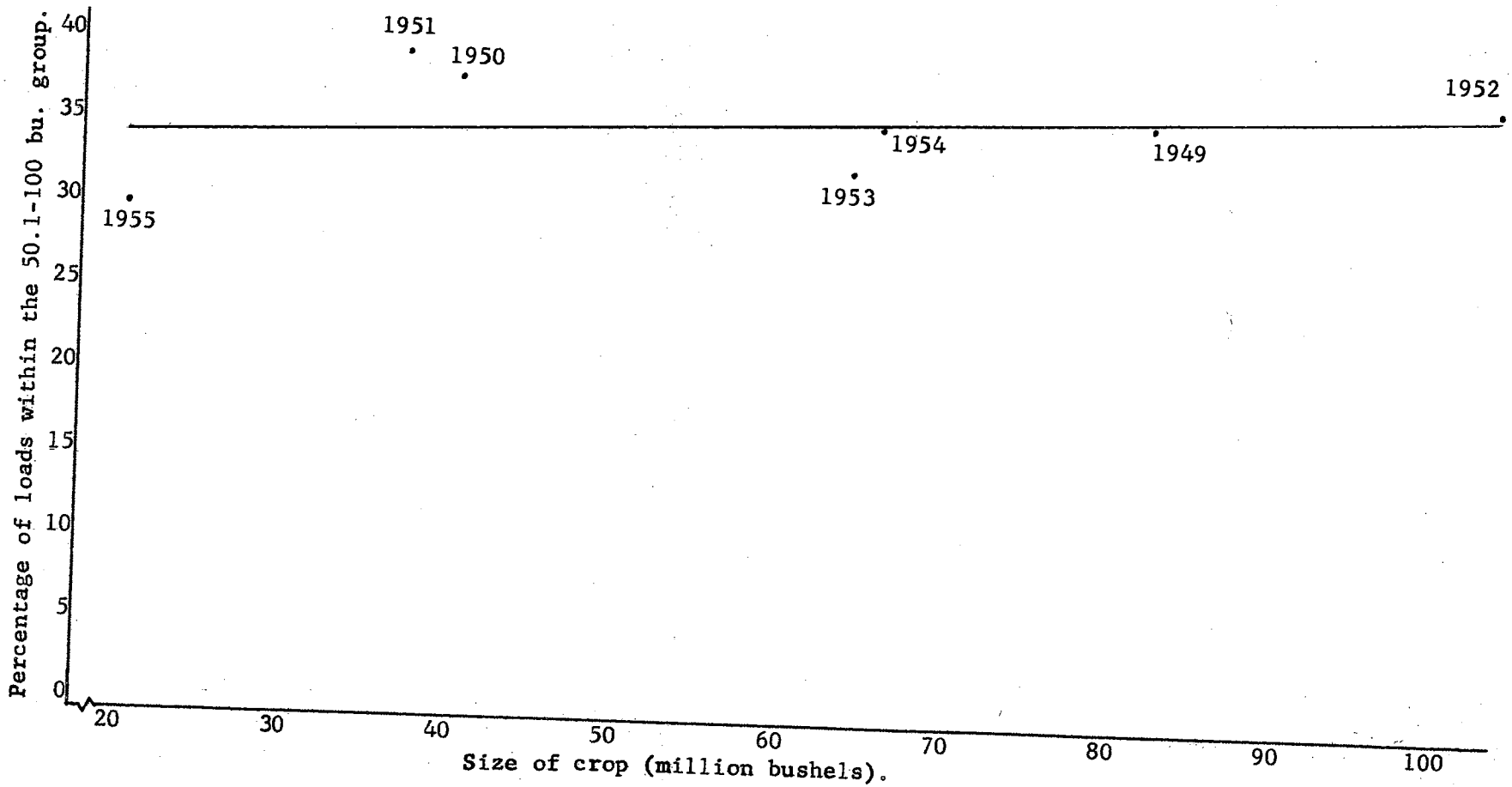


Figure 2. The Regression of Load Size 50.1-100 bushels on Crop Size, Oklahoma, 1949-1955.

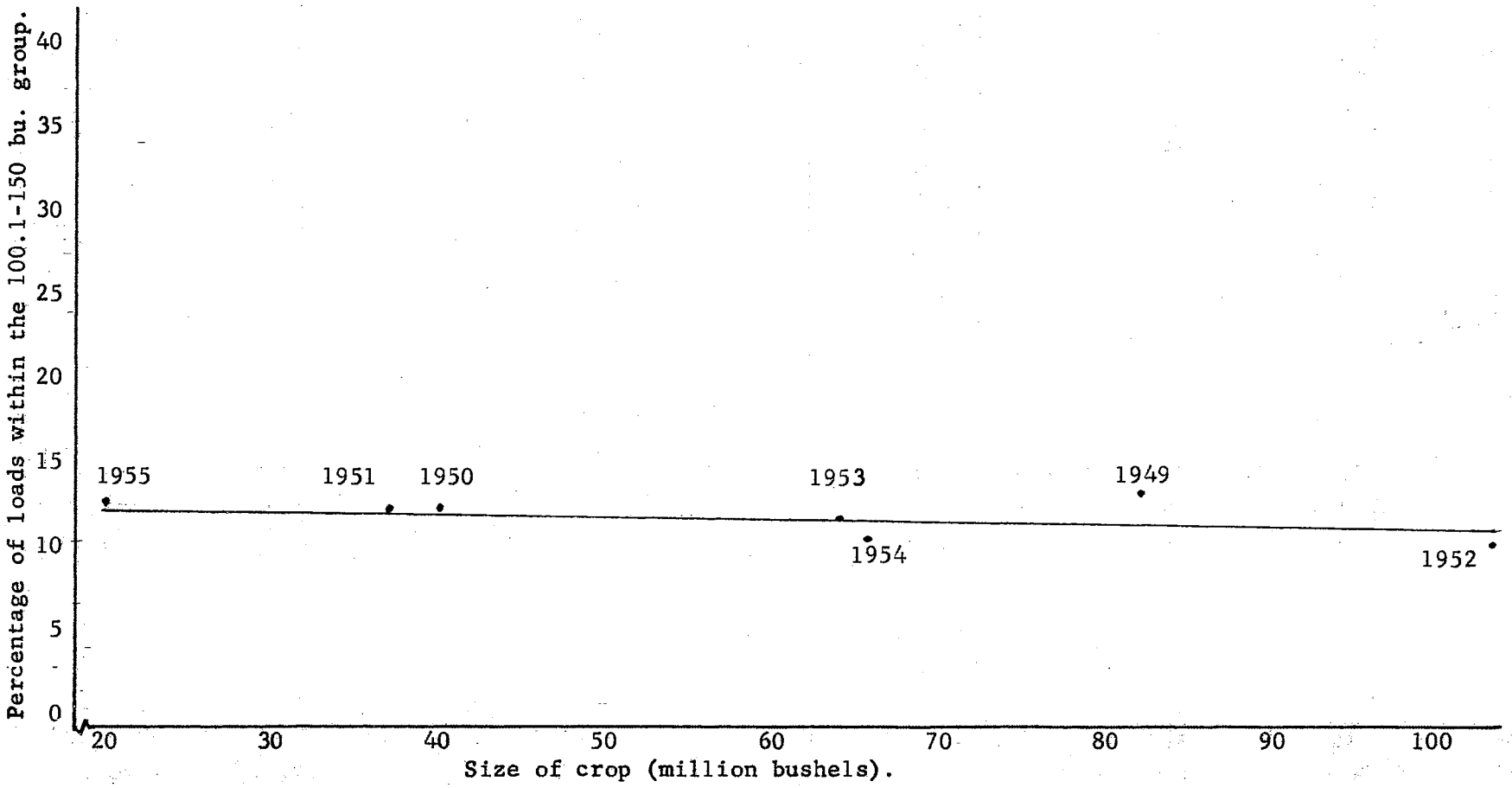


Figure 3. The Regression of Load Size 100.1-150 bushels on Crop Size, Oklahoma, 1949-1955.

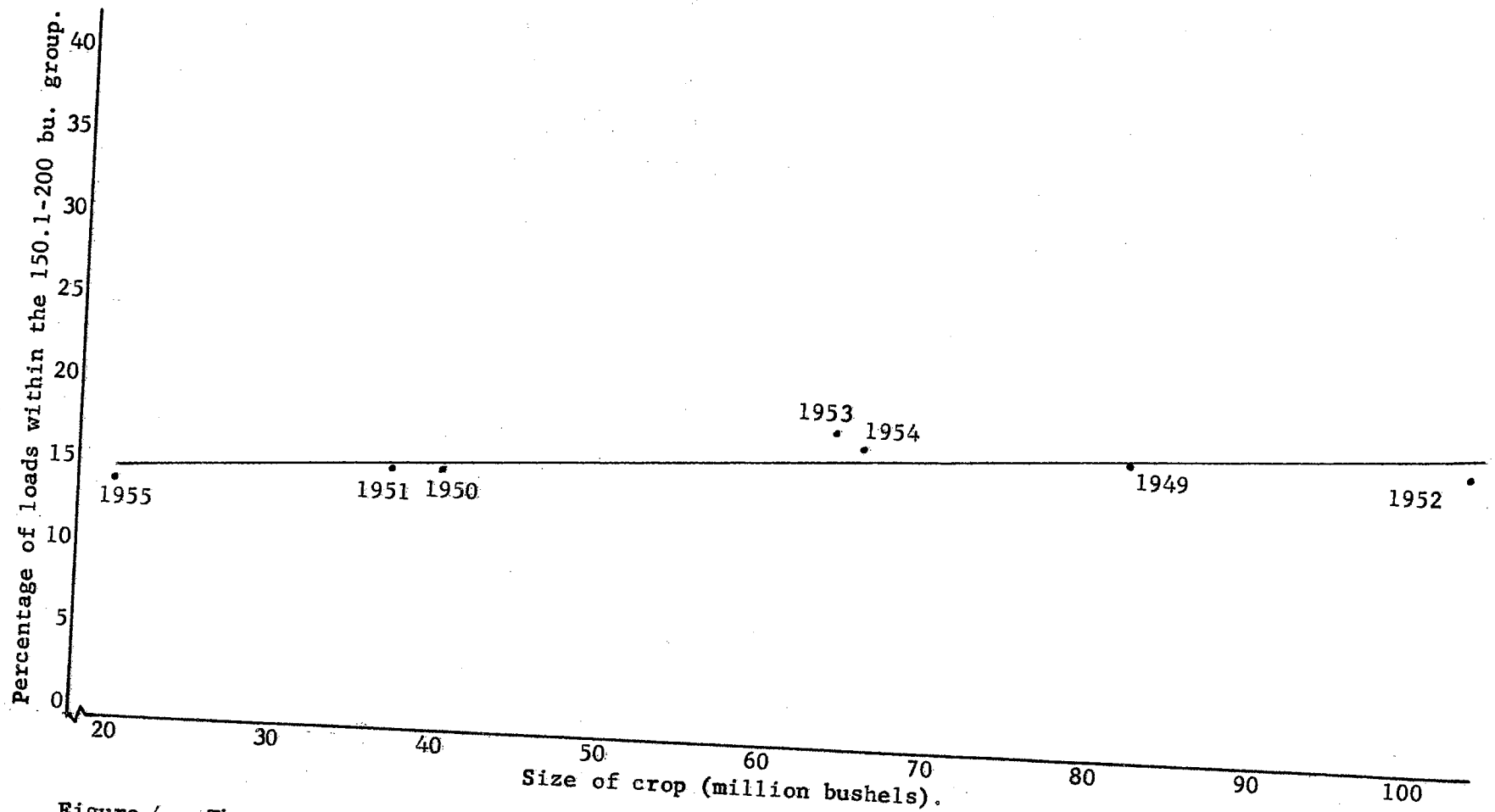


Figure 4. The Regression of Load Size 150.1-200 bushels on Crop Size, Oklahoma, 1949-1955.

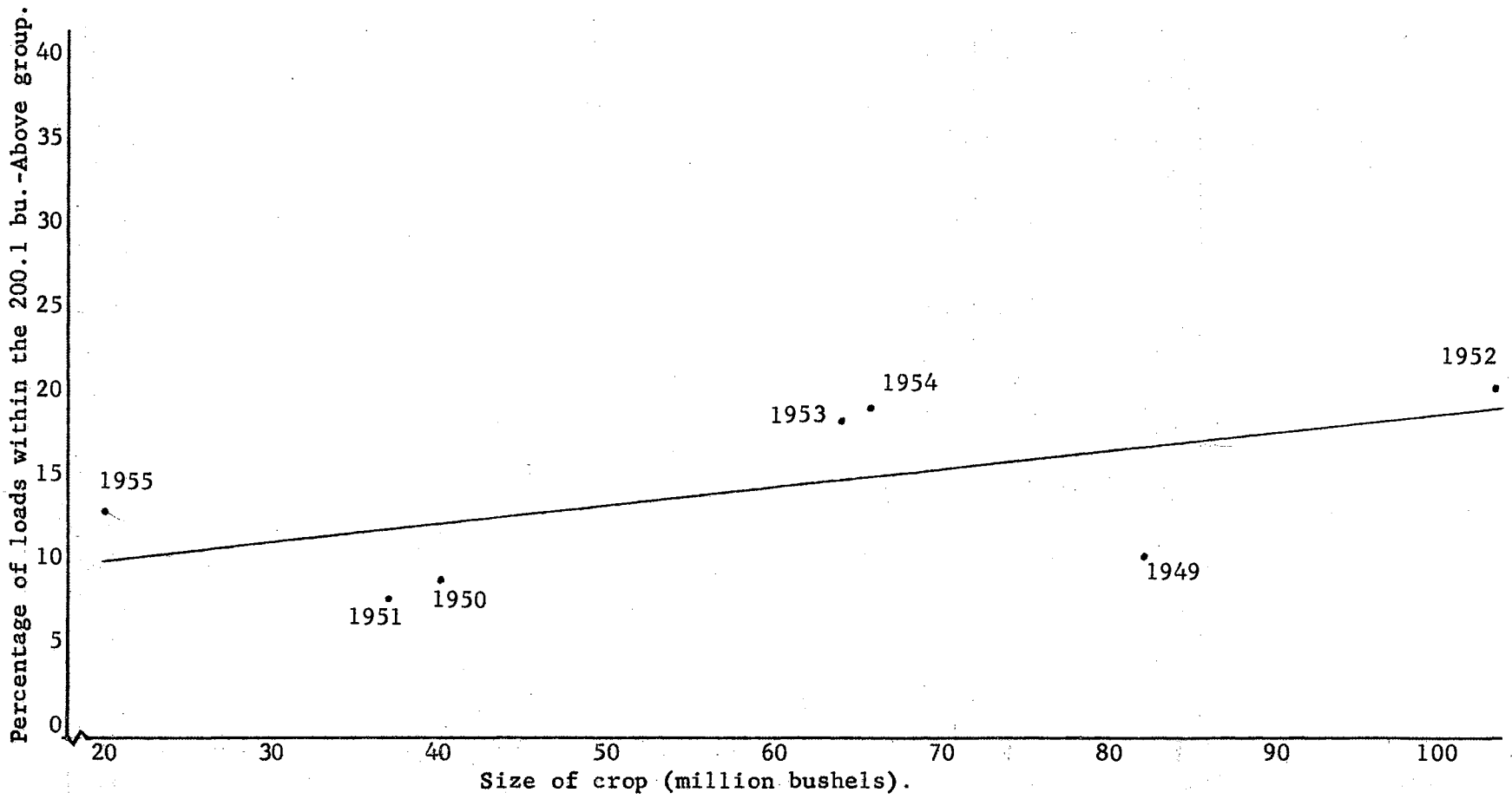


Figure 5. The Regression of Load Size 200.1 bu.-and above on Crop Size, Oklahoma, 1949-1955.

VITA

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Candidate for the Degree of

Master of Science

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