

GRAIN SORGHUM MOVEMENTS FROM SOUTHWESTERN KANSAS IN RELATION  
TO SPATIAL PRICE DIFFERENCES

by

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## INTRODUCTION

### Importance of Grain Sorghum in Kansas Economy

Grain sorghums have increased in importance in Kansas since about 1940. This increase can be attributed to less land planted to wheat due to acreage allotments, the need for another cash crop in years when wheat fails, and realization of its importance as a feed grain. Total production has also been increased by the development of new varieties and better methods of production. The ability of grain sorghum to withstand drought gives some assurance to the producer of having a feed grain in drought years when conditions are unfavorable for corn production in the corn producing areas.

For the ten-year period of 1947-1956 Kansas farmers sold 65 percent of their grain sorghum production on the cash market. This average compares with 1955 when 63 percent was sold and 60 percent in 1956.<sup>1</sup> It was estimated that 74 percent of the 1957 Kansas crop would be sold by the producer.<sup>2</sup>

Table 1 shows the increase in Kansas farm value of grain sorghum since 1947. Grain sorghums have ranked from third to fifth in farm value of all crops from 1947-1956 and it is estimated that they were second to wheat in 1957. Corn has ranked from second to fourth during this same period. In 1954 grain sorghum ranked third to wheat and alfalfa hay while corn was fourth. By percentage comparison in Table 1 the farm value of grain sorghum as compared to the farm value of corn shows that grain sorghums have gained considerably on corn in the period 1947-1956. For the record crop of 1957

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<sup>1</sup>Kansas State Board of Agriculture, Price Patterns, p. 15.

<sup>2</sup>U. S. Department of Agriculture, Field and Seed Crops By States, 1956-57, p. 16.

Table 1. Kansas farm value: All crops, corn for grain, and grain sorghums, and percent grain sorghums are of all crops and of corn for grain 1947-1956, 10 year average, and 1957.

Year	:Farm Value: : of All : Crops :	:Farm Value : : of Corn for: : Grain :	: Farm Value : of : Grain Sorghum: :	:Farm Value of: :Grain Sorghum:Percent of :Farm Value :All Crops	:Farm Value of :Grain Sorghum:Percent of :Farm Value of :Corn for Grain
	(thousands)	(thousands)	(thousands)		
1947	\$912,364	\$ 79,003	\$21,429	2.3	27.1
1948	730,308	104,831	28,968	4.0	27.6
1949	538,665	77,872	30,365	5.6	39.0
1950	679,893	123,932	45,835	6.7	37.0
1951	618,006	89,230	76,795	12.4	86.1
1952	944,554	71,496	29,102	3.1	40.7
1953	556,911	56,591	35,542	6.4	62.8
1954	675,012	48,651	56,298	8.3	115.7
1955	510,472	34,910	33,472	6.6	95.9
1956	513,845	31,535	30,488	5.9	96.7
10 yr. ave.					
1947-56	668,003	71,805	38,834	5.8	54.1
1957 <sup>1</sup>	515,831	41,607	103,303	20.0	248.3

<sup>1</sup>Preliminary estimate.

Source: Kansas State-Federal Crop Reporting Service.

It was estimated that the farm value of grain sorghum was 248.3 percent of the farm value of corn in Kansas.

With this increase in value, grain sorghums are also becoming important as a surplus crop in Kansas. Markets other than local and in the state are needed to a greater degree than before.

#### Purpose and Problem

Wayne M. Shirk in his thesis on Marketing Grain Sorghum in Kansas stated that, "Kansas farmers have not obtained maximum return from their sorghum

grain production."<sup>1</sup> Shirk concluded in his study that farmers did not get maximum returns because they sold at the wrong time of the year.

This study was to determine whether Kansas sellers were taking advantage of price differences between markets at a given point in time. A small part of a spatial equilibrium problem has been studied to see if the grain sorghum market was in equilibrium. To do this the economic theory that "under competitive conditions, the price to the producer would be the central market price less the cost of transportation services between the production location and the consuming center" was applied.<sup>2</sup>

If an equilibrium was found between the producing area and the consuming area considered, it would be indifferent as to where Kansas grain sorghum was shipped. But, it was felt that an equilibrium did not exist within the structure of the grain sorghum market. The period covered was from July 1, 1955 to December 31, 1957.

The partial spatial equilibrium used was made up of the consuming markets of Washington, California, and Kansas City. Kansas was considered part of the main producing area of grain sorghums. The study was limited to an area south of a line from Salina through Goodland, and west of a line from Salina through Wichita, since almost all movement west was from this area.

#### Procedure and Assumptions

Grain sorghum prices for Los Angeles, Seattle, and Kansas City, and

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<sup>1</sup>Wayne M. Shirk, Marketing Grain Sorghum in Kansas, Unpublished Master's Thesis, Kansas State College, 1956, p. 2.

<sup>2</sup>Earl O. Heady, Economics of Agriculture Production and Resource Use, p. 642.



movements of grain sorghums to California, Washington, and Kansas City were analyzed. Freight costs (f.o.b.) from Kansas to these three markets were deducted from the prices of each market. This put the prices of the markets considered on the same basic level.

Prices for Los Angeles were obtained from Feedstuffs, Volume 27, No. 26 through Volume 29, No. 52. These prices were listed as nominal terminal market prices and were for the latter part of each week. Los Angeles prices were considered to be representative of terminal market prices in California, since local prices in California should be reflected on the Los Angeles market.

Seattle prices were received by letter from P. L. Doctor, Agricultural Statistician, who copied the prices from the records of the Seattle Grain Exchange. These prices were Friday quotations or the closest marketing day to Friday. Seattle prices were considered to be representative of terminal market prices in Washington, since one of the largest feed manufacturers in the state, the Washington Cooperative Farmer's Association, set a price on grain sorghums which was reflected on the price at the Seattle Grain Exchange.<sup>1</sup>

Kansas City prices were taken from the Kansas City Grain Market Review, 1955-1957, and were No. 2 nominal, Friday quotations.

Data on grain sorghum movements, which will be discussed later, were obtained from the records of the Kansas Entomological Commission. Carlot receipts in Kansas City were taken from the Kansas City Grain Market Review.

It was assumed that a very large percent of the carlot receipts in Kansas City were from Kansas and further that these receipts came chiefly from the area in Kansas which was covered in the final analysis of this study. A partial basis for this assumption was from the results of a survey

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<sup>1</sup>P. L. Doctor, letter to author, March 5, 1958.

made in the summer of 1955 in which Kansas State College participated in a North Central Region Cooperative Research Project on country elevator marketing operations. It was found from this study that western Kansas was a surplus area, while large quantities were sometimes shipped in for resale locally in eastern Kansas. Southeastern Kansas country elevator managers reported that two and one-half as much grain sorghum was sold to local farmers as was locally received from producers in the area.

It was further assumed that the largest part of the carlot receipts in Kansas City remained there since it is the second largest feed manufacturing center in the United States. Based on this assumption flat freight rates to Kansas City were used in this study. If proportional rates had been used during certain periods of time a better market than Kansas City might have been located east of the Kansas City market.

The procedure used for each section will be specified in the text.

## SUPPLY AND DISTRIBUTION OF GRAIN SORGHUMS

### General

Table 2 shows the flow of grain sorghums in the United States as they move from producer to the consumer. This has been based on a ten-year average of 1947-1956. Eighty-three and six-tenths percent of the average total supply was determined by production while carryover contributed 16.4 percent each year.

The consumer receives his grain sorghums mainly in the form of live-stock products. Small amounts of grain sorghums are used in this country for making alcohol. The exports from this country are used largely for food products by the foreign countries.



Table 2. Grain sorghums: Supply and distribution, United States, 1947-1956,  
10 year average, and 1957.

Year	Supply			Distribution			Stocks,		
Beginning October 1	Carry- over	Production	Total Supply	Food and Ind. Uses	Seed	Exports	Total Non- Feed Uses	Livestock	End of Year
					(million bushels)				
1947	7.0	93.2	100.2	9.6	1.9	16.6	28.1	65.4	6.7
1948	6.7	131.4	138.1	3.5	1.5	40.0	45.0	74.3	18.7
1949	18.7	143.5	167.2	10.0	2.0	31.6	43.6	63.8	52.7
1950	59.7	233.5	293.2	36.5	1.9	75.3	113.7	141.4	38.1
1951	38.1	162.9	201.0	12.5	1.6	62.1	76.2	114.8	10.0
1952	10.0	90.7	100.7	4.0	1.8	10.4	16.2	77.0	7.5
1953	7.5	115.7	123.2	5.0	2.4	15.3	22.7	78.2	22.3
1954	22.3	235.3	257.6	8.0	2.9	47.7	58.6	124.0	75.0
1955	75.0	242.5	317.5	8.0	2.6	66.1	76.7	159.4	81.4
1956	81.4	205.1	286.5	8.0	3.3	22.0	33.3	172.6	80.6
10 yr. ave. 1947-1956	32.6	165.9	198.5	10.5	2.2	38.7	51.4	107.1	40.0
1957 <sup>1</sup>	80.6	562.0	642.6	10.0	3.0	60.0	73.0	242.0	327.6

<sup>1</sup> Preliminary estimate.

Source: Federal-State Crop Reporting Service.

Historical supply and distribution data were obtained from the following U. S. Department of Agriculture publications: Grain and Feed Statistics Through 1956, Statistical Bulletin No. 159; The Feed Situation, October, 1957; and Crop Production, Annual Summary By States, 1947-1957.

#### Production

United States: Production of grain sorghums has been variable, since this crop has been used largely as a substitute for wheat and cotton when these crops had to be abandoned. The major producing states are Texas, Kansas, and Oklahoma. This is an area of very hazardous weather conditions, thus grain sorghums are suitable since they are a drought resistant crop and require a long growing season.

For a ten-year period (1947-1956) average production in the United States was 161.8 million bushels. This compares with a high, until 1957, of 242.5 million bushels in 1955. In 1957 the all time high of 562.0 million bushels of grain sorghums was produced in the United States. This was 2.3 times larger than the 1955 crop and 3.5 time the ten-year average.

The three state area of Kansas, Oklahoma, and Texas over the ten-year period (1947-1956) produced 84.3 percent of the United States production. This compares to 68.0 percent in 1957 when this area produced 2.8 times its ten-year average. Toward the end of the 1947-1956 period a decline was noted in the percentage of production in this area of the total production. Further analysis shows that from 1947-1956, 87.5 percent of the United States production was from the selected Great Plains states of South Dakota, Nebraska, Kansas, Oklahoma, and Texas. Eighty-three percent of the total 1957 production was in this Great Plains area.

In number of bushels Texas, Kansas, and Oklahoma are not producing less, but that rather the Northern Great Plains states have increased their production. Percentagewise of the total United States production this has caused a slight movement from Texas, Kansas, and Oklahoma to the Northern Great Plains states and along the western edge of the Corn Belt. Development of better adapted varieties has probably caused this movement to areas which have more rainfall and shorter growing seasons. This allows grain sorghums to be planted instead of corn.

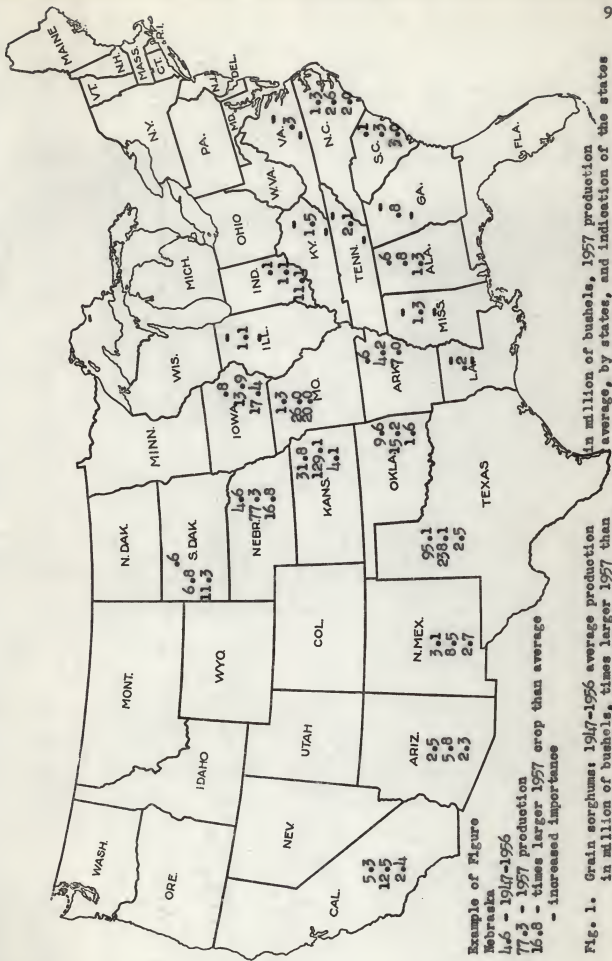
Figure 1 shows the changes which have been taking place in grain sorghum production. Missouri, Iowa, and Nebraska have made the largest gains in production. This trend differs from that noted by R. J. Doll in 1952 when he stated that grain sorghum production was on the decrease in Missouri.<sup>1</sup> Since that time Missouri production has risen very sharply. This upward trend which appears to be taking place includes states surrounding Missouri to the south, east, and north and reflects the substitution of grain sorghums for corn. The production increases in the Southwest could very well be caused by the use of irrigation on arid land.

Kansas: Kansas produced 19.6 percent of the United States production over the ten-year period. The record high for Kansas, until 1957, was 57.3 million bushels in 1951. This compares with the ten-year average of 31.8 million bushels. Twenty-three percent of the United States production in 1957 was produced in Kansas which recorded a new high of 129.1 million bushels, 2.3 times larger than the previous high of 1951.

Production has been mainly in the southwestern third of the state with central and southcentral areas being next. In 1955, 55.1 percent of the

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<sup>1</sup>R. J. Doll, Grain Sorghum in the Great Plains Economy, p. 10.



grain sorghum production was located in the western half of the section outlined in Figure 2, and 71.6 percent for the whole outlined section. For the 1956 crop 46.8 percent of total production was in the western half and 59.6 percent for the outlined area. In 1957, 47.4 percent was in the western half and 68.8 percent of the production was produced in the outlined area.

Figure 2 shows the top ten producing counties of grain sorghums in Kansas for 1955-1957. Production in Kansas has mainly been in the southwestern two-thirds of the state.

#### Non-Feed Uses

Since about 1944 exports have been of importance in the distribution of grain sorghums for non-feed uses. For the ten-year period of 1947-1956, 24.4 percent of the total disappearance left the United States through exports. This movement to foreign countries has been due to grain sorghums being relatively cheap compared to other grains.<sup>1</sup> From 1947-1956, an average of 38.7 million bushels was exported each year compared to an average annual production in Kansas of 31.3 million bushels.

The remaining part of non-feed uses of grain sorghums goes for food and industrial uses and seed. Six and six-tenths percent of the total disappearance was used for food and industrial uses from 1947-1956 while 1.4 percent was used for seed. Some of the industrial uses of grain sorghums are industrial alcohol, tapioca, flour used in wall board, paper and cloth sizing, adhesives, and drilling mud for the petroleum industry.<sup>2</sup> A wet-

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<sup>1</sup>R. J. Doll, Grain Sorghum in the Great Plains Economy, p. 19.

<sup>2</sup>W. M. Ross and H. H. Laude, Growing Sorghums in Kansas, Kansas Agricultural Experiment Station Circular 319, p. 13.

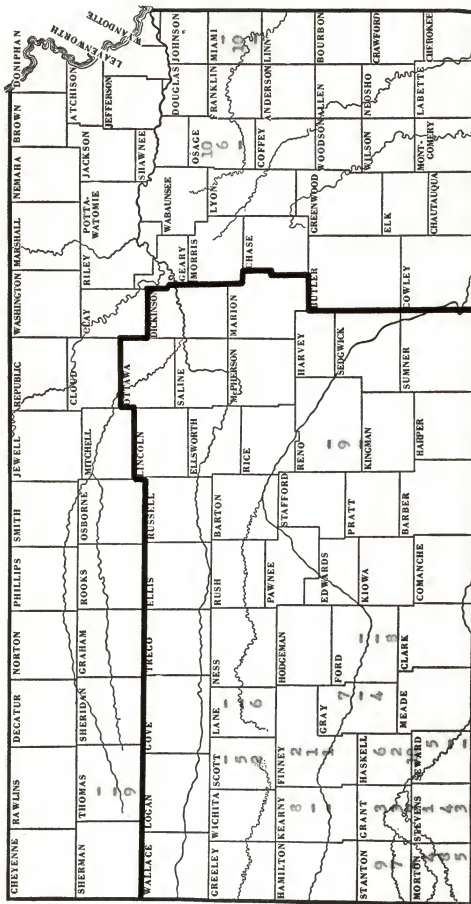


Fig. 2. Grain sorghams: Rank of top ten counties in production, 1955-57 crops, top number in county represents rank in 1955; middle number, 1956; and bottom number, 1957.  
Source: Kansas State-Federal Crop Reporting Service.



processing plant at Corpus Christi, Texas, which produces starch and starch products, has been increasing the quantity of grain sorghums used for food purposes.<sup>1</sup>

### Feed for Livestock

Grain sorghums used for livestock feed have been of major importance throughout the history of grain sorghum production in the United States. In 1929, 97 percent of the total production for that year was fed to livestock. Eighty-four percent of the 1956 production went for livestock feed and it is estimated that 77 percent of the 1957 production will be used for this purpose. Percentage-wise this shows a drop, but in total bushels there has been a large increase due to the increase in production. In 1929, 48.6 million bushels were fed to livestock. This compares with 1947 and 1956, when 65.4 and 172.6 million bushels, respectively, were fed to livestock.

### FREIGHT RATES FOR GRAIN SORGHUMS

#### Transcontinental Freight Rate Groups

The United States has been divided into several transcontinental freight rate groups by the Interstate Commerce Commission. Freight rates are set on these groups for the rail movement of certain commodities to the Pacific and Atlantic Coasts. Competitive forces and a desire to simplify tariffs for long hauls have resulted in these freight rate groups being established.

Kansas has been divided into three transcontinental freight rate groups. The groups are represented on Figure 3 by areas B, A and C, and D. This

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<sup>1</sup>Kenneth W. Meinken, The Demand and Price Structure for Oats, Barley, and Sorghum Grains, U. S. Department of Agriculture Technical Bulletin No. 1080, pp. 15-16.

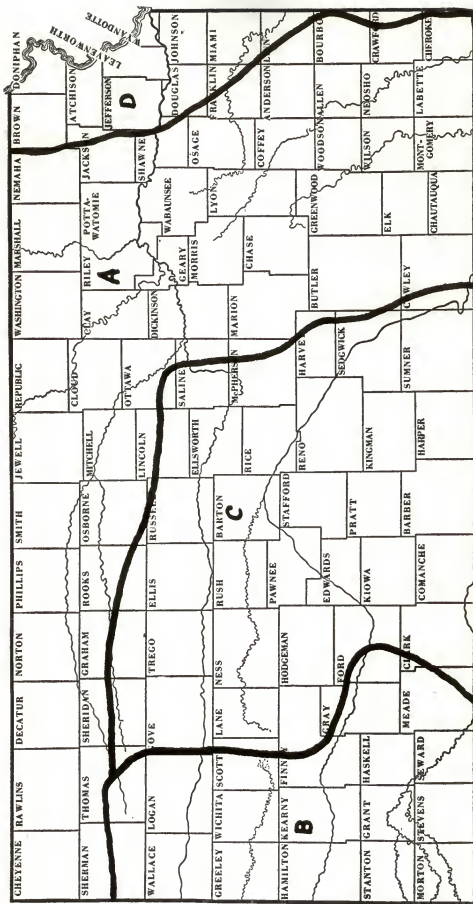


Fig. 3. Transcontinental freight rate groups in Kansas for grain sorghum, following changes made by Interstate Commerce Commission, effective November 16, 1956.

identification is that of the author and differs from that used by the Interstate Commerce Commission and the railroads.<sup>1</sup> Group B as used in this study is actually Group I as used by the Interstate Commerce Commission and the railroads, while Groups A and C are Group G, and Group D is Group F. This change in identification was made for convenience in presenting this study. Group G was subdivided effective November 16, 1956 by the Interstate Commerce Commission into Groups A and C, as used by the author, for the application of reduced freight rates to grain sorghums shipped to the South Coast (which includes California, Nevada, Arizona, and Western Utah). These reduced rates to the South Coast were to meet the competition of motor-carriers and itinerant truckers and applied to Groups B and C.<sup>2</sup>

One set of freight costs for a carlot of grain sorghums shipped to the South Coast from any point of origin within a particular freight rate group in Kansas would be the same. Another set of freight costs would apply in a similar situation on grain sorghums shipped to the North Coast (which includes Washington, Idaho, Oregon, and Western Montana).

#### Freight Rates Used in Problem

Freight rates as they apply to the transcontinental groups in Kansas with changes are shown in Table 3 for the 30 month period under consideration. In the final analysis the basic freight rate plus three percent transportation tax was used, since three percent of the rate to Kansas City would be less than three percent of the rate to the West Coast. Thus, making a cent or two difference in the margin between Kansas City and the West Coast.

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<sup>1</sup>D. Philip Locklin, *Economics of Transportation*, p. 197.

<sup>2</sup>Interstate Commerce Commission, Grain From Groups I and J Origin to Pacific Coast, p. 135.

Table 3. Basic freight rates plus three percent transportation tax for grain sorghams shipped from points in Kansas to the West Coast and Kansas City, July 1, 1955 to December 31, 1957 with changes shown. Dollars per hundred pounds.<sup>1</sup>

Origin in :		: Basic Freight Rates Plus 3 Percent Transportation Tax Effective											
Kansas		: Destination : 7/1/55 : 3/7/56 : 11/16/56 : 12/17/56 : 12/26/56 : 12/28/56 : 2/25/57 : 8/26/57											
		(Dollars per hundred pounds)											
Freight Rate Group A	California	0.999	1.051	1.051	1.051	1.051	1.102	1.102	1.102	1.102	1.102	1.143	
	Washington	0.999	1.051	1.051	1.051	1.051	1.102	1.102	1.102	1.102	1.102	1.143	
Freight Rate Group B	California	0.999	1.051	0.870	0.829	0.870	0.870	0.870	0.829	0.829	1.102	0.829	
	Washington	0.999	1.051	1.051	1.051	1.102	1.102	1.102	1.102	1.102	1.102	1.143	
Freight Rate Group C	California	0.999	1.051	0.932	0.886	0.932	0.932	0.932	0.836	0.836	1.102	0.836	
	Washington	0.999	1.051	1.051	1.051	1.102	1.102	1.102	1.102	1.102	1.102	1.143	
Freight Rate Group D	California	0.999	1.051	1.051	1.051	1.051	1.102	1.102	1.102	1.102	1.102	1.143	
	Washington	0.999	1.051	1.051	1.051	1.102	1.102	1.102	1.102	1.102	1.102	1.143	
Garden City	Kansas City	0.381	0.402	0.402	0.402	0.402	0.402	0.422	0.422	0.422	0.422	0.438	
Salina or Wichita	Kansas City	0.294	0.309	0.309	0.309	0.309	0.309	0.309	0.324	0.324	0.324	0.335	

<sup>1</sup>Obtained by personal correspondence from J. A. Lynch, Transportation Assistant, The Board of Trade of Kansas City, Missouri, letter dated March 10, 1958, and from M. B. Hammett, Assistant Director, Bureau of Traffic, Interstate Commerce Commission, Washington 25, D. C., letter dated April 1, 1958, File No. 282052.

Freight rates are different from each point of origin in each freight rate group in Kansas on shipments made to Kansas City. Therefore, certain points of origin were chosen to be the most representative for the groups under consideration (B and C).

Garden City was used as the origin in Group B for shipments made to Kansas City. This origin was centrally located in the main producing area of this group. Salina and Wichita were used as the origins for Group C shipments to Kansas City. Rates are the same to Kansas City from these two origins. All rates used applied to cars of a minimum weight of 80,000 pounds.

## MOVEMENT OF KANSAS GROWN GRAIN SORGHUMS

## Source of Obtaining Movements to Western States

Data concerning the movement of grain sorghums from Kansas to the West Coast was obtained from the records of the North and South Divisions of the Kansas Entomological Commission. Figure 4 shows these divisions. Offices for the North Division are located at the Department of Entomology, Kansas State College, Manhattan, and for the South Division at the Department of Entomology, University of Kansas, Lawrence.

The data were taken from certificates which must be issued to all cars or trucks of grain sorghums shipped to certain Western States. These certificates state that the grain being shipped is free of infestation of the European corn borer. In February 1950 all of the states west of, and including, Colorado put into effect quarantines which would help stop the European corn borer from spreading to these states.<sup>1</sup> This was due to the rapid spread of the borer westward during the summer of 1949. The quarantines stated that all corn and grain sorghums shipped from the European corn borer area (which included Kansas) had to be passed through a half-inch mesh screen.<sup>2</sup> This screened out all foreign matter which was large enough to harbor the larvae of the borer. After the grain had been screened it was certified by the state entomologist of the Division from which it was shipped.

Since 1950 the borer has spread into the Eastern counties of Colorado and that state subsequently removed the quarantine. This leaves eight states which still carry the quarantine at the present time. These are Washington,

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<sup>1</sup>Kansas Entomological Commission, 22nd Biennial Report, 1949-1950, p. 14.  
<sup>2</sup>Kansas Entomological Commission, 24th Biennial Report, 1952-1954, p. 7.



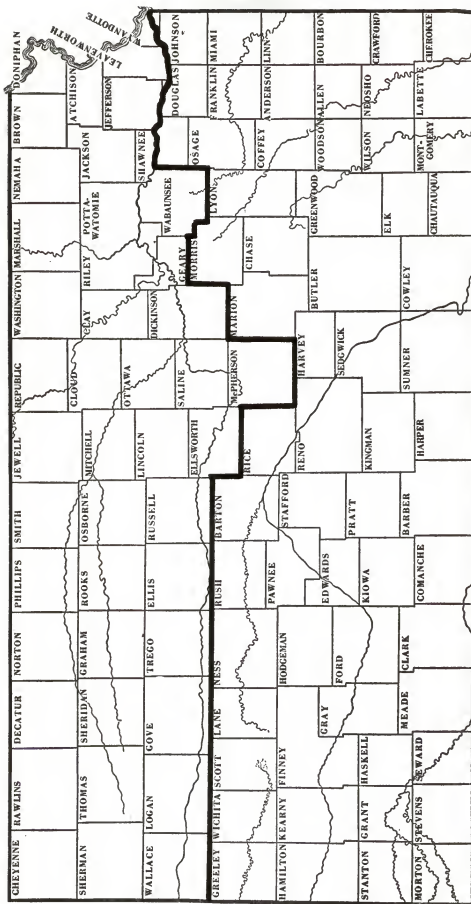


Fig. 4. North and South Divisions of the Kansas Entomological Commission.

Oregon, California, Idaho, Utah, Nevada, Arizona, and New Mexico.

Since the Division offices usually destroy their inspection certificates after two fiscal years data could be obtained only from July 1, 1955 until the study closed December 31, 1957.

#### Movement From Kansas Entomological Divisions to the West Coast

Table 4 shows movement of grain sorghums out of Kansas to seven Western states from the Entomological Commission's Divisions. New Mexico was not included in the table since during the 30 month period studied there was no movement from Kansas to that state.

For the first 18 months (July 1, 1955 - December 31, 1957) movement by railroad from the North Division was quite small, accounting for only 2.0 percent of the total movement from the state. The remainder of the movement from the state moved from the western half of the South Division. Of the 644 carlots shipped from Kansas during this 18 month period 390 carlots or 60.6 percent of the total movement was designated for Washington, 24.8 percent or 160 carlots to California, and 13.4 percent or 86 carlots to Oregon. The remaining 1.2 percent or eight carlots were shipped to Nevada, Utah, and Idaho.

In 1957, 42.7 percent of the railroad movement was from the North Division, while the remainder (57.3 percent) was shipped from the South Division. It was noted that the largest part of the shipments from the North Division moved from the southwestern counties of this Division.

During the 30 month period 35.7 percent or 1,351 carlots of the total state movement were shipped from the North Division. Eighty-seven and seven-tenths percent of this movement was designated for California and Utah. For this same period 64.3 percent or 2,426 carlots of the total movement to the



west was from the South Division. Movement to California from the South accounted for 64.6 percent of the total South Division shipments, while shipments to Washington and Utah added another 30.8 percent. For the state 63.0 percent or 2,380 carlots moved to California and 30.4 percent or 1,148 carlots moved to Washington and Utah.

#### Movement From Freight Rate Groups to the West Coast

After obtaining the movement data from the Entomological Commission the movement was broken down into the freight rate groups in Kansas, which have previously been mentioned. This break down has been shown in Table 5.

For the first 18 month period covered 3.4 percent of the movement by railroad to the Western states concerned was from Group A, 32.6 percent from Group B, and 64.0 percent from Group C. In 1957, or the last 12 months of the period, 0.2 percent of the movement by rail was from Group A, 86.4 percent from Group B, 13.3 percent from Group C, and 0.1 percent from Group D. For the total 30 month period 3,747 cars or 99.2 percent of the movement by rail left Groups B and C.

Since the movement of grain sorghums during the period studied was heaviest from Groups B and C the remainder of this study was devoted to these area.

#### Movement to Kansas City

Movement from the rate groups in Kansas to Kansas City was not pinpointed as was the case of the western movement. As was stated earlier the assumption was made that a very large percentage of the carlot receipts in Kansas City were received from Kansas during the period considered. A further assumption was that this grain came from freight rate Groups B and C.

Table 5. Grain sorghums: Movement from freight rate groups in Kansas to seven Western States, July 1, 1955 to December 31, 1957.

Year	Rate	Freight : Cars/Trucks of Grain Sorghums Shipped to:							: Total : Total <sup>1</sup> : Percent of			
		Wash.	Oregon	Calif.	Nevas.	Arizona	Utah	Idaho	Cars	Trucks	Estimated: Cars From	
: Group :		:	:	:	:	:	:	:	Shipped	Shipped	Bushels : Each Group	
1955 <sup>2</sup>	A	1/0							1		2,000	0.9
	B	51/0	17/0	2/2					70	2	141,000	26.4
	C	21/0	3/0	13/0	2/0				39		78,000	35.5
	D											
State		73/0	20/0	15/2	2/0				110	2	221,000	100.0
1956	A	16/0	5/0			0/1			21	1	42,500	3.9
	B	102/0	22/0	16/7					140	7	283,500	26.2
	C	199/0	39/0	129/0		2/1	4/0		373	1	746,500	69.9
	D											
State		317/0	66/0	145/7		2/2	4/0		534	9	1,072,500	100.0
1957	A			4/0		2/0			6		12,000	0.2
	B	63/0	11/0	1922/3	114/0	19/0			2708	3	5,417,500	86.4
	C	59/0	13/0	294/2		51/0			417	2	835,000	13.3
	D					2/0			2		4,000	0.1
State		127/0	24/0	2220/5	114/0	19/0	629/0		3133	5	6,268,500	100.0
30-month Totals												
	A	17/0	5/0	4/0		2/1			28	1	56,500	0.7
	B	221/0	50/0	1940/12	114/0	19/0			2918	12	5,842,000	77.3
	C	279/0	55/0	436/2	2/0	53/1	4/0		829	3	1,659,500	21.9
	D					2/0			2		4,000	0.1
State		517/0	110/0	2380/14	116/0	19/0	631/2	4/0	3777	16	7,562,000	100.0

<sup>1</sup>Each carlot estimated 2,000 bushels, each truck 500 bushels.

<sup>2</sup>Includes only period from July 1, 1955 to December 31, 1955.

During the 30 month period analyzed in this study there was a constant receipt of grain sorghums in Kansas City. For the first six months covered there were 1,619 carlots received in Kansas City or an estimated 3.2 million bushels. In 1956, 2,456 carlots were received or 4.9 million bushels, and in 1957, 8,500 carlots or 17.0 million bushels.

#### Truck Movements

Sixteen trucks bearing certificates moved during the 30 months. This was the equivalent of about four railroad cars. Since movement of grain sorghums from Kansas by truck was so small it was not considered in the spatial problem. Trucking of grain sorghums was generally done by itinerant truckers, therefore, it was difficult to set trucking rates to use in an equilibrium problem.

Grain sorghums which are trucked generally go as a secondary product back to the area from which the trucker came with a primary product. Therefore, the trucker wishes to pay his expenses back and if a profit can be realized he will take advantage of it. It appears that trucking rates generally run around 85 percent of railroad freight rates.

Large quantities of grain sorghums are trucked from Texas to California and during the 1955-1956 season almost all movements were by truck.<sup>1</sup> From July 1, 1953 to June 30, 1954, 91 truck loads of grain sorghums left the South Division of the Kansas Entomological Commission carrying quarantine certificates.<sup>2</sup>

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<sup>1</sup>Interstate Commerce Commission, Grain From Group I and J Origins to Pacific Coast, p. 135.

<sup>2</sup>Kansas Entomological Commission, 24th Biennial Report, 1953-1954, p. 15.



## PRICE DIFFERENTIALS BETWEEN LOS ANGELES, SEATTLE, AND KANSAS CITY

## Cash Price

The 30 month period included in this study was broken down into 131 weeks. Price of grain sorghums, per hundredweight, at Los Angeles, Seattle, and Kansas City was listed for each respective week for which it could be obtained. Los Angeles terminal market price was quoted 115 weeks out of the 131 weeks in the study, while the Seattle Grain Exchange quoted prices for only 65 weeks. Kansas City price was quoted for all 131 weeks. Lack of price data for Washington was due to the fact that since grain sorghums are not grown in Washington prices are quoted only when grain sorghums are actually traded.<sup>1</sup>

For the remainder of this study Los Angeles terminal market price will be referred to as the price for California, and the Seattle Grain Exchange price as the Washington price.

From the weekly prices for the three markets the freight rates as they applied to Groups B and C were subtracted. Using the data for Group B and the week of January 1-7, 1956 the actual grain sorghum price in California was \$2.675, in Washington \$2.750, and in Kansas City \$2.11. Freight rates from Group B during this same week were 99.9 cents to both California and Washington, and 38.1 cents to Kansas City. All prices and freight costs are per hundredweight. After subtracting the freight rates from the actual prices the net prices were \$1.676 for California, \$1.751 for Washington, and \$1.729 for Kansas City.

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<sup>1</sup>P. L. Doctor, letter to author, March 5, 1958.

The next step was to take the net Kansas City price from the net California and Washington prices for each respective week. This gave a margin for California and Washington above or below the Kansas City price. For the example of January 1-7, 1956 the price differential for California was 5.3 cents below the Kansas City price, while Washington was 2.2 cents above the Kansas City price.

On a 100,000 pound carlot shipped from Group B to California this would mean that the total amount received for this carlot in California would be \$53.00 less than if it was shipped to Kansas City. In Washington the total received for the car would be \$22.00 more than Kansas City.

This procedure was used for both Groups B and C, with the results shown on Figures 5 and 6 for these groups, respectively. The worksheets from which the above example was taken and which were used to derive each point on Figures 5 and 6 appear in Tables 8 and 9 in the appendix.

In Figure 5 the range in the differential for California was from 43.0 cents below the Kansas City price in June 1956 to 42.9 cents above the Kansas City price in September 1957. Washington price differential ranged from 18.9 cents below in June 1956 to 36.5 cents above in September 1957. California price was below Kansas City price 67 weeks, above 47 weeks, and equal one week for Group B. Washington price was below 12 weeks and above 53 weeks for the same group.

For Figure 6 the range in the price differential for California was from 49.2 cents below Kansas City in August 1956 to 26.9 cents above in September 1957. The price differential for Washington was from 28.2 cents below Kansas City price in June 1956 to 26.2 cents above in September 1957. In Group C, California price was below Kansas City price 96 weeks and above 19 weeks. Washington price was below Kansas City 46 weeks and above 19 weeks.

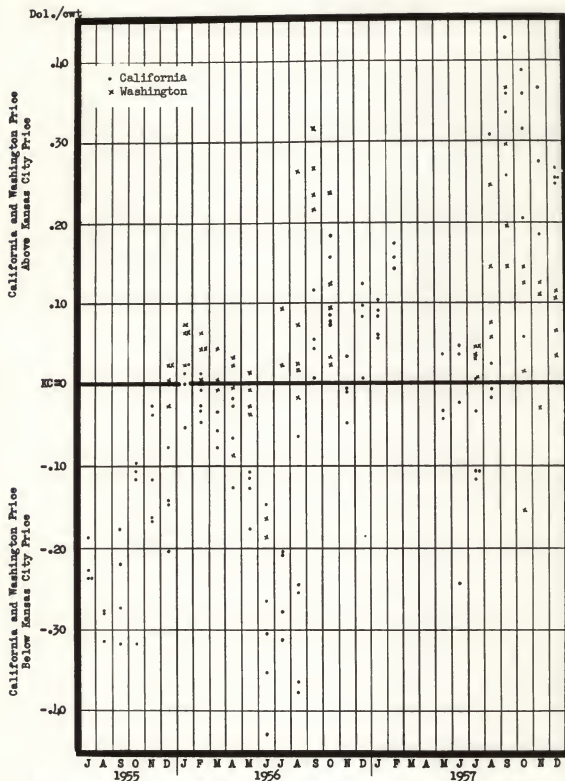


Fig. 5. Cash price differential to the Kansas seller between selling grain sorghums on California and Washington markets compared to Kansas City market for freight rate Group B of Kansas, July 1, 1955 - Dec. 31, 1957.

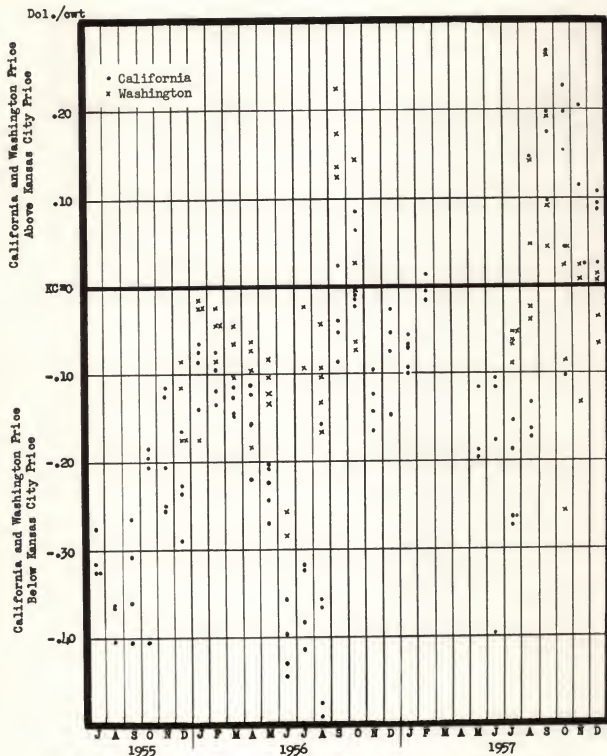


Fig. 6. Cash price differential to the Kansas seller between selling grain sorghums on California and Washington markets compared to Kansas City market for freight rate Group C of Kansas, July 1, 1955 - Dec. 31, 1957.

### Loan Price

Government support prices for terminal markets were taken for the three crop years of 1955-1957 for California and Kansas City. Washington did not have a support price for the first two crop years concerned, but a support price was set in 1957 due to the availability of storage in that state.

For the 1955 grain sorghum crop the terminal market support price in California was \$2.63, per hundredweight, while at Kansas City terminals the support price was \$2.22. The California terminal market support price was \$2.84 in 1956 and \$2.73 in 1957, while at Kansas City the support price for terminal markets was \$2.42 in 1956 and \$2.31 in 1957. Washington terminal market support price for the 1957 crop was \$2.73.

The same procedure was used for the loan price differential as in the cash price differential. For example, the loan price for the 1955 crop was \$2.63 in California and \$2.22 in Kansas City. On January 1, 1956 the freight rate from Group B to California was 99.9 cents and 38.1 cents to Kansas City. After subtracting the freight rates from the California and Kansas City loan prices the net loan price for California was \$1.631 and \$1.839 in Kansas City. In this example, for January 1, 1956, California terminal markets held a negative margin of 20.8 cents compared to Kansas City terminal markets on grain sorghums stored under government loan. On a 100,000 pound car the shipper would have taken \$208.00 less for his stored grain in California than in Kansas City.

Following this procedure the loan price differentials were calculated for Groups B and C for the three crop years, taking into account the freight rate changes. The results showed that Kansas City held an advantage for the 1955-1957 crops in the loan rate over California and for the 1957 crop over

Washington for grain sorghums shipped for storage from Group C. The California margin ranged from 13.4 cents below the Kansas City rate for the 1957 crop to 33.2 cents below Kansas City in March 1956 for the 1955 crop. Up to December 31, 1957 the Washington margin was 39.1 cents below Kansas City for the 1957 crop shipped out of Group C.

Kansas City also held a loan advantage over grain sorghums shipped from Group B to California for the 1955-1956 crops. The range was from 0.7 cents below Kansas City price in December 1956 for the 1956 crop to 23.9 cents below Kansas City price in March 1956 for the 1955 crop. For the 1957 crop California held a margin of 2.9 cents above Kansas City on grain stored under the loan rate up to December 31, 1957. Washington was 28.5 cents below Kansas City for the 1957 crop up to the end of 1957.

Government support prices for grain sorghums stored in terminal warehouses are based on grain grading No. 2 or better and which contains 13 percent or less moisture. The warehouse has to be approved for storage.

#### RELATIONSHIP OF MOVEMENT IN RESPONSE TO PRICE

##### California and Washington

Shipments made to California and Washington from Groups B and C in Kansas were divided into three categories for the 30 month period. Comparisons were made when California and Washington had a cash price advantage over Kansas City, when the cash price was disadvantageous, and when shipments moved during a week when no cash price was quoted for California and Washington. These comparisons are shown in Tables 6 and 7 for Groups B and C, respectively.



Table 6. Grain sorghums: Shipments from Group B to California and Washington, when there was a cash price advantage, disadvantage, or no cash price reported, compared to Kansas City price July 1, 1955 to December 31, 1957.

		:No. Shipments to California When :		No. Shipments to Washington When		
		: Price :		: Price :		: No Price
		: Advantage:Disadvantage:		: Reported : Price :		: Reported
		in Calif.:		Advantage:Disadvantage :		in Wash.
1955 <sup>1</sup>		2		5	15	31
1956	5	11		76	21	5
1957	1749		30	54		14
Total	1754	13	30	135	36	50
Percent of Total Shipments to Each State						
	97.6	0.7	1.7	61.1	16.3	22.6

<sup>1</sup> July 1, 1955 to December 31, 1955.

As shown in Table 6, 97.6 percent or 1,754 of the 1,797 cars designated to California during the 30 month period from Group B moved when California held a price advantage over Kansas City. Thirteen cars or 0.7 percent of the total shipments moved to California when there was a disadvantage in the price, while 30 cars or 1.7 percent moved during weeks when no cash price was reported in California. Eighteen of the 30 cars shipped when no cash price was quoted moved during weeks when the loan rate was favorable in California over the Kansas City loan rate. The largest movement made to California from Group B was during the latter 17 weeks of 1957 during which the cash price was favorable over Kansas City, except for one week when no cash price was reported.

Table 7. Grain sorghums: Shipments from Group C to California and Washington, when there was a cash price advantage, disadvantage, or no cash price reported, compared to Kansas City price, July 1, 1956 to December 31, 1957.

	:No. Shipments to California When			: No. Shipments to Washington When		
	:	:	:	:	:	:
	Price	Price	No Price	Price	Price	No Price
	Advantage	Disadvantage	Reported	Advantage	Disadvantage	Reported
			in Calif.			in Wash.
1955 <sup>1</sup>		13			8	13
1956	3	124	2	13	157	29
1957	274	7	13	13	14	30
Total	277	144	15	26	179	72
Percent of Total Shipments to Each State	63.5	33.0	3.5	9.4	64.6	26.0

<sup>1</sup>July 1, 1955 to December 31, 1955.

Out of 221 shipments designated for Washington from Group B, 61.1 percent or 135 cars moved when Washington held a cash price advantage over Kansas City. Sixteen and three-tenths percent or 36 cars were shipped when price was unfavorable in Washington, and 22.6 percent or 50 cars moved when no cash price was quoted in Washington.

There were 30 weeks when California price held a margin above Kansas City price that there were no shipments to California from Group B. Washington had 27 weeks when it held an advantageous margin and had no shipments designated to it from Group B.

Ninty-seven percent of the movement, 1,743 out of 1,797 cars shipped from Group B to California, moved when California held a cash price advantage

over Kansas City for a period of four or more weeks in succession. One hundred ten of the 221 cars, or 49.3 percent, designated for Washington moved during a likewise period of time. The rest of the movement to California and Washington made during a cash price advantage over Kansas city moved when the advantage was held from one to three weeks in succession.

All 36 cars shipped from Group B to Washington at a price disadvantage move immediately following weeks when Washington held a price advantage over Kansas City.

Sixty-three and one-half percent of the shipments from Group C to California, as reported in Table 7, were made when California held a cash price advantage over Kansas City. This accounted for 277 cars out of a total of 436 shipped from Group C to California during the 30 months studied. One hundred-forty-four cars or 33.0 percent moved when the cash price in California was disadvantageous, while 15 cars or 3.5 percent were shipped when no cash price was reported. Most of the shipments designated for California when the cash price was unfavorable moved in the first six months of 1956 before the reduced freight rates went into effect on grain sorghums.

Only 9.4 percent of the shipments designated from Group C to Washington moved when Washington held a cash price advantage. During the 30 months this accounted for 26 of the 277 shipments made. Sixty-four and six-tenths percent or 179 cars out of 277 moved when the cash price was disadvantageous, while 72 cars or 26.0 percent moved when no cash price was reported.

From Group C there were eight weeks when shipments were not received in California when this state held a cash price advantage over Kansas City. Washington had ten weeks when it held a cash price advantage, but received no shipments.

Sixty-one and nine-tenths percent of the movement from Group C to California was made when a cash price advantage was held over Kansas City for four or more successive weeks. This was 270 of the 436 cars designated for California. The 26 cars shipped to Washington under a favorable cash price moved during the four or more week period. All other movement to California under favorable cash price conditions moved when the cash price advantage was held from one to three weeks in succession over Kansas City.

One hundred percent of the 179 shipments from Group C, designated for Washington when a price disadvantage was held by Washington, moved during periods when Washington was holding a negative price differential for five or more successive weeks. None of these shipments moved during weeks immediately following a positive price differential. Ninety-six and one-half percent of the 144 shipments to California from Group C moved when California held a price disadvantage with Kansas City for five or more weeks in succession. The remaining 3.5 percent moved immediately following positive price differentials in favor of California.

#### Effects of Western Movement on Kansas City Movement

During all the weeks when either California or Washington held a cash price advantage Kansas City was receiving carlots of grain sorghums. When there was movement to California or Washington it appeared at no time to cause decreased movement to Kansas City.

For the 131 weeks in the study there was an average of 95.5 carlots per week of grain sorghums received in Kansas City. The range for this period was two cars in the second week of February 1957 to 1,730 cars in the second week of December 1957. In February 1957 receipts were very small, but at this particular time no shipments were made west. This was following

the small crop of 1956. Farm stocks on hand and production appeared to influence the carlot receipts in Kansas City.

#### SUMMARY AND CONCLUSIONS

Grain sorghums are becoming of increasing importance to the Kansas farmer as a cash grain and, also, as a feed grain. This study was concerned with the effectiveness with which grain sorghums were marketed for cash and covered the period from July 1, 1955 to December 31, 1957.

According to economic theory an equilibrium in price should exist between the producing and consuming area. Kansas was considered the producing area in the partial spatial equilibrium problem which was analyzed, while Kansas City, California, and Washington were designated the consuming area. For grain sorghums shipped out of Kansas the equilibrium was not found in the market. Wide fluctuations were found between the California - Washington markets compared to Kansas City. The extreme example was when California price differential ranged from 43.0 cents below to 42.9 cents above the Kansas City price during the 30 month period studied for Group B.

Reduced freight rates added to the cash price advantage which California sometimes hold over Kansas City. For the first half of the period studied movement was mainly to Washington, but after the reduction in freight rates went into effect the movement changed to California. Freight rates were reduced to meet the competition of other carriers.

Movement to California from freight rate Group B in Kansas was found to be made 97.6 percent of the time when price conditions were favorable in California over Kansas City. Therefore, it appeared that the Kansas seller was taking advantage of this market when price was favorable.

It appeared that all shipments, from Group B to California and Washington



made when these states were at a price disadvantage were caused by a lag in shipments compared to price. Movements made to Washington when no cash price was reported might have been on a contract basis, since this movement seemed not to be accounted for by a lag in the market.

For shipments designated from Group C to Washington and California the full advantage of cash prices appeared not to be taken. Of the 33.0 percent of the total shipments made during a price disadvantage to California 96.5 percent were made when California had held a negative price differential for five or more successive weeks. One hundred percent of the 179 cars shipped to Washington at a price disadvantage were also during a period of five or more successive weeks when Washington held a negative price differential with Kansas City. Therefore, the shipments which moved under a price disadvantage appeared not to be caused by a lag in the shipments compared to price.

Carlot receipts of grain sorghums in Kansas City which were assumed to be from the main producing area of Kansas were not affected during the periods of favorable prices in California and Washington.

The price differential suggested that greater quantities of grain sorghums should have moved to California and Washington (relative to movement to Kansas City) if the greatest opportunities for profit had been realized. Even though the Kansas sellers have not taken full advantage of the California and Washington markets this does not fully support the original assumption that these markets should have an effect upon the number of carlot receipts in Kansas City.

It was noted that in Group B the lowest price differential for California and Washington below Kansas City appeared during the same month (June 1956) and that the highest price differential over Kansas City for both states was



September 1957. The situation in Group C was similar. This minus differential could possibly have been due to any increase in price in the Kansas City area in June 1956 in expectation of a small crop in the fall of 1956. The high positive differential in September 1957 may have been due to the large crop which was almost ready to be harvested. Possibly price decreased in the Kansas City area in expectation of large quantities being available during harvest, while this probability did not effect the Western markets.

Another possible reason for price fluctuations could be the characteristics of grain sorghums to pick up moisture while in storage (elevator or moving in cars). In conversation and correspondence with grain men this factor was pointed out as being one of the chief problems with the 1957 crop. A carlot of grain sorghums testing 13 percent moisture in Kansas might be 14 or 15 percent when it arrived in California. This was of major concern when grain was shipped for government storage, since the loan rate calls for 13 percent or less moisture.

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APPENDIX

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Appendix: WORKSHEETS USED TO ANALYZE PRICE  
DIFFERENTIALS AND MOVEMENT.

The following worksheets (Tables 8 and 9) were used in deriving the points plotted on Figures 5 and 6. Procedure used appears in the written discussion of this subject.



Table 8. Comparison of grain sorghum movements to cash price differences from freight rate Group B in Kansas to California, Washington, and Kansas City.

Week	California		Washington		Kansas City		Difference	
	Cash Price	Carlot	Cash Price	Carlot	Cash Price	Carlot		
Receipts	Actual	Net	Actual	Net	Actual	Net	Receipts	Calif. Wash.
1955								
July								
3	\$2.750	\$1.751			\$2.37	\$1.989	17	\$-.238
10	2.700	1.701			2.31	1.929	15	-.226
17	2.700	1.701			2.27	1.899	21	-.183
24	2.650	1.651			2.27	1.899	19	-.238
31					2.22	1.839	42	
Aug					2.15	1.769	29	-.280
7	2.488	1.489			2.21	1.829	22	-.278
14	2.550	1.551			2.24	1.859	33	
21					2.24	1.859	13	
28	2.544	1.545			2.11	1.729	24	-.314
Sept					2.14	1.759	29	-.220
4	2.550	1.551			2.18	1.799	41	-.273
11	2.538	1.539			2.25	1.869	29	-.318
18	2.525	1.526			2.25	1.869	28	-.318
25	2.550	1.551			2.25	1.869	44	-.118
Oct					2.00	1.619	177	-.098
2	2.550	1.551			1.98	1.599	166	-.108
9	2.500	1.501			1.99	1.609	188	-.118
16	2.500	1.501			2.05	1.669	178	-.038
23	2.500	1.501			1.97	1.589	144	-.028
30	2.550	1.551			1.96	1.579	53	-.168
Nov					2.05	1.669	48	-.163
6	2.550	1.551			2.12	1.739	70	-.141
13	2.550	1.551			2.11	1.729	81	-.148
20	2.500	1.501			2.11	1.729	62	-.203
27	2.575	1.576			2.11	1.729	39	-.078
Dec								
4	2.537	1.538	2.700	1.701	2.11	1.729		-.028
11	2.600	1.601	2.750	1.751	2.13	1.749		-.002
18	2.525	1.526	2.750	1.751	2.11	1.729		-.022
25	2.650	1.651	2.750	1.751	2.11	1.729		-.022

Table 8. (cont.)

Week	California		Washington		Kansas City		Differential	
	Cash Price	Carlott	Cash Price	Carlott	Cash Price	Carlott		
Beginning: Actual: Net <sup>1</sup> : Receipts <sup>2</sup> : Actual: Net <sup>1</sup> : Receipts <sup>3</sup> : Calif: Wash.								
1956								
Jan 1	\$2.675	\$1.676	\$2.750	\$1.751	\$2.11	\$1.729	24	\$-.053
8	2.683	1.689	2.750	1.751	2.07	1.689	34	.000
15	2.700	1.701	2.750	1.751	2.06	1.679	79	\$.022
22	2.700	1.701	2.750	1.751	2.07	1.689	52	\$.012
29	2.700	1.701	2.750	1.751	2.07	1.689	51	\$.012
Feb 5	2.700	1.701	2.750	1.751	2.09	1.709	23	-.003
12	2.675	1.676	2.750	1.751	2.09	1.709	47	\$.042
19	2.700	1.701	2.750	1.751	2.13	1.749	42	-.033
26	2.700	1.701	2.750	1.751	2.11	1.729	21	-.048
Mar 4	2.700	1.701	2.800	1.801	2.14	1.759	16	-.023
11	2.750	1.669	2.800	1.749	2.15	1.748	14	-.053
18	2.775	1.724	2.800	1.749	2.16	1.753	26	\$.001
25					2.18	1.778	21	-.079
Apr 1	2.812	1.761	2.850	1.799	2.29	1.838	27	-.034
8	2.900	1.849	2.950	1.899	2.28	1.878	58	-.127
15	2.913	1.862	2.975	1.924	2.33	1.928	94	\$.089
22	2.950	1.899	3.000	1.949	2.32	1.918	97	-.029
29	2.900	1.849	3.000	1.949	2.36	1.953	49	-.004
May 6	2.900	1.849	3.000	1.949	2.33	1.978	27	\$.031
13	2.925	1.874	3.050	1.999	2.39	1.988	32	-.109
20	2.912	1.861	3.050	1.999	2.44	2.038	17	-.129
27	2.950	1.899			2.45	2.048	33	-.114
June 3	2.925	1.874	3.000	1.949	2.54	2.138	33	-.177
10	2.925	1.874			2.58	2.178	54	-.149
17	2.888	1.837			2.59	2.188	47	-.264
24	2.912	1.861	3.075	2.024	2.60	2.291	33	-.304
July 1	2.938	1.877			2.60	2.198	17	-.351
8	3.000	1.949			2.63	2.228	54	-.430
15	3.100	2.049	3.400	2.349	2.66	2.258	32	-.311
22	3.125	2.074	3.350	2.299	2.63	2.278	45	-.279
29	3.075	2.024	3.300	2.249	2.67	2.263	16	-.209
								-.204
								-.244

Table 3. (cont.)

Week	California				Washington				Kansas City				Differential <sup>4</sup>
	Cash Price	Carlott	Cash Price	Carlott	Cash Price	Carlott	Cash Price	Carlott	Cash Price	Carlott	Cash Price	Carlott	
Beginning:	Actual: Net <sup>1</sup>	Receipts <sup>2</sup>	Actual: Net <sup>1</sup>	Receipts <sup>2</sup>	Actual: Net <sup>1</sup>	Receipts <sup>2</sup>	Actual: Net <sup>1</sup>	Receipts <sup>2</sup>	Actual: Net <sup>1</sup>	Receipts <sup>2</sup>	Actual: Net <sup>1</sup>	Receipts <sup>2</sup>	Calif.: Wash.
1956													
Aug	5	\$2,925	\$1,874	\$3,300	\$2,249		\$2,64		\$2,238	20	\$-364	\$4,011	
	12	2,900	1,849	3,300	2,249		2.63		2,228	17	-379	4,021	
	19	2,925	1,874	3,250	2,199		2.53		2,128	13	-254	4,071	
Sept	26	2,925	1,874	3,250	2,199		2.34		1,938	28	-064	4,261	
	2	2,925	1,874	3,150	2,099	10	2.27		1,868	36	4,006	4,231	
	9	2,912	1,861	3,125	2,074	5	2.21		1,808	90	4,053	4,266	
	16	2,925	1,874	3,125	2,074	2	2.16		1,758	163	4,116	4,316	
	23	2,950	1,899	3,125	2,074	2	2.26		1,858	155	4,041	4,216	
	30	2,960	1,909	3,125	2,074	1	2.24		1,838	137	4,071	4,236	
Oct	7	2,962	1,911	3,000	1,949		2.23		1,828	124	4,083	4,121	
	14	2,938	1,937	3,000	1,949		2.25		1,853	84	4,079	4,091	
	21	3,085	2,034	3,000	1,949		2.28		1,878	88	4,156	4,021	
	28	3,100	2,049	2,950	1,899		2.27		1,868	87	4,181	4,031	
Nov	4	2,985	1,934				2.34		1,938	30	-004		
	11	3,000	1,949				2.40		1,998	32	-049		
	18	2,912	2,042				2.41		2,008	37	4,034		
	25	2,838	2,018				2.43		2,028	30	-010		
Dec	2	2,875	2,005				2.40		1,998	21	4,007		
	9	2,950	2,030				2.40		1,998	22	4,082		
	16	2,950	2,121				2.40		1,998	9	4,123		
	23	2,925	2,096			5	2.40		1,993	10	4,098		
	29	2,925	2,055				2.41		1,998	15	4,057		
1957													
Jan	6	2,950	2,030				2.41		1,983	16	4,082		
	13	2,970	2,100				2.42		1,998	16	4,102		
	20	2,938	2,068				2.43		2,008	13	4,060		
Feb	27	2,938	2,068				2.40		1,978	8	4,090		
	3	2,900	2,030				2.31		1,888	8	4,142		
	10	2,875	2,005				2.27		1,848	2	4,157		
	17	2,900	2,030				2.28		1,858	6	4,172		
	24						2.29		1,868	7			

Table 8. (cont.)

Week	California		Washington		Kansas City		Differential <sup>4</sup>	
	Cash Price	Carlott	Cash Price	Carlott	Cash Price	Carlott		
Beginning:	Actual: Net <sup>1</sup>	Receipts <sup>2</sup> : Actual: Net <sup>1</sup>	Actual: Net <sup>1</sup>	Receipts <sup>2</sup> : Actual: Net <sup>1</sup>	Actual: Net <sup>1</sup>	Receipts <sup>2</sup> : Actual: Net <sup>1</sup>	Calif.: Wash.	
1957								
Mar	3				\$2.29	\$1.868	15	\$
	10				2.32	1.898	9	
	17				2.32	1.898	20	
	24				2.32	1.898	9	
	31				2.32	1.898	9	
Apr	7				2.32	1.898	14	
	14				2.30	1.878	4	
	21				2.30	1.878	10	
	28				2.28	1.858	15	
May	5				2.26	1.838	31	
	12	2.625	1.796		2.18	1.758	28	4.033
	19	2.575	1.746		2.20	1.778	37	-.032
	26	2.575	1.746		2.21	1.788	10	-.042
June	2	2.375	1.546		2.21	1.788	25	-.242
	9	2.575	1.746		2.19	1.768	27	-.022
	16	2.575	1.746		2.13	1.708	14	4.038
	23	2.625	1.796		2.17	1.748	30	4.048
	30	2.600	1.771		2.19	1.768	31	4.003
July	7	2.575	1.746		2.20	1.778	31	4.032
	14	2.550	1.721		2.25	1.828	21	-.107
	21	2.550	1.721		2.26	1.838	44	-.117
	28	2.550	1.721		2.25	1.828	42	-.107
Aug	4	2.500	1.671		2.10	1.678	31	-.007
	11	2.500	1.671		2.11	1.688	17	-.017
	18	2.500	1.671		2.07	1.648	16	4.023
	25	2.500	1.671		1.80	1.362	15	4.309
Sept	1	2.500	1.671		1.75	1.312	13	4.295
	8	2.500	1.671		1.85	1.412	19	4.259
	15	2.500	1.671		1.68	1.242	62	4.429
	22	2.375	1.546		1.65	1.212	65	4.334
	29	2.325	1.496		1.62	1.182	181	4.314

Table 8. (concl.)

Week	: California			: Washington			: Kansas City			: Differential <sup>4</sup>		
	: Cash Price		: Carlot	: Cash Price		: Carlot	: Cash Price		: Carlot	: Receipts <sup>3</sup>		: Receipts <sup>3</sup>
Beginning:	Actual:	Net <sup>1</sup>	: Receipts <sup>2</sup>	Actual:	Net <sup>1</sup>	: Receipts <sup>2</sup>	Actual:	Net <sup>1</sup>	: Receipts <sup>2</sup>	Actual:	Net <sup>1</sup>	: Receipts <sup>2</sup>
1957												
Oct	6	\$2.350	\$1.521	17	\$	4	\$1.57	\$1.132	193	\$4.389	\$	\$
	13	2.325	1.496	15	2.450	1.307	1.73	1.292	49	4.204	4.015	4.015
	20	2.350	1.521	22	2.450	1.307	1.90	1.462	76	4.059	4.155	4.155
	27	2.350	1.521	42	2.450	1.307	1.60	1.162	81	4.359	4.145	4.145
Nov	3			29			1.69	1.252	334			
	10	2.375	1.546	56	2.450	1.307	1.62	1.182	337	4.364	4.125	4.125
	17	2.375	1.546	54	2.475	1.332	1.80	1.352	575	4.184	4.030	4.030
	24	2.375	1.546	152	2.525	1.382	1.71	1.272	892	4.274	4.110	4.110
Dec	1	2.375	1.546	278	2.550	1.407	1.73	1.292	1,536	4.254	4.115	4.115
	8	2.450	1.621	383	2.550	1.407	1.81	1.372	1,730	4.249	4.035	4.035
	15	2.475	1.646	373	2.600	1.457	1.83	1.392	1,070	4.254	4.065	4.065
	22	2.450	1.621	325	2.600	1.457	1.79	1.352	491	4.269	4.105	4.105

<sup>1</sup>Actual cash price minus freight cost from Group B.

(Freight cost used appear in Table 3.)

<sup>2</sup>In number of railroad cars received from Group B.<sup>3</sup>Total receipts received in Kansas City.<sup>4</sup>California and Washington net cash price above (+) or below (-) Kansas City net cash price.

Table 9. Comparison of grain sorghum movements to cash price differences from freight rate Group C in Kansas to California, Washington, and Kansas City.

		: California		: Washington		: Kansas City		: Differential <sup>4</sup>	
Beginning		Cash Price	Carlot	Cash Price	Carlot	Cash Price	Carlot		
		Actual: Net <sup>1</sup>	Receipts <sup>2</sup>	Actual: Net <sup>1</sup>	Receipts <sup>2</sup>	Actual: Net <sup>1</sup>	Receipts <sup>2</sup>	Calif.: Wash.	Calif.: Wash.
1955									
July	3	\$2.750	\$1.751			\$2.37	\$2.076	17	\$-.325
	10	2.700	1.701			2.31	2.016	15	-.315
	17	2.700	1.701			2.27	1.976	21	-.275
	24	2.650	1.651			2.27	1.976	19	-.325
	31					2.22	1.926	42	
Aug	7	2.433	1.439			2.15	1.856	29	-.367
	14	2.550	1.551			2.21	1.916	22	-.365
	21					2.24	1.946	38	
	28	2.544	1.545			2.24	1.946	13	-.401
Sept	4	2.550	1.551			2.11	1.816	24	-.265
	11	2.543	1.539		2	2.14	1.846	29	-.307
	18	2.525	1.526			2.18	1.836	41	-.360
	25	2.550	1.551			2.25	1.956	29	-.405
Oct	2	2.550	1.551			2.25	1.956	23	-.405
	9	2.500	1.501			2.00	1.706	44	-.205
	16	2.500	1.501			1.98	1.686	177	-.185
	23	2.500	1.501			1.99	1.696	166	-.195
	30	2.550	1.551			2.05	1.756	188	-.205
Nov	6	2.550	1.551		1	1.97	1.676	173	-.125
	13	2.550	1.551		4	1.96	1.666	144	-.115
	20	2.500	1.501			2.05	1.756	53	-.255
	27	2.575	1.576			2.12	1.826	48	-.250
Dec	4	2.537	1.538		2	2.11	1.816	70	-.228
	11	2.600	1.601		3	2.13	1.836	81	-.235
	18	2.525	1.526		1	2.11	1.816	62	-.175
	25	2.650	1.651		4	2.11	1.816	39	-.165
1956									
Jan	1	2.675	1.676		10	2.11	1.816	24	-.175
	8	2.633	1.639		5	2.07	1.776	34	-.025





Table 9. (cont.)

Week	California				Washington				Kansas City				Differential <sup>4</sup>	
	Cash Price	Carlott	Cash Price	Carlott	Cash Price	Carlott	Cash Price	Carlott	Cash Price	Carlott	Cash Price	Carlott	Calif.:	Wash.
Beginning:	Actual:	Net:	Receipts <sup>2</sup>	Actual:	Net:	Receipts <sup>2</sup>	Actual:	Net:	Receipts <sup>2</sup>	Actual:	Net:	Receipts <sup>2</sup>	Calif.:	Wash.
1956														
Aug	19	\$2.925	\$1.874		\$3.250	\$2.199			\$2.241			13	\$-.367	\$-.042
	26	2.925	1.874		3.250	2.199			2.34			28	-.157	-.168
Sept	2	2.925	1.874		3.150	2.099			2.27			36	-.087	-.138
	9	2.912	1.861	1	3.125	2.074			2.21			90	-.040	-.173
	16	2.925	1.874	3	3.125	2.074			2.21			163	-.023	-.223
	23	2.950	1.899		3.125	2.074			2.26			155	-.052	-.123
	30	2.960	1.909		3.125	2.074			2.24			137	-.022	-.143
Oct	7	2.962	1.911		3.000	1.949			2.23			124	-.010	-.023
	14	2.988	1.937		3.000	1.949			2.26			84	-.014	-.002
	21	3.085	2.034		2.950	1.899			2.23			83	-.063	-.072
	28	3.100	2.049		2.950	1.899			2.27			87	-.088	-.062
Nov	4	2.995	1.934						2.34			30	-.097	
	11	3.000	1.949						2.40			32	-.142	
	18	2.912	1.980						2.41			37	-.121	
	25	2.833	1.956						2.43			30	-.165	
Dec	2	2.875	1.943						2.40			21	-.148	
	9	2.950	2.013						2.40			22	-.073	
	16	2.950	2.064						2.40			9	-.027	
	23	2.925	2.039						2.40			10	-.052	
	30	2.925	1.993						2.41			15	-.093	
1957														
Jan	6	2.950	2.018						2.41			16	-.068	
	13	2.970	2.038						2.42			16	-.058	
	20	2.938	2.006						2.43			13	-.100	
	27	2.938	2.006						2.40			8	-.070	
Feb	3	2.900	1.968						2.31			8	-.018	
	10	2.875	1.943						2.27			2	-.003	
	17	2.900	1.963						2.28			6	-.012	
	24								2.29			7		
Mar	3								2.29			15		
	10								2.32			9		
	17								2.32			20		
	24								2.32			9		
	31								2.32			9		



Table 9. (concl.)

Week Beginning	California		Washington		Kansas City		Differential <sup>4</sup>				
	Cash Price	Carlott	Receipts <sup>2</sup>	Cash Price	Carlott	Cash Price	Carlott				
	Actual: Net <sup>1</sup>	Actual: Net <sup>1</sup>	Receipts <sup>2</sup> : Actual: Net <sup>1</sup>	Actual: Net <sup>1</sup>	Receipts <sup>2</sup> : Actual: Net <sup>1</sup>	Actual: Net <sup>1</sup>	Receipts <sup>2</sup> : Actual: Net <sup>1</sup>	Calif.: Wash.			
1957											
Nov	17	\$2,375	\$1,489	10	\$2,475	\$1,332	\$1.30	\$1.465	575	\$4.024	\$-133
	24	2,375	1,489	22	2,525	1,382	1.71	1,375	392	4.114	4.007
Dec	1	2,375	1,489	69	2,550	1,407	1.73	1,295	1,536	4.094	4.012
	8	2,450	1,564	53	2,550	1,407	1.81	1,475	1,730	4.039	-0.068
	15	2,475	1,589	71	2,600	1,457	1.83	1,495	1,070	4.026	-0.038
	22	2,450	1,564	19	2,600	1,457	1.79	1,455	491	4.109	4.002

<sup>1</sup>Actual cash price minus freight cost from Group B. (Freight cost used appear in Table 3.)<sup>2</sup>In number of railroad cars received from Group B.<sup>3</sup>Total receipts received in Kansas City.<sup>4</sup>California and Washington net cash price above (+) or below (-) Kansas City net cash price.

GRAIN SORGHUM MOVEMENTS FROM SOUTHWESTERN KANSAS IN RELATION  
TO SPATIAL PRICE DIFFERENCES

by

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AN ABSTRACT OF A THESIS

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Kansas farmers have found an increased importance in the utilization of grain sorghums as a cash crop. With this increase has come the need for new markets outside of the producing area. The purpose of this study was to determine whether Kansas sellers were taking advantage of price differences between markets at a given point in time. This study was particularly concerned with the effectiveness with which Kansas grain sorghums were marketed during the period July 1, 1955 to December 31, 1957.

The economic theory was taken that prices of grains vary regionally, because they are chiefly reflecting costs of transportation from producing areas to consuming areas. From this a partial spatial equilibrium problem was set consisting of Kansas as the producing area and of Kansas City, California, and Washington as the consuming areas. A specified producing area was stated for Kansas which was an area south of a line from Salina through Goodland, and west of a line from Salina through Wichita. This area included two of the four transcontinental freight rate groups in Kansas.

Terminal market prices for grain sorghums were taken from Kansas City and Los Angeles, while prices for Seattle were from the Seattle Grain Exchange. These prices represented one day in each week, therefore, all other data used was broken down into periods of 131 weeks. To put these prices on an equal basis the transportation costs from the two transcontinental freight rate groups used in Kansas, referred to by the author as Groups B and C, were subtracted from the actual Los Angeles and Seattle cash price to give a net cash price. Freight rates from Garden City in Group B, and Salina and Wichita in Group C were used to obtain the Kansas City net price.

To find a price differential the Kansas City net price was subtracted from the Los Angeles and Seattle net price. This differential then gave a margin for the two western markets above or below the Kansas City net price.



For the remainder of the study Los Angeles terminal market price was referred to as the California price and Seattle Grain Exchange price as the Washington price.

The equilibrium was not found in the market for grain sorghums shipped out of Kansas. Wide fluctuations were found between the California - Washington markets compared to Kansas City. An extreme example was when California price differential ranged from 43.0 cents below to 42.9 cents above Kansas City price during the 30 month period studied for Group B.

Movement of grain sorghums from Kansas was then compared to these price differentials. Source of movements were obtained from European corn borer certificates which are issued by the Kansas Entomological Commission to all shipments of grain sorghums moving from Kansas to eight Western states. Carlot receipts in Kansas City were taken from the Kansas City Grain Market Review and were assumed from a previous study to be mainly from the area studied in Kansas.

Ninty-seven and six-tenths percent of the movement to California from freight rate Group B in Kansas was made when price conditions were favorable in California over Kansas City. Therefore, it appeared that the Kansas seller was taking advantage of this market when price was favorable.

It appeared that all shipments, from Group B to California and Washington, made when these states were at a price disadvantage were caused by a lag in shipments compared to price. Movements made to Washington when no cash price was reported might have been on a contract basis, since this movement seemed not to be accounted for by a lag in the market.

For shipments designated from Group C to Washington and California the full advantage of cash prices seemed not to be taken. Of the 33.0 percent of the total shipments made during a price disadvantage to California 96.5 percent were made when California had held a negative price differential

for five or more successive weeks. One hundred percent of the 179 cars shipped to Washington at a price disadvantage were also during a period of five or more successive weeks when Washington held a negative price differential with Kansas City. Therefore, the shipments which moved under a price disadvantage appeared not to be caused by a lag in the shipments compared to price.

Carlot receipts of grain sorghums in Kansas City which were assumed to be from the main producing area of Kansas were not affected during the periods of favorable prices in California and Washington.

There were many weeks when California and Washington held a price advantage, but there was no movement to these states. The price differential, therefore, suggested that greater quantities of grain sorghums should have moved to California and Washington (relative to movement to Kansas City) if the greatest opportunities for profit had been realized. Even though the Kansas sellers have not taken full advantage of the California and Washington markets in all cases this does not fully support the original assumption that these markets should have an effect upon the number of carlot receipts in Kansas City.

The lowest and highest price differentials for California and Washington over Kansas City for Groups B and C occurred during similar periods of time. Possible reasons for this could have been changes in price in one area (Kansas City) in expectation of the coming crop which were not reflected to the West Coast markets immediately. Also, the problem of grain sorghums in picking up moisture while in storage may have limited shipments to the West Coast.