

Selected Characteristics of the United States Grain Marketing Industry

DONALD W. LARSON and E. DEAN BALDWIN

Agricultural Experiment Stations of
Alabama, Arkansas, California, Delaware, Georgia, Idaho, Illinois,
Indiana, Iowa, Kansas, Kentucky, Louisiana, Michigan, Minnesota,
Mississippi, Missouri, Montana, Nebraska, North Dakota, Ohio,
Oklahoma, Oregon, South Dakota, Tennessee, Texas, and Wisconsin,
in addition to the Tennessee Valley Authority and the U.S. Department
of Agriculture, cooperating

**The Ohio State University
Ohio Agricultural Research and Development Center**

Wooster, Ohio

Research Bulletin 1178

FOREWORD

Sponsored by the agricultural experiment stations of the following states, by the Cooperative State Research Service (CSRS), U. S. Department of Agriculture (USDA), and by the Economic Research Service (ERS), USDA

Participating States

Alabama
Arkansas
California
Delaware
Georgia
Idaho
Illinois
Indiana
Iowa
Kansas
Kentucky
Louisiana
Michigan
Minnesota
Mississippi
Missouri
Montana
Nebraska
North Dakota
Ohio
Oklahoma
Oregon
South Dakota
Tennessee
Texas
Wisconsin

Experiment Station Directors

G. A. Buchanan
P. E. LaFerney
L. N. Lewis
R. E. Fowler
C. W. Donoho, Jr.
R. I. Miller
D. A. Holt
B. R. Baumgardt
L. R. Kolmer
J. O. Dunbar
C. E. Barnhart
C. O. Little
R. G. Gast
R. J. Sauer
R. R. Foil
R. L. Mitchell
J. R. Welsh
R. G. Arnold
H. R. Lund
F. E. Hutchinson
C. B. Browning
J. R. Davis
R. A. Moore
D. M. Gossett
N. P. Clarke
L. M. Walsh

PREFACE

This report fulfills part of the objectives undertaken by the Southern Regional Research Project S-176, Marketing Systems for Grains and Oilseeds, and the North Central Regional Research Project NC-137, Effect of Changes in Transportation on Performance of the U.S. Agricultural Transportation System. This publication conveys information collected by a 1977 grain market survey which was conducted as a part of these two research projects.

The authors wish to thank Karlene Robison, Jill Loar, Janice Christensen, and Tom Myers for their assistance in the preparation of this report.

This publication reports the results of research conducted by two regional technical committees: Southern Regional Committee S-176, Marketing Systems for Grain and Oilseeds, and North Central Regional Committee NC-137, Effect of Changes in Transportation on Performance of the U.S. Agricultural Transportation System. The following state agricultural experiment station representatives, Tennessee Valley Authority (TVA) staff members, and USDA personnel comprised the technical committees.

SOUTHERN REGIONAL COMMITTEE S-176

State Agricultural Experiment Stations

J. L. Stallings*	Alabama
E. J. Wailes*	Arkansas
U. C. Toensmeyer	Delaware
J. Jordan and S. Ott	Georgia
L. D. Hill* and P. Garcia	Illinois
M. R. Reed*	Kentucky
H. D. Traylor*	Louisiana
W. L. Bateman*, A. Allen, and T. D. Phillips	Mississippi
E. D. Baldwin* and C. S. Thraen	Ohio
C. B. Sappington*	Tennessee

Tennessee Valley Authority

W. J. Free*

U. S. Department of Agriculture

T. Q. Hutchinson* and M. N. Leath*	Economic Research Service
P. L. Farris	Cooperative State Research Service

Administrative Advisor

T. J. Whatley Tennessee

NORTH CENTRAL REGIONAL COMMITTEE NC-137

State Agricultural Experiment Stations

L. D. Hill* and R. Hauser	Illinois
J. K. Binkley*	Indiana
C. P. Baumel*	Iowa
L. O. Sorenson*	Kansas
S. R. Thompson*	Michigan
J. Fruin*	Minnesota
R. K. Rudel*	Missouri
D. G. Anderson*	Nebraska
W. W. Koo*	North Dakota
D. W. Larson*	Ohio
L. Makus*	Oklahoma
C. E. Lamberton*	South Dakota
S. W. Fuller*	Texas
R. H. Vilstrup*	Wisconsin

U. S. Department of Agriculture

J. M. MacDonald	Economic Research Service
P. L. Farris	Cooperative State Research Service

Administrative Advisor

D. E. Anderson North Dakota

*Voting member and project leader for participating organization.

CONTENTS

*** * ***

Foreword	i
Preface	ii
Introduction	1
Methodology	1
Participating States and Regional Boundaries	1
Presentation of Survey Data	7
Number, Size, and Types of Plants by Region	7
Utilization of Permanent Storage Space, Drying Capacities, and Turnover Rates	8
Transportation Characteristics	12
Conclusions	21
References	22
Appendix A — Definitions of Terms in 1977 NCSR Grain Survey	22
Firm Types	22
Transportation Rate Categories	22

All publications of the Ohio Agricultural Research and Development Center and other state agricultural experiment stations are available to all on a nondiscriminatory basis without regard to race, color, national origin, sex, handicap, or religious affiliation.

Selected Characteristics of the United States Grain Marketing Industry

DONALD W. LARSON and E. DEAN BALDWIN¹

INTRODUCTION

The U.S. grain marketing industry is composed of producers, processors, merchants, and brokers as well as physical facilities such as country elevators, terminal elevators, export elevators, processing plants, and feed mills.² One basic function of this industry is to facilitate the movement of grain and grain products from areas of production to areas of consumption. Other basic functions of this industry include the buying, selling, storing, and processing of grain. The importance of this industry is demonstrated by the immense volumes of grain transported through this marketing network each year. The total volume of corn, wheat, and soybean production in the United States during 1977 amounted to more than 10.2 billion bushels with a farm market value of more than \$29.4 billion. Inefficiency in the grain marketing system which increases costs could substantially reduce the prices paid to U.S. farmers, increase prices paid by the final consumer, and contribute to a loss of export markets.

The level of efficiency in this industry is influenced by the actions of governmental, industrial, and other private-sector decision makers. It is therefore important that these groups receive the information necessary to enable them to formulate rational and economically sound conclusions. The purpose of this publication is to describe and compare selected characteristics of the grain marketing industry in five regions of the United States. Some of the important characteristics of the grain marketing industry investigated in this publication include: the number, types, and sizes of grain firms in the industry; the kinds of services offered by each type of firm; and the modes of transportation utilized by each type of firm.

The remainder of this publication is divided into three main sections. The first section identifies the regional research committees which initiated this project. This section also discusses the methodology used in collecting the data and describes the five geographic regions of the U.S. identified in this publication. The second section presents the information used to describe and compare the market characteristics of these five regions. The final section discusses the implications and conclusions to be drawn from this information.

METHODOLOGY

This publication conveys information which was collected jointly by the Southern and the North Central Regional Research Committees. The two committees were the Southern Regional Grain Marketing Research Pro-

ject S-176, Marketing Systems for Grains and Oilseeds, and the North Central Regional Research Project NC-137, Effects of Changes in Transportation on Performance of the U.S. Agricultural Transportation System. These two committees are composed of members from participating state agricultural experiment stations, Tennessee Valley Authority staff members, and personnel from the U.S. Dept. of Agriculture.

Participating States and Regional Boundaries

Data for this publication were obtained through a 1977 survey of grain firms conducted by the two research committees. A total of 40 states participated in this survey and provided grain flow data, while 26 of those states provided the market structure data used in this publication (Fig. 1). The amount and completeness of information gathered varied from state to state. Omissions of data are noted at the bottom of the appropriate tables.

In each participating state the total population of grain firms was obtained from lists such as those compiled by the licensing division of the state departments of agriculture. The facilities on this list were divided into groups based upon storage capacity and operational characteristics. The types of facilities or plants include country elevators, terminal elevators, river elevators, export elevators, feed manufacturers, feed mills, flour millers, corn millers, soybean processors, and "others." Definitions for these types of facilities are presented in Appendix A. The regional committees recommended that each state interview all elevators with 1 million or more bushels of storage capacity and all river and export elevators. All flour mills, corn processors, and soybean processors were also interviewed. All others were sampled on a Crop Reporting District (CRD) basis or by NCSR marketing area.³

After the regional committees developed a questionnaire with a selected minimum number of questions to be included in all state surveys, each state had the opportunity to modify its respective questionnaire to include additional questions. Each state was then asked to complete the interviews and tabulate the data. The cooperating states mailed the grain flow information to

¹Professor and Associate Professor, respectively, Dept. of Agricultural Economics and Rural Sociology, The Ohio State University

²In this publication, "grain" is used to refer to corn, wheat and soybeans.

³An NCSR marketing area is a region whose boundaries have been defined by members of the North Central and/or Southern Regional Research Committees for the purpose of gathering research information. The NCSR marketing areas for the U.S. are shown in Figure 2.

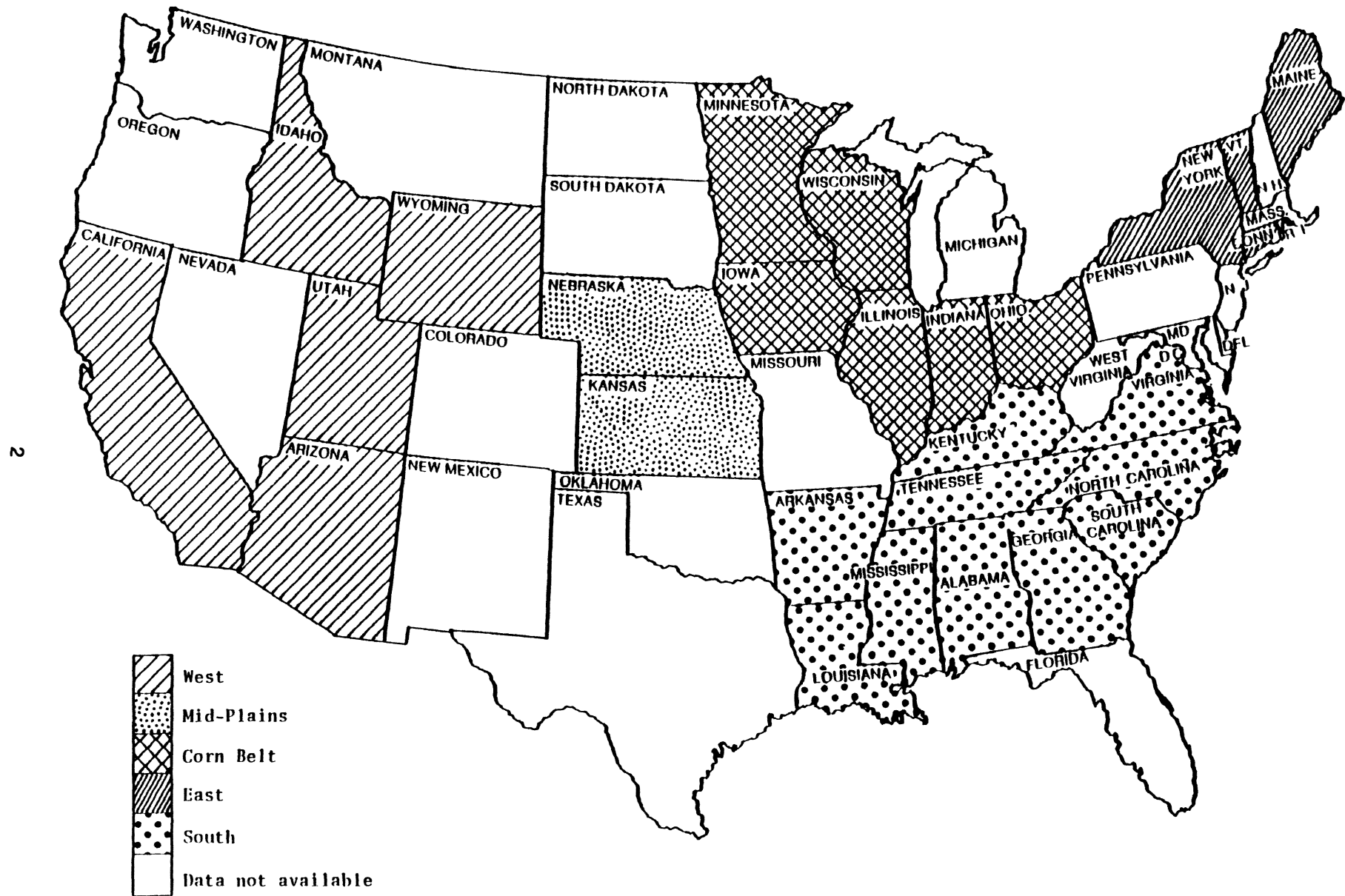


FIG. 1. — Locations of Five Regions in 1977 NCSR Grain Marketing Structure Study.

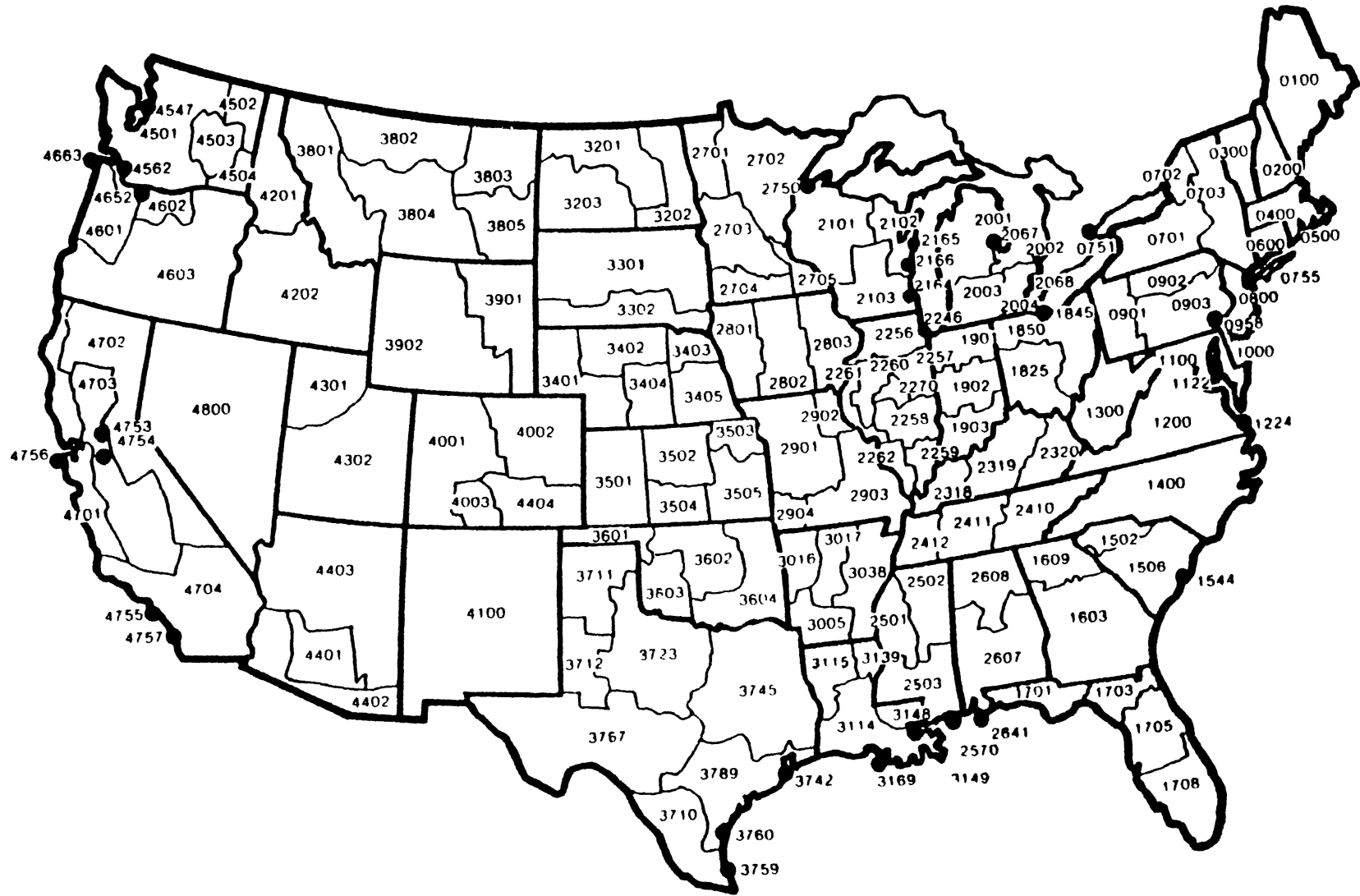


FIG. 2. — S-176 and NC-137 Grain Marketing Areas

the University of Illinois for analysis of national grain flows and the market structure and transportation data to The Ohio State University for analysis of the U.S. grain market structure.

The 26 states which participated in the market structure survey were aggregated into five regions for the purpose of reporting this information (Table 1 and Fig. 1). The regional boundaries were chosen to capture differences in production and marketing patterns. For example, the Corn Belt produces grain surpluses and markets these surpluses into deficit grain areas and to export points (Table 2).⁴ The East is a grain deficit region which imports grain from the Corn Belt for processing into dairy and poultry feed. The South is also a feed grain deficit region where soybean production is in-

creasing but feed grains are imported from the Corn Belt for processing into feed. The major Atlantic export ports are also located in the South. The Mid-Plains is a grain surplus producing region. Many of the hard winter wheat varieties are produced there. The West is a grain deficit region, but all Pacific export ports are located there. The information in Tables 1 and 2 will be referred to throughout this report when describing the various characteristics of the market structure of these regions.

⁴In Table 2 consumption includes grain used for seed, live-stock feed and processing. This table does not include data for North Carolina, Virginia, Wisconsin, or the East and West regions. Soybean consumption data for Nebraska are also not available.

TABLE 1.—1977 Grain Production by State and Region for States Providing Information for the 1977 NCSR Grain Market Structure Survey.

State and Region	Corn	Wheat	Soybeans	Total
	000 bushels			
East				
Connecticut	*	*	*	*
Maine	*	*	*	*
New York	51,200	6,825	437	58,462
Vermont	*	*	*	*
Total Region	51,200	6,825	437	58,462
Corn Belt				
Illinois	1,163,400	67,510	336,300	1,567,210
Indiana	633,420	55,800	144,300	833,520
Iowa	1,092,200	4,033	251,340	1,347,573
Minnesota	600,000	131,894	133,835	865,729
Ohio	380,100	72,380	119,990	572,470
Wisconsin	291,200	3,075	6,720	300,995
Total Region	4,160,320	334,692	992,485	5,487,497
Mid-Plains				
Kansas	161,280	344,850	28,215	534,345
Nebraska	648,450	103,250	40,680	792,380
Total Region	809,730	448,100	68,895	1,326,725
South				
Alabama	10,875	3,080	33,600	47,555
Arkansas	2,279	25,740	105,800	133,819
Georgia	24,000	3,300	21,800	49,100
Kentucky	132,300	10,138	40,920	183,358
Louisiana	3,380	1,292	62,980	67,652
Mississippi	5,760	3,570	78,475	87,805
North Carolina	88,740	6,000	29,040	123,780
Tennessee	47,450	10,080	52,170	109,700
Virginia	30,800	6,231	8,360	45,391
Total Region	345,584	69,431	433,145	848,160
West				
Arizona	5,000	10,080	*	15,080
California	28,652	42,548	*	71,200
Idaho	2,408	57,900	*	60,308
Utah	1,157	5,665	*	6,822
Wyoming	2,550	5,620	*	8,170
Total Region	39,767	121,813	*	161,580

*Indicates little or no production of that commodity in the state

Source: Field Crops Production, Disposition, Value, 1977-78. Economics and Statistics Service, U.S. Dept. of Agriculture, April 11, 1979

TABLE 2.—1977 Grain Consumption and Surplus or Deficit Totals by State and Region for States Providing Information for the 1977 NCSR Grain Market Structure Survey.*†

State and Region‡	Corn	Wheat	Soybeans	Total	Surplus/ (Deficit)
	000 bushels				
Corn Belt					
Illinois	311 410	47 933	176 524	535 867	1 031 343
Indiana	313 115	13 670	69 456	396 241	437,279
Iowa	617 848	6 432	148 130	772 410	575 163
Minnesota	250 240	88 118	68 577	406 935	458 794
Ohio	148 271	38 426	26 507	213 204	359 266
Total Region	1 640 884	194 579	489 194	2 324 657	2 861 845
Surplus/(Deficit)	2 228 236	137 038	496 571	2 861 845	
Mid-Plains					
Kansas	82 358	87 932	37 071	207 361	326 984
Nebraska	185 569	23 868	—	209 437	582,943
Total Region	267,927	111 800	37 071	416 798	909 927
Surplus/(Deficit)	514 803	336 300	31,824	909 927	
South					
Alabama	92,229	2,039	36,132	130,400	(82,845)
Arkansas	88,882	5,114	56,747	150,743	(16,924)
Georgia	136 757	5,262	32,433	174,452	(125,352)
Kentucky	79 339	4,431	17,892	101,662	81,696
Louisiana	18 149	6,107	17,860	42,116	25,536
Mississippi	57,897	583	35,178	93,658	(5,853)
Tennessee	79,434	26,477	50,033	155,944	(46,244)
Total Region	52,687	50,013	246,275	848,975	(169,986)
Surplus/(Deficit)	(326,643)	7,187	149,470	(169,986)	

* Includes consumption for seed, livestock and processors

† Surplus and deficit totals are calculated based on production totals from Table 1 of this report

‡ Data not available for North Carolina, Virginia, Wisconsin, or the East and West regions
Soybean consumption data not available for Nebraska

Source Lazarus, Sheryl S Lowell D Hill, and Stanley R Thompson Nov 1980, Grain Production and Consumption for Feed in the North Central and Southern States with Projections for 1985, 1990 and 2000

TABLE 1. Total Number of Plants and Total Permanent Storage Capacity, 1977

Region and Total Permanent Storage Capacity (000 bu)	Country Elevators	Terminals and Sub-terminals	River Elevators	Export Elevators	Feed Manufacturers	Feed Mills	Flour Mills	Corn Mills	Soybean Processors	Others	Total Number of Plants
East											
0-299	180	0	0	0	66	0	0	0	0	10	256
300 or more	0	0	0	3	0	0	0	0	0	1	4
Total Region	180	0	0	3	66	0	0	0	0	11	260
Percent of Region	69.2	0	0	1.2	25.4	0	0	0	0	4.2	100
Corn Belt											
0-299	1,679	53	38	1	296	668	9	7	1	119	2,871
300-699	1,009	45	25	0	16	13	8	0	2	1	1,119
700-1,099	400	37	7	0	3	12	6	3	3	1	472
1,100-2,999	578	28	20	3	7	1	4	4	14	1	660
3,000-8,999	90	14	9	10	1	0	2	1	16	3	146
9,000 or more	0	2	1	6	0	0	1	2	1	0	13
Total Region	3,756	179	100	20	323	694	30	17	37	125	5,281
Percent of Region	71.1	3.4	1.9	0.4	6.1	13.1	0.6	0.3	0.7	2.4	100
Mid-Plains											
0-299	668	0	2	0	102	0	1	1	0	3	777
300-699	564	2	0	0	1	0	2	0	0	3	572
700-1,099	206	5	1	0	2	0	5	1	0	0	220
1,100-2,999	232	27	0	0	4	0	8	2	4	2	279
3,000-8,999	22	10	1	0	0	0	1	0	0	2	36
9,000 or more	13	14	0	0	0	0	1	0	0	0	28
Total Region	1,705	58	4	0	109	0	18	4	4	10	1,912
Percent of Region	89.2	3.0	0.2	0	5.7	0	0.9	0.2	0.2	0.6	100
South											
0-299	468	1	11	2	531	280	55	6	5	78	1,437
300-699	175	3	14	0	18	20	9	3	5	2	249
700-1,099	93	1	6	0	7	6	4	0	3	1	121
1,110-2,999	96	1	22	1	0	5	3	0	6	2	136
3,000-8,999	46	0	4	10	0	0	0	0	13	1	74
9,000 or more	19	0	0	0	0	0	0	0	0	0	19
Total Region	897	6	57	13	556	311	71	9	32	84	2,036
Percent of Region	44.1	0.3	2.8	0.6	27.3	15.3	3.5	0.4	1.6	4.1	100
West											
0-299	71	2	3	0	145	32	0	3	1	35	292
300-699	36	0	0	1	34	28	0	2	0	4	105
700-1,099	20	0	1	0	5	18	0	2	0	1	47
1,100-2,999	36	1	7	3	1	32	0	2	1	0	83
3,000-8,999	5	1	3	1	0	0	0	0	0	0	10
9,000 or more	0	0	1	0	0	0	0	0	0	0	1
Total Region	168	4	15	5	185	110	0	9	2	40	538
Percent of Region	31.2	0.7	2.8	0.9	34.4	20.5	0	1.7	0.4	7.4	100
Total—All Regions	6,706	247	176	41	1,239	1,115	119	39	75	270	10,027
Percent of All Regions	66.9	2.5	1.7	0.4	12.4	11.1	1.2	0.4	0.7	2.7	100

Source: NCSR Grain Survey, 1977.

PRESENTATION OF SURVEY DATA

Number, Size, and Types of Plants by Region

There was a reported total of 10,027 plants in the 26 states in 1977 (Table 3). Country elevators comprised 66.9% of all plants while feed mills and feed manufacturers accounted for 23.5% of the total. The plants were concentrated in the Corn Belt (52.7% of the total), South (20.3%), and Mid-Plains (19.1%) regions, while the remaining 7.9% were located in either the East or West regions. For all plants, 56.2% have a permanent storage capacity of less than 300,000 bushels.

A total of 5.2 billion bushels of grain storage capacity is reported for the Corn Belt, Mid-Plains, and South regions (Table 4). Country elevators and terminal and subterminal elevators accounted for 82.5% of this total. Therefore, most grain stored off farm is stored in elevators rather than in processing plants.

Nearly 90% of the 5.2 billion bushel storage capacity

was reported by the Corn Belt and Mid-Plains regions. Since these two regions produced a total of 6.8 billion bushels of grain (86.4% of the total) in 1977, one can conclude that grain storage is oriented toward the regions in which it is produced (Tables 1 and 3).

The most noticeable difference among the regions is the relatively large volume of storage capacity reported for terminal and subterminal elevators in the Mid-Plains (Table 4). Feed mill and feed manufacturing firms in the South are also larger and account for a greater percentage of the total region's grain storage capacity than the same plant types in the Corn Belt (Table 4). This can be partially attributed to the fact that the South consumes more grain than it produces and must therefore obtain a portion of its grain supply from distant sources. These longer-distance shipments to the South region's feed mill and manufacturing plants, as opposed to the relatively shorter-distance shipments to similar plants in the Corn Belt region, lend themselves more readily to large volume modes of transportation such as rail.

TABLE 4.—Number of Plants, Total Grain Storage Capacity, and Share of Capacity by Type of Plant and Region, 1977.

Region*	Units	Country Elevators	Terminals and Sub-Terminals	River Elevators	Export Elevators	Feed Mills and Manufacturers	Other Processors	Total
Corn Belt								
Plants Reporting	Number	3,730	179	99	20	1,011	215	5,254
Total Storage Capacity	000 bu	2,206,796	199,171	92,399	163,866	58,704	266,189	2,987,125
Average Storage Capacity	000 bu	591	1,113	933	8,193	58	1,238	569
Share of Capacity	Percent	73.9	3.7	3.1	5.5	2.0	8.9	100
Mid-Plains								
Plants Reporting	Number	1,705	57	8	†	†	117	1,887
Total Storage Capacity	000 bu	1,172,973	356,825	44,048	-	-	74,086	1,647,932
Average Storage Capacity	000 bu	688	6,660	5,506	-	-	633	873
Share of Capacity	Percent	71.2	21.7	2.7	-	-	4.5	100
South								
Plants Reporting	Number	883	6	35	†	780	171	1,875
Total Storage Capacity	000 bu	339,470	4,316	35,552	-	71,921	99,760	551,019
Average Storage Capacity	000 bu	384	719	1,016	-	92	583	293
Share of Capacity	Percent	61.6	0.8	6.5	-	13.1	18.1	100
Three-Region Total								
Plants Reporting	Number	6,318	242	142	20	1,791	503	9,016
Total Storage Capacity	000 bu	3,719,239	560,312	71,999	163,866	130,625	440,035	5,186,076
Average Storage Capacity	000 bu	589	2,315	1,211	8,193	73	875	575
Share of Capacity	Percent	71.7	10.8	3.3	3.2	2.5	8.5	100

* Data not available for the East and West regions.

† Data not available.

Source: NCSR Grain Survey, 1977.

Information in Table 5 also helps to explain the large volume of grain storage capacity reported for feed mill and feed manufacturing plants in the South region. Feed plants in the South annually process more grain per plant into feed than do the corresponding plant types in the Corn Belt region. It is not surprising that the larger feed processing firms in the South region require a greater amount of grain storage capacity.

Feed processing plants in the West region tend to be larger than their counterpart plants in the Corn Belt, South, or Mid-Plains regions. This characteristic is due in part to the large-scale livestock producing facilities which exist in the West. Feed plants in the Mid-Plains region tend to be relatively small, with 96.5% of the reporting firms processing less than 10,000 tons annually. Data were unavailable for the East (Table 5).

Utilization of Permanent Storage Space, Drying Capacities, and Turnover Rates

Most of the grain stored in the East (85%) was stored in the "plant-owned" category. Most of the remaining 15% was owned by farmers (Table 6). Plants in the South stored 67% of their total grain inventory in the "plant-owned" category, stored an additional 21% in the "farmer-owned" category, 9% in the "delayed price" category, and the remainder in "CCC or other" category. The West used nearly 63% of its total storage capacity to store plant-owned grain, 24% to store farmer-owned grain, and 13% to store CCC and other. In contrast, the Corn Belt used 54% of its storage capacity to store farmer-owned grain, 28% to store plant-owned grain, 14% to store delayed price grain, while the

TABLE 5.—Number of Feed Manufacturers, Feed Mills, Country Elevators, and Integrated Livestock Enterprises Reporting Feed Processed by Region and Total Volume of Feed Processed, 1977.

Region and Plant Type*	Annual Processing (000 tons)								Total
	0-0.9	1-9.9	10-24.9	25-49.9	50-99.9	100-149.9	150-299.9	>300	
	No. of Plants								
Corn Belt†									
Feed Manufacturers	50	31	1	4	4	2	3	1	96
Feed Mills	0	47	99	26	0	0	0	0	172
Country Elevators	90	132	202	4	0	0	0	0	428
Integrated Livestock	0	6	0	0	0	0	0	0	6
Total Region	140	216	302	34	4	2	3	1	702
Percent of Region	19.9	30.8	43.0	4.8	0.6	0.3	0.4	0.1	100
Mid-Plains									
Feed Manufacturers	0	0	2	3	0	0	0	0	5
Feed Mills	0	0	0	0	0	0	0	0	0
Country Elevators	154	381	9	0	0	0	0	0	544
Integrated Livestock	0	0	0	0	0	0	0	0	0
Total Region	154	381	11	3	0	0	0	0	549
Percent of Region	28.1	69.4	2.0	0.5	0	0	0	0	100
South									
Feed Manufacturers	181	195	49	30	42	11	6	1	515
Feed Mills	91	67	45	23	28	15	10	13	292
Country Elevators	93	68	9	16	0	0	1	0	187
Integrated Livestock	3	7	12	3	26	12	12	5	80
Total Region	368	337	115	72	96	38	29	19	1074
Percent of Region	34.3	31.4	10.7	6.7	8.9	3.5	2.7	1.8	100
West									
Feed Manufacturers	0	11	9	42	43	8	4	0	117
Feed Mills	0	0	0	0	0	0	0	0	0
Country Elevators	0	0	0	0	0	0	0	0	0
Integrated Livestock	0	0	8	8	64	26	3	1	110
Total Region	0	11	17	50	107	34	7	1	227
Percent of Region	0	4.8	7.5	22.0	47.1	15.0	3.1	0.4	100

*Data not available for the East region

†Data not available for Iowa, Indiana, Minnesota, and Wisconsin

Source: NCSR Grain Survey, 1977

TABLE 6.—Utilization of Permanent Storage Capacity by Ownership of Grain, Type of Plant and Region, 1977.

Region and Plant Type	Ownership of Grain											
	Farmer Owned				CCC or Other				Total			
	Grain Bank		Non-Grain Bank		Non-Farmer Grain		Plant Owned		Delayed Price Grain		Total	
No. Plants Reporting	1,000 bu Stored	No. Plants Reporting	1,000 bu Stored	No. Plants Reporting	1,000 bu Stored	No. Plants Reporting	1,000 bu Stored	No. Plants Reporting	1,000 bu Stored	No. Plants Reporting	1,000 bu Stored	
East												
Country Elevators	60	1,400	10	1,250	0	0	30	11,750	10	200	110	14 600
Feed Mills and Mfrs	0	0	0	0	0	0	20	4,202	0	0	20	4 202
Sub-Total	60	1,400	10	1,250	0	0	50	15,952	10	200	130	18 802
Percent of Region	46.2	7.4	7.7	6.6	0	0	38.4	84.8	7.7	1.1	100	100
Corn Belt†												
Country Elevators	1,647	131,920	2,012	576,415	890	33,463	2,041	191,220	1,185	132,774	7,775	1 065 792
Terminals and Export	79	7,382	148	60,335	54	19,524	233	203,346	88	70,132	602	360 719
Feed Mills and Mfrs	452	21,644	231	4,178	219	156	674	13,343	276	6,693	1 852	46 014
Other Processors	66	2,208	73	7,464	42	0	129	12,324	62	4 657	372	26 653
Sub-Total	2,244	163,154	2,464	648,392	1,205	53,143	3,077	420,233	1,611	214,256	10 601	1 499 178
Percent of Region	21.2	10.9	23.2	43.2	11.4	3.5	29.0	28.0	15.2	14.3	100	100
South‡												
Country Elevators	54	22,794	79	21,085	11	1,360	210	45,776	66	9 052	420	89 067
Terminals and Export	3	599	5	1,505	1	3,800	22	20,549	15	3 444	46	29 897
Feed Mills and Mfrs	18	4,476	10	1,999	6	126	205	37 058	3	2 343	242	46 002
Other Processors	0	0	2	92	0	0	46	29 623	8	2 954	56	32 669
Sub-Total	75	16,869	96	24,681	18	5 286	486	133 006	92	17 793	764	197 635
Percent of Region	9.8	8.5	12.6	12.5	2.4	2.7	63.2	67.3	12.0	9.0	100	100
West**												
Country Elevators	3	40	13	5,358	8	561	16	4 767	0	0	40	10 726
Terminals and Export	0	0	0	0	2	16	6	2 311	0	0	8	2 327
Feed Mills and Mfrs	11	262	6	629	8	2 797	34	3 710	0	0	59	7 398
Other Processors	0	0	0	0	0	0	28	5 545	0	0	28	5 545
Sub-Total	14	302	19	5,987	18	3,374	84	16 333	0	0	135	25 996
Percent of Region	10.4	1.2	14.1	23.0	13.3	13.0	62.2	62.8	0	0	100	100
All Regions*												
Country Elevators	1,764	145,154	2,114	604,108	909	35,384	2 297	253 513	1 261	142 026	8 345	1 180 185
Terminals and Export	82	7,981	153	61 840	57	23 340	26	226 206	103	73 576	656	392 943
Feed Mills and Mfrs	481	26,382	247	6 806	233	3 079	933	58 313	279	9 036	2 173	103 616
Other Processors	66	2,208	75	7 556	42	0	203	47 492	70	7 611	456	64 867
Sub Total	2,393	181,725	2,589	680,310	1,241	61 803	3,694	585 524	1 713	232 249	11 630	1 741 611
Percent of All Regions	20.6	10.4	22.3	39.1	10.7	3.5	31.8	33.6	14.7	13.3	100	100

*Data not available for the Mid Plains region

†Data not available for Iowa

‡Data not available for Arkansas Louisiana and North Carolina Grain Bank, Non Grain Bank and CCC or Non Farm data not available for Alabama Terminal and Export data for Mississippi included in the Country Elevator category

**Data not available for California and Idaho

Source NCSR Grain Survey 1977

TABLE 7.—Bushels of Grain Dried, Drying Capacity, and Type of Fuel Used by Type of Plant and Region, 1977.

Region and Plant Type	Plants with Dryers	Total Drying Capacity	Type of Fuel Used					Total Volume Dried	Proportion of Total Volume Dried
			Natural Gas	LP Gas	Oil	Electric	Other*		
			bu/hr. @ 5 pts.	000 bushels					
East	No.								
Country Elevators	150	**	13,850	0	300	0	3,920	18,070	93.4
Export Elevators	3	**	0	0	750	0	0	750	3.9
Processors and Others	15	750	404	0	126	0	0	530	2.7
Total Region	168	**	14,254	0	1,176	0	3,920	19,350	100
Percent of Total Volume Dried			73.7	0	6.1	0	20.2	100	
Corn Belt									
Country Elevators	2,918	5,496,110	274,213	165,017	14,161	700	208,646	662,737	64.5
Terminals and Subterminals	112	297,550	51,419	12,768	3,500	0	31,501	99,188	9.7
River Elevators	62	179,085	22,223	3,683	9,906	0	8,383	44,195	4.3
Export Elevators	10	32,350	23,082	965	174	0	100	24,321	2.4
Processors and Others	615	691,750	99,075	8,106	1,139	0	87,961	196,281	19.1
Total Region	3,717	6,696,845	470,012	190,539	28,880	700	336,591	1,026,722	100
Percent of Total Volume Dried			45.8	18.6	2.8	0.1	32.8	100	
Mid-Plains									
Country Elevators	1,204	883,025	99,641	84,541	0	0	153,545	337,727	93.7
Terminals and Subterminals	40	38,265	6,705	1,000	0	0	13,858	21,563	6.0
River Elevators	1	500	0	0	0	0	0	0	0
Processors and Others	8	3,700	0	1,050	0	0	0	1,050	0.3
Total Region	1,253	925,490	106,346	86,591	0	0	167,403	360,340	100
Percent of Total Volume Dried			29.5	24.0	0	0	46.5	100	
South									
Country Elevators	391	1,087,721	137,425	200,983	2,819	1,904	9,297	352,428	66.2
Terminals and Subterminals	75	52,293	2,226	1,267	1,000	0	781	5,274	1.0
River Elevators	55	79,133	8,908	3,308	28,436	233	35	40,920	7.7
Export Elevators	8	38,100	17,957	0	5,162	0	6,103	29,222	5.5
Processors and Others	248	286,184	47,203	18,635	33,570	3,538	1,434	104,380	19.6
Total Region	777	1,543,431	213,719	224,193	70,987	5,675	17,650	532,224	100
Percent of Total Volume Dried			40.2	42.1	13.3	1.1	3.3	100	
West									
Total All Plant Types	13	8,771	53	0	0	1,000	3,350	4,403	100
Percent of Total Volume Dried			1.2	0	0	22.7	76.1	100	
Total All Regions									
Country Elevators	4,663	7,466,856	525,129	450,541	17,280	2,604	375,408	1,370,962	70.6
Terminals and Subterminals	227	388,108	60,350	15,035	4,500	0	46,140	126,025	6.5
River Elevators	118	258,718	31,131	6,991	38,342	233	8,418	85,115	4.4
Export Elevators	21	70,450	41,039	965	6,086	0	6,203	54,293	2.8
Processors and Others†	899	991,155	146,735	27,791	34,835	4,538	92,745	306,644	15.8
Total	5,928	9,175,287	804,384	501,323	101,043	7,375	528,914	1,943,039	100
Percent of Total Volume Dried	—	—	41.4	25.8	5.2	0.4	27.2	100	

* Some states reported the Total Volume Dried without specifying the Type of Fuel Used. These totals, along with those dryers using fuels not properly described by the other four categories, have been included here.

† The totals for the West are included in Processors and Other Plant types.

‡ Data not available.

Source: NCSR Grain Survey, 1977.

remainder was stored as CCC or other. Data were unavailable for the Mid-Plains region.

The fact that most of the storage capacity in the East, South, and West was used to store plant-owned grain is consistent with their grain deficit position. That is, the plants are buying grain from surplus producing regions and are storing it in their facilities for future processing or shipment to other demand points. Farmers from the grain deficit regions are not directly involved in the acquisition of grain from surplus producing regions. However, for the Corn Belt, a grain surplus region, many farmers are storing grain or are using delayed price selling practices to capture higher prices during the storage season. Thus, farmers in the grain surplus region provide, in part, the storage function for grain which moves from the surplus producing region to deficit grain regions and export points.

Bushels of grain dried, drying capacity, and types of fuel used by type of plant and region are reported in Table 7. In 1977, all plants reported drying 1.9 billion bushels of grain or 25% of the total grain production. Assuming that most of the dried grain was corn, grain plants dried approximately 35% of total corn production in these regions.

Country elevators accounted for the largest volume of grain dried in each region except in the West, where all plant types were combined in the same category. A total

of nearly 1.4 billion bushels (70.6% of the total) of grain was dried by country elevators in the four regions reporting this information. These totals seem logical considering that country elevators usually comprise the first stop in the marketing process for grain once it leaves the farm. Grain which has a high moisture content is a perishable commodity and must therefore be dried on farms or at elevators before it can safely be shipped or stored for any length of time. Country elevators will typically derive a significant portion of their income from charges assessed for the drying of grain.

Although a substantial amount of the information regarding the type of fuel used for drying had to be reported in a category designated as "other" (see footnote to Table 7), the most popular types of fuel appear to be natural and LP gas. The only exception to this is in the West region which reported that 22.7% of the grain was dried using electricity. Natural gas was the energy source used for 41.4% of the total amount of grain dried in all five regions, while LP gas accounted for 25.8% of the total. The question arises as to what types of fuel will be used for drying grain in the future. Choosing a source of energy will become an increasingly important decision as the relative cost of this and other fuels continues to change.

The 1977 annual turnover rate by type of plant for the Corn Belt, Mid-Plains, and South regions is reported in

TABLE 8.—Annual Turnover Rate by Type of Plant and Region, 1977.

Region and Plant Type*	Plants Reporting	Volume of Grain Received	Permanent Storage Capacity	Turnover Rate
	No.		000 bushels	
Corn Belt				
Country Elevators	3,730	9,035,114	2,163,138	4 18
Terminal Elevators	179	566,481	196,461	2 88
River Elevators	99	1,063,681	90,549	11 75
Export Elevators	20	602,573	169,116	3 56
Feed Mills and Mfrs	1,011	611,953	58,335	10 49
Other	215	777,206	260,227	2 99
Total Region	5,254	12,657,008	2,937,826	4 31
Mid-Plains				
Country Elevators	1,705	1,581,781	1,161,693	1 36
Terminal Elevators	57	478,339	352,825	1 36
River Elevators	8	78,097	44,048	1 77
Export Elevators	†	†	†	†
Feed Mills and Mfrs	†	†	†	†
Other	117	579,304	74,086	7 82
Total Region	1,887	2,717,521	1,632,652	1 66
South				
Country Elevators	833	713,290	333,909	2 14
Terminal Elevators	6	30,407	4,316	7 05
River Elevators	35	147,201	35,552	4 14
Export Elevators	†	†	†	†
Feed Mills and Mfrs	780	683,102	69,927	9 77
Other	171	379,528	99,760	3 80
Total Region	1,825	1,953,528	543,464	3 59

*Data not available for the East and West regions

†Data not available

Source NCSR Grain Survey, 1977

Table 8. The highest turnover rate among all plant types was reported for river elevators in the Corn Belt region. This relatively large number can be partially explained by the nature of these types of plants. River elevators in the Corn Belt region often have very little storage capacity and sometimes load barges directly from rail cars or trucks. The next highest turnover rates were reported for feed mills and feed manufacturing plants in the Corn Belt and South regions. It is not surprising that these plants have a high turnover rate. These plants typically derive their income from the processing and selling of feed products and not from the storage of grain, as do some of the other plant types. Processors normally work from pipeline stocks and acquire grain on a daily or weekly basis.

Transportation Characteristics

The remaining tables in this report convey information concerning the transportation of grain and livestock feed. The volume of grain shipped and received interstate and intrastate, respectively, by all elevators, feed mills, and other processors by mode of transportation is reported in Tables 9 and 10. This information is available for the Corn Belt, Mid-Plains, and South regions; however, not every state in these regions reported these data.

The largest volumes of shipments were made by truck

in the Corn Belt and South regions, while in the Mid-Plains region plants shipped 65.1% of their grain by rail (Table 9). This is consistent with the information reported in Table 4 which shows that terminal and subterminal elevators in the Mid-Plains region accounted for 21.7% of that region's total storage capacity, and the average capacity of the facilities in that region was larger than in other regions. Larger facilities tend to use large-volume modes of transportation such as rail. The geography of the Mid-Plains region also limits its access to water as a mode of transportation. This is demonstrated by the fact that the region shipped only 1.7% of its grain by this mode.

Plants in all three reporting regions received the largest volume of all grain by farm truck. In each region a large majority of the receipts by farm truck were at elevators (Table 10).

The South region received relatively large amounts of interstate grain via the railroad and water modes of transportation (Table 10). These two modes are always associated with shipments larger in size than the lots moved by the truck or farm truck modes. This can be partially attributed to the fact that grain consumption in the South for 1977 exceeded the volume produced by a substantial amount. Because the South obtains a significant portion of its grain from distant sources (Table 2), these longer-distance shipments are usually more economical via the large volume modes of transportation.

TABLE 9.—Volume of Grain Shipped by All Elevators, Feed Mills, and Other Processors by Mode of Transportation, Type of Plant, and Region, 1977.

Region and Plant Type*	Transportation Mode				Total Volume Shipped	Plant Type Share
	Rail	Truck	Water	Farm Truck		
	000 bushels					%
Corn Belt†						
All Elevators	1,031,707	1,616,684	904,914	61,022	3,614,327	92.4
Feed Mills	4,873	89,061	15,413	1,413	110,760	2.8
Other Processors	63,989	103,211	18,551	374	186,125	4.8
Total Region	1,100,569	1,808,956	938,878	62,809	3,911,212	100
Model Share (%)	28.1	46.3	24.0	1.6	100	
Mid-Plains‡						
All Elevators	690,054	247,695	21,383	37,326	996,458	80.5
Feed Mills	0	79,844	0	17,337	97,181	7.9
Other Processors	115,035	22,123	0	6,458	143,616	11.6
Total Region	805,089	349,662	21,383	61,121	1,237,255	100
Model Share (%)	65.1	28.3	1.7	4.9	100	
South**						
All Elevators	103,596	241,860	225,416	13,677	584,549	76.4
Feed Mills	23,236	15,503	0	828	39,567	5.2
Other Processors	29,118	99,975	8,376	3,491	140,960	18.4
Total Region	155,950	357,338	233,792	17,996	765,076	100
Model Share (%)	20.4	46.7	30.6	2.4	100	

*Data not available for the East and West regions

†Data not available for Iowa and Wisconsin

‡All data for Kansas included in the All Elevators classification

**Data not available for Virginia. All data for Louisiana included in the All Elevators classification. All Farm Truck shipments for North Carolina included in the Truck classification

Source: NCSR Grain Survey, 1977

TABLE 10.—Volume of Grain Received by All Elevators, Feed Mills, and Other Processors by Mode of Transportation, Type of Plant, and Region, 1977.

Region and Plant Type*	Transportation Mode				Total Volume Received	Plant Type Share
	Rail	Truck	Water	Farm Truck		
	000 bushels					%
Corn Belt†						
All Elevators	186 154	1 297 357	5 009	2 899 270	4 387 790	86 6
Feed Mills	1 498	64 912	0	106 489	172 899	3 4
Other Processors	104 776	309 785	3 617	85 859	504 037	10 0
Total Region	292 428	1 672 054	8 626	3 091 618	5 064 726	100
Model Share (%)	5 8	33 0	0 2	61 0	100	
Mid-Plains‡						
All Elevators	353 561	226 771	0	998 716	1 579 048	92 8
Feed Mills	9 611	81 262	0	4 606	95 479	5 6
Other Processors	0	22 822	185	3 115	26 122	1 5
Total Region	363 172	330 855	185	1 006 437	1 700 649	100
Model Share (%)	21 4	19 5	0 0	59 2	100	
South**						
All Elevators	149 734	207 673	27 726	579 172	964 305	63 2
Feed Mills	99 476	108 588	3 216	30 130	241 410	15 8
Other Processors	180 222	44 113	51 967	43 697	319 999	21 0
Total Region	429 432	360 374	82 909	652 999	1 525 714	100
Model Share (%)	28 1	23 6	5 4	42 8	100	

*Data not available for the East and West regions

†Data not available for Iowa and Wisconsin

‡All data for Kansas included in the All Elevators classification

**Data not available for Virginia. All data for Louisiana included in the All Elevators classification. All Farm Truck receipts for North Carolina included in the Truck category.

Source: NCSR Grain Survey 1977

The volume of grain shipped and received under selected rail rates by region and type of plant is reported in Tables 11 and 12, respectively. The East and West regions reported no information for these two tables while the Mid-Plains region reported information only for country elevators (Table 11).

The South did not ship grain via unit train or large (25-50) multiple-car railroad rates, while the Corn Belt reported a total of 43.6% of its shipments in these two categories (Table 11). The South region also would not be expected to have reported large shipments of grain by

rail based on the fact that this region consumed more grain than it produced in 1977.

In the South, all plants reported receiving 12.6% and 10.8% of their grain, respectively, via the 25-50 multi-car and unit train rates (Table 12). This is compared to only 2.6% of the receipts for the same categories in the Corn Belt region. These totals seem reasonable when one considers that the South is a deficit production region and the Corn Belt a surplus production region. It seems likely that many of the unit train shipments from the Corn Belt would appear as unit train receipts in the South (Tables 11 and 12).

TABLE 11.—Volume of Grain Shipped Under Selected Rail Rates by Type of Plant and Region, 1977.

Region and Plant Type*	Rail Rates				Unit Train	Total Bushels Shipped
	Single	2 - 5	Multiple 6 - 24	25 - 50		
	000 bushels					
Corn Belt†						
Country Elevators	223,223	167,689	45,522	41,949	174,123	652,396
Percent of Total	34.2	25.7	7.0	6.4	26.7	100
Terminals and Subterminals	51,487	44,748	3,974	885	181,607	282,701
Percent of Total	18.2	15.8	1.4	0.3	64.2	100
River Elevators	15,350	19,274	5,361	4,367	5,317	49,689
Percent of Total	30.9	38.8	10.8	8.8	10.7	100
Export Elevators	30,335	1,750	5,940	5,724	36,956	80,705
Percent of Total	37.6	2.2	7.4	7.1	45.8	100
Feed Mills and Manufacturers	1,487	348	221	0	2,017	4,073
Percent of Total	36.5	8.5	5.4	0	49.5	100
Other Processors	2,338	1,189	650	0	26,828	31,005
Percent of Total	7.5	3.8	2.1	0	86.5	100
Total Region	324,130	234,998	61,668	52,925	426,848	1,100,569
Percent of Total	29.5	21.4	5.6	4.8	38.8	100
Mid-Plains‡						
Country Elevators	405,152	128,915	7,865	20,118	2,336	564,386
Percent of Total	71.8	22.8	1.4	3.6	0.4	100
South**						
Country Elevators	13,595	62,027	7,827	0	0	83,449
Percent of Total	16.3	74.3	9.4	0	0	100
Other Firms	9,321	10,134	1,999	0	0	21,454
Percent of Total	43.4	47.2	9.3	0	0	100
Total Region	22,916	72,161	9,826	0	0	104,903
Percent of Total	21.8	68.8	9.4	0	0	100

*Data not available for the East and West regions

†Data not available for Iowa and Wisconsin. Data not available for Indiana River Elevators, Export Elevators, or Feed Mills and Manufacturers classifications

‡Includes data for Nebraska only

**All available data for Louisiana are included in the Country Elevator classification

Source: NCSR Grain Survey, 1977

TABLE 12.—Volume of Grain Received Under Selected Rail Rates by Type of Plant and Region, 1977.

Region and Plant Type*	Rail Rates					Total Bushels Received
	Single	2 - 5	Multiple 6 - 24	25 - 50	Unit Train	
	000 bushels					
Corn Belt†						
Country Elevators	38 134	83	9	0	0	38 226
Percent of Total	99 8	0 2	0	0	0	100
Terminals and Subterminals	25 650	2 898	2 891	109	0	31 548
Percent of Total	81 3	9 2	9 2	0 3	0	100
River Elevators	26 245	3 525	0	4 353	0	34 123
Percent of Total	76 9	10 3	0	12 8	0	100
Export Elevators	105 252	51	1 234	2 022	1 001	109 560
Percent of Total	96 1	0 1	1 1	1 8	0 9	100
Feed Mills and Manufacturers	6 833	0	0	0	0	6 833
Percent of Total	100	0	0	0	0	100
Other Processors	68,079	220	3,543	277	19	72,138
Percent of Total	94 4	0 3	4 9	0 4	0	100
Total Region	270,193	6,777	7,677	6 761	1,020	292 428
Percent of Total	92 4	2 3	2 6	2 3	0 3	100
South‡						
Country Elevators	71,614	45,393	17,413	0	0	134 420
Percent of Total	53 3	33 8	12 9	0	0	100
Terminals and Subterminals	219	3,562	0	0	0	3 781
Percent of Total	5 8	94 2	0	0	0	100
River Elevators	666	2,441	0	0	0	3,107
Percent of Total	21 4	78 6	0	0	0	100
Feed Mills and Manufacturers	12,802	106,732	620	0	0	120,154
Percent of Total	10 7	88 8	0 5	0	0	100
Other Firms	25,001	39,764	2,935	53,893	46,372	67,700
Percent of Total	14 8	23 7	1 8	32 1	27 6	100
Total Region	110,302	197,892	20,968	53,898	46,372	429,432
Percent of Total	25 7	46 1	4 9	12 6	10 8	100

*Data not available for the East, Mid-Plains, and West regions

†Data not available for Iowa and Wisconsin Data not available for Indiana River Elevators, Export Elevators, or Feed Mills and Manufacturers classifications

‡All available data for Louisiana are included in the Other Firms classification

Source NCSR Grain Survey, 1977

The average grain load-out and receiving capacities, respectively, by mode of transportation and type of plant for each region are reported in Tables 13 and 14. It is interesting to note that the Corn Belt and Mid-Plains (grain surplus producing regions) have the largest load-out capacities for nearly every plant type and transportation mode. Assuming that these shipments are often destined for regions with deficit production totals such as the South, it would seem desirable for the plants in the South region to have large receiving capacities. However, as shown in Table 14, this does not appear to be the case for country elevators, grain processors, and other processors. The exception is the terminal and export elevator classification which can unload box cars and hopper cars relatively quickly. These relatively slow receiving capacities can possibly be a cause of or lead to increased turnaround times for transportation equip-

ment between surplus production regions and the South. A longer turnaround time often results in expensive demurrage charges and does not allow for the most efficient use of the transportation vehicles. This ultimately will increase the overall cost of transportation.

Of equal importance is the number of plants in the deficit grain areas which can handle train loads of grain. Although these data are not readily available, limited storage capacities and limited railroad siding space probably limit the number of trains which can move into these deficit regions. Since train load rates are the most economical of all railroad rates, these plants within the deficit regions must pay higher freight bills and may find it difficult to compete for grain with export points which can take advantage of train load rates.

TABLE 13.—Average Grain Load-Out Capacity by Mode of Transportation, Type of Plant, and Region, 1977.

Region and Plant Type	Transport Mode									
	Truck and Semi-Trailers		Covered Hopper Cars		Box Cars		Barges		Ocean or Lake Vessel	
	Number of Plants	Average Capacity	Number of Plants	Average Capacity	Number of Plants	Average Capacity	Number of Plants	Average Capacity	Number of Plants	Average Capacity
	bu/hr	bu/hr	bu/hr	bu/hr	bu/hr	bu/hr	bu/hr	bu/hr	bu/hr	bu/hr
East										
Country Elevators	150	1,960	110	1,936	90	2,700	10	27 000	10	27 000
Terminals and Export	3	2,400	3	7,000	0	0	3	36,000	3	37 000
Feed Mills and Mfrs	1	4,000	4	4,000	0	0	0	0	0	0
Other Processors	2	2,500	0	0	0	0	0	0	0	0
All Plant Types	156	1,988	117	2,136	90	2,700	13	29 077	13	29 308
Corn Belt										
Country Elevators	3,731	6,624	2,133	11,809	1,138	3,904	1	20 000	0	0
Terminals and Export	211	6,048	158	11,211	63	7,018	96	17,591	19	43 642
Feed Mills and Mfrs	722	2,160	42	1,712	46	1,425	0	0	0	0
Other Processors	90	9,975	49	4,876	10	2,052	2	17,500	1	15 000
All Plant Types	4,754	5,984	2,382	11,449	1,257	3,955	99	17,613	20	42 210
Mid-Plains										
Country Elevators	1,504	4,515	1,529	4,601	793	3,695	0	0	0	0
Terminals and Export	40	6,840	57	18,545	30	13,657	8	11,575	0	0
Feed Mills and Mfrs	33	1,700	10	1,550	3	700	0	0	0	0
Other Processors	0	0	0	0	0	0	0	0	0	0
All Plant Types	1,577	4,515	1,596	5,080	826	4,046	8	11,575	0	0
South*										
Country Elevators	1,070	3,676	205	4,427	26	2,650	48	11,953	13	50 000
Terminals and Export	65	3,766	28	4,620	0	0	23	9,396	6	21 167
Feed Mills and Mfrs	277	1,903	74	3,130	4	1,400	0	0	0	0
Other Processors	27	2,390	17	3,098	11	844	4	6,509	0	0
All Plant Types	1,439	3,315	324	4,078	41	2,044	75	10,879	19	40,895
West†										
Country Elevators	17	4,509	16	5,306	2	1,000	0	0	0	0
Terminals and Export	7	2,252	5	3,920	0	0	0	0	0	0
Feed Mills and Mfrs	35	3,399	22	4,057	0	0	0	0	0	0
Other Processors	4	2,583	0	0	0	0	0	0	0	0
All Plant Types	63	3,519	43	4,506	2	1,000	0	0	0	0

*The Terminals and Export and the Feed Mills and Manufacturers data for Louisiana as well as the Terminals and Export data for Mississippi have been included in the Country Elevator category

†Data not available for Idaho and California

Source NCSR Grain Survey, 1977

TABLE 14.—Average Grain Receiving Capacity by Mode of Transportation, Type of Plant, and Region, 1977.

Region and Plant Type	Transport Mode									
	Truck and Semi-Trailers		Covered Hopper Cars		Box Cars		Barges		Ocean or Lake Vessel	
	Number of Plants	Average Capacity	Number of Plants	Average Capacity	Number of Plants	Average Capacity	Number of Plants	Average Capacity	Number of Plants	Average Capacity
	bu/hr	bu/hr	bu/hr	bu/hr	bu/hr	bu/hr	bu/hr	bu/hr	bu/hr	bu/hr
East										
Country Elevators	150	4,667	100	5,730	60	8,450	10	35 000	10	45,000
Terminals and Export	3	2,400	3	2,600	0	0	0	0	0	0
Feed Mills and Mfrs	60	3,977	64	3,826	59	3,986	0	0	0	0
Other Processors	7	2,113	10	5,542	3	1,119	0	0	0	0
All Plant Types	220	4,367	177	4,978	122	6,111	10	35,000	10	45,000
Corn Belt										
Country Elevators	3,733	7,238	126	10,889	72	4,208	7	22,000	0	0
Terminals and Export	292	10,215	76	13,244	46	8,132	6	11 645	1	25 000
Feed Mills and Mfrs	1,547	1,566	71	3,300	89	1,147	0	0	0	0
Other Processors	169	5,868	49	9,127	30	5,559	1	10,000	1	10 000
All Plant Types	5,741	5,821	322	9,368	237	3,991	14	16,705	2	17,500
Mid-Plains										
Country Elevators	711	7,956	36	7,243	11	3,363	0	0	0	0
Terminal and Export	52	10,490	56	19,442	48	14,015	0	0	0	0
Feed Mills and Mfrs	90	2,360	26	1,592	16	1,575	0	0	0	0
Other Processors	3	8,667	2	6,000	1	1,800	0	0	0	0
All Plant Types	856	7,524	120	11,691	76	9,694	0	0	0	0
South*										
Country Elevators	1,096	4,196	124	5,179	32	3,358	14	28,864	0	0
Terminals and Export	35	9,906	17	9,147	1	20,000	12	4 578	0	0
Feed Mills and Mfrs	647	1,790	194	2,240	17	1,522	4	18,625	0	0
Other Processors	154	3,700	101	4,561	18	1,911	13	6,646	0	0
All Plant Types	1,932	3,454	436	3,883	68	2 761	43	14 417	0	0
West†										
Country Elevators	20	4,705	8	6,679	0	0	0	0	0	0
Terminals and Export	7	2,252	2	8,000	0	0	0	0	0	0
Feed Mills and Mfrs	68	3,173	28	2,876	0	0	0	0	0	0
Other Processors	29	2,060	7	1,886	0	0	0	0	0	0
All Plant Types	124	3,108	45	3,404	0	0	0	0	0	0

*The Terminals and Export and the Feed Mills and Manufacturers data for Louisiana as well as the Terminals and Export data for Mississippi have been included in the Country Elevator category

†Data not available for Idaho and California

Source NCSR Grain Survey, 1977

The volume of feed shipped and the distance shipped for feed manufacturers, feed mills, and integrated livestock firms in the Corn Belt and South regions are presented in Table 15.⁵ The distances that the total amounts

of feed were shipped are very similar between the two regions, with most shipments in the "21-50" mile category. Feed was shipped the greatest average distance in both regions by the "feed manufacturers" plant type (33.1% of the total for the Corn Belt and 46.7% of the total for the South in the "more than 50" mile

⁵See Appendix A for definitions of these firm types

TABLE 15.—Volume of Feed Shipped by Region, Type of Plant, and Distance Shipped, 1977.

Region and Plant Type*	Distance Shipped in Miles					Total	Percent of Total
	0 - 5	6 - 10	11 - 20	21 - 50	> 50		
Tons							
Corn Belt							
Feed Manufacturers	162 738	307 012	466 412	414 244	667 240	2 017 646	54 8
Percent of Feed Manufacturers	8 1	15 2	23 1	20 5	33 1	100	
Feed Mills	204 718	183 038	306 939	111 158	13 528	819 381	22 2
Percent of Feed Mills	25 0	22 3	37 5	13 6	1 7	100	
Integrated Livestock	0	54 794	246 459	546 459	0	847 712	23 0
Percent of Integrated Livestock	0	6 5	29 1	64 5	0	100	
Total Region	367 456	544,844	1 019 810	1 071 861	680 768	3 684 739	100
Percent of Total	10 0	14 8	27 7	29 1	18 5	100	
South							
Feed Manufacturers	79 743	100,267	294 971	366 742	736 182	1 577 905	14 5
Percent of Feed Manufacturers	5 1	6 4	18 7	23 2	46 7	100	
Feed Mills	748 708	984,289	667 599	766 834	503,323	3,670,753	33 6
Percent of Feed Mills	20 4	26 8	18 2	20 9	13 7	100	
Integrated Livestock	475 599	627,399	1 663 063	2 139 074	763,695	5,668,830	51 9
Percent of Integrated Livestock	8 4	11 1	29 3	37 7	13 5	100	
Total Region	1 304 050	1 711,955	2 625 633	3 272 650	2,003,200	10,917,488	100
Percent of Total	11 9	15 7	24 0	30 0	18 3	100	

*Data not available for the East Mid-Plains and West regions
Source NCSR Grain Survey, 1977

TABLE 16.—Total Bushels of Grain Shipped to Farmers by Type of Plant, Region, and Distance Transported, 1977.

Region and Plant Type*	Total No. of Plants Shipping Grain	Total Grain Shipped	Grain Shipped by Mileage Block			
			0 - 25	26 - 50	51 - 100	> 100
000 bushels						
Corn Belt†						
Country Elevators	1 022	98,004	82,561	2,902	4,943	7,598
Terminals and Export	26	34 262	2,682	6,625	16,538	8,417
Feed Mills and Mfrs	259	5,942	5,864	68	0	10
Other	0	0	0	0	0	0
Total Region	1 307	138 208	91,107	9,595	21,481	16,025
Percent of Total	—	100	65 9	6 9	15 5	11 6
South‡						
Country Elevators	120	18,594	7,391	5,983	3,692	1,528
Terminals and Export	40	5,848	3,178	2,047	623	0
Feed Mills and Mfrs	84	11 392	5,952	5,250	190	0
Other	7	195	128	67	0	0
Total Region	251	36,029	16,649	13,347	4,505	1,528
Percent of Total	—	100	46 2	37 1	12 5	4 2

*Data not available for the East, Mid-Plains, and West regions

†Data not available for Iowa

‡All data for Louisiana are included in the Terminals and Export classification. All data for Mississippi are included in the Country Elevators classification. Data not available for Arkansas or North Carolina

Source NCSR Grain Survey, 1977

category). The plant types in both regions shipping the largest percentages of feed the shortest distance are the "feed mills." Feed mills in the Corn Belt region shipped 37.5% of their feed in the "11-20" mile category while feed mills in the South region shipped 26.8% of their grain in the "6-10" mile category.

An interesting difference between the two regions is the percentage of feed transported by each plant type. Feed manufacturers in the Corn Belt transported the largest volume (54.8% of the region total) of feed, while in the South region integrated livestock firms transported the greatest volume (51.9% of the region total). It is also interesting to note that the South region reported the shipment of nearly three times the amount of feed as the Corn Belt region. This corresponds with the relatively large feed processing totals for the South region (Table 5).

The total bushels of grain shipped to farmers by type of plant and distance transported for the Corn Belt and South regions is presented in Table 16. The most noticeable difference between the two regions is the volume of grain shipped to farmers by feed mills and feed manufacturing plants. These types of plants in the Corn Belt

region shipped a total of 5.942 million bushels (4.3% of the region total) while the same plant types in the South region shipped 11.392 million bushels (31.6% of the region total).

The total bushels of grain received from farmers by type of plant and distance transported are shown in Table 17. Partial information at least was available for each region except the East. The data in this table should be read with some level of caution due to the inconsistency in the number of plants reported in each category. For example, a total of only 553 of 897 country elevators in the South region reported receipts of grain from farmers (Table 3). This helps to explain the relatively low percentage of grain receipts reported in the country elevator category for the South region.

The large majority of the grain received from farmers for the Corn Belt, Mid-Plains, and West regions was reported in the country elevator category. This agrees with the previous discussion of data from Table 10 in that a large percentage of the receipts at elevators is transported by farm trucks. Also, a relatively large percentage of grain reported for the South region is reported in the larger mileage blocks. This indicates that farmers in

TABLE 17.—Total Bushels of Grain Received from Farmers by Type of Plant, Region, and Distance Transported, 1977.

Region and Plant Type*	Total No. of Plants Receiving Grain	Total Grain Received	Grain Receipts by Mileage Block			
			0 - 25	26 - 50	51 - 100	> 100
000 bushels						
Corn Belt†						
Country Elevators	2,610	2,838,733	2,607,408	134,709	58,788	37,828
Terminals and Export	229	429,429	290,641	94,320	35,964	8,504
Feed Mills and Mfrs	1,171	171,782	168,978	3,915	3,625	1,264
Other	131	48,367	36,584	8,608	2,701	474
Total Region	4,141	3,494,311	3,103,611	241,552	101,078	48,070
Percent of Total	—	100	88.8	6.9	2.9	1.4
Mid-Plains‡						
Country Elevators	985	792,848	792,848	0	0	0
Total Region	985	792,848	792,848	0	0	0
Percent of Total	—	100	100	0	0	0
South**						
Country Elevators	553	196,591	163,395	28,661	3,285	1,250
Terminals and Export	168	889,433	165,467	550,048	162,346	21,572
Feed Mills and Mfrs	267	63,418	35,380	24,640	1,916	1,482
Other	62	45,640	16,304	13,836	9,973	5,527
Total Region	1,030	1,205,082	380,546	617,185	177,520	29,831
Percent of Total	—	100	31.6	51.2	14.7	2.5
West						
Country Elevators	5	2,170	2,133	37	0	0
Feed Mills and Mfrs	13	282	48	48	60	126
Other	4	11	11	0	0	0
Total Region	22	2,463	2,192	85	60	126
Percent of Total	—	100	89.0	3.5	2.4	5.1

*Data not available for the East region

†Data not available for Iowa

‡Includes data for Kansas only

§All data for Louisiana are included in the Terminals and Export classification. All data for Mississippi are included in the Country Elevators classification. Data not available for North Carolina

Source: NCSR Grain Survey, 1977

TABLE 18.—Total Bushels of Grain Shipped by Truck to Other Elevators by Type of Plant, Region, and Distance Transported, 1977.

Region and Plant Type*	No. of Plants Shipping Grain	Total Grain Shipped	Grain Shipped by Mileage Block			
			0 - 25	26 - 50	51 - 100	> 100
000 bushels						
Corn Belt†						
Country Elevators	2 302	1 734 103	519 586	333 464	518 447	362 606
Terminals and Export	180	182 854	53 511	44 762	28 093	56 488
Feed Mills and Mfrs	401	66 922	14 376	28 450	13 910	10 186
Other	70	19 619	3 507	1 568	12 841	1 703
Total Region	2 953	2 003 498	590 980	408 244	573 291	430 983
Percent of Total	—	100	29 5	20 4	28 6	21 5
South‡						
Country Elevators	382	478 438	67 298	79 871	278 010	53,259
Terminals and Export	88	63 890	25 628	12 233	11 195	14 723
Feed Mill and Mfrs	49	10 807	125	117	6 542	4,023
Other	12	5 227	2	3 417	362	1,446
Total Region	531	558 362	93 053	95 749	296 109	73,451
Percent of Total	—	100	16 7	17 1	53 0	13 2

*Data not available for the East Mid Plains, and West regions

†Data not available for Iowa

‡All data for Louisiana are included in the Terminals and Export classification All data for Mississippi are included in the Country Elevators classification Data not available for North Carolina

Source NCSR Grain Survey 1977

TABLE 19.—Total Bushels of Grain Received by Truck from Other Elevators by Type of Plant, Region, and Distance Transported, 1977.

Region and Plant Type*	No. of Plants Receiving Grain	Total Grain Shipped	Grain Receipts by Mileage Block			
			0-25	26-50	51-100	> 100
000 bushels						
Corn Belt†						
Country Elevators	268	67,436	32,749	25,728	7,210	1,749
Terminals and Export	139	1,409 446	363,748	380,399	404,463	260,836
Feed Mills and Mfrs	745	59,254	22,994	8,506	11,007	16,747
Other	46	33,114	12,843	13,043	5,535	1,693
Total Region	1,198	1,569,250	432,334	427,676	428,215	281,025
Percent of Total	—	100	27 6	27 3	27 3	17 9
South‡						
Country Elevators	97	17,068	2,867	8,712	2,797	2,682
Terminals and Export	120	125,700	26,358	30,414	26,074	42,854
Feed Mills and Mfrs	246	63,992	2,093	10,742	2,386	48,771
Other	78	110,420	13,030	18,439	33,363	45,588
Total Region	541	317,180	44,348	68,307	64,620	139,905
Percent of Total	—	100	14 0	21 5	20 4	44 1
West**						
Country Elevators	6	619	0	0	0	619
Terminals and Export	2	11,962	0	0	0	11,962
Feed Mills and Mfrs	50	175,252	618	394	4,053	170,187
Other	25	18,598	2,301	4,864	454	10,979
Total Region	83	206,431	2,919	5,258	4,507	193,747
Percent of Total	—	100	1 4	2 5	2 2	93 9

*Data not available for the East and Mid-Plains regions

†Data not available for Iowa

‡All data for Louisiana are included in the Terminals and Export classification Data not available for North Carolina

**Data not available for California or Idaho

Source NCSR Grain Survey, 1977

the South region generally ship their grain farther than farmers in the other three regions.

The bushels of grain shipped by truck to other elevators by type of plant and distance transported for the Corn Belt and South regions are reported in Table 18. In the South region, 53.0% of total shipments to other elevators are in the "51-100" mileage block. By comparing this and the other totals with the Corn Belt region, it can be seen that on the average the South region generally shipped the grain reported in this table a greater distance than the other region.

Table 19 indicates the bushels of grain received by truck from other elevators by type of plant and distance transported for the Corn Belt, South, and West regions. This table indicates that of the grain received by truck by plants in the West region from other elevators, 93.9% came from locations more than 100 miles away. This table also indicates that when plants in the South region received grain by truck from other elevators, it generally traveled a greater distance than the same type of shipments in the Corn Belt region.

CONCLUSIONS

This publication describes and compares the structure of the grain marketing industry of five selected regions in the United States. Two of these regions, the Corn Belt and the Mid-Plains, are grain surplus producing areas while the remaining three regions, South, East, and West, are grain deficit areas. The conclusions are discussed in terms of these broader distinctions of grain surplus producing areas and the grain deficit areas.

Nearly 96% of all terminal elevators, 85% of all country elevators, 73% of river elevators, 55% of soybean processing plants, and 54% of all corn processors are reportedly located in grain surplus producing regions. In contrast, 52% of the feed manufacturers and mills, 52% of all export elevators, and 60% of the flour mills are reportedly located in grain deficit regions. Elevators are primarily located in the grain surplus producing regions because they perform the assembly, transportation, storage, standardization, and distribution functions to transfer grain into deficit regions and to export points. Grain processing plants are located in the production areas or on transportation routes where the grain can be processed into meal, flour, or oil for shipment to final destinations. If data were available for all Mid-Plains and Corn Belt states, most flour mills would also be reported as located in the grain surplus producing regions rather than in the grain deficit areas. Export elevators are dispersed throughout grain surplus and deficit regions, reflecting the exit ports on the Atlantic and Pacific Oceans and Great Lakes. The feed manufacturers and feed mills are quite evenly dispersed throughout all regions, reflecting the location of livestock.

Most grain is stored in elevators in the regions in which it is produced. Most of the elevator storage capacity is used to store elevator-owned grain in grain deficit areas, while farmer-owned grain fills more than one-half of the elevator storage space in grain surplus re-

gions. Therefore, both elevators and farmers perform part of the storage function in grain surplus regions. Since farmers in grain deficit regions typically do not have storage facilities, most of the storage function is performed by grain elevators.

Plants in the grain surplus producing regions have larger storage capacities per plant than plants in the grain deficit regions. These large capacities have developed to store the large supply of surplus grain and to take advantage of unit train transportation rates. This storage near the origins regularizes the flow of grain from grain surplus areas to grain deficit areas. Many firms in the grain deficit regions do not have large storage facilities and cannot take advantage of unit train rates. An exception to this conclusion, however, is the export elevators which have large storage capacities and take advantage of unit train rates.

The use of unit train and multiple car rates for shipments to grain deficit regions may further be constrained by their limited grain receiving capacity. These relatively slow receiving capacities can possibly be a cause of or lead to increased turnaround times for transportation equipment between surplus production regions and deficit areas. A longer turnaround time often results in expensive demurrage charges and does not allow for the most efficient use of the transportation vehicles.

The grain plants reported drying nearly 25% of all grain. Therefore, both grain plants and farmers performed the drying function. Country elevators, the first link in the grain handling system, dried most of the grain. Most plants used natural or LP gas to dry grain. The exception was the West where most plants used electricity.

The average loadout capacity in grain surplus regions such as the Mid-Plains and the Corn Belt is greater than the average receiving capacity of grain deficit areas such as the South. Further, it may limit unit train and large multi-car shipments from grain surplus regions to the deficit regions. This could lead to more expensive transportation costs for grain shipments.

Plants in the South, Mid-Plains, and Corn Belt received the largest volume of all grain by truck. The truck share was highest in the grain surplus producing regions, 94% in the Corn Belt and 80% in the Mid-Plains. In the grain-deficit South, 66% of grain receipts were by truck, 28% by rail, and 6% by water.

Any policies or actions by public or private decision makers which impact the number or type of grain elevator plants (other than export elevators) or processors will have the most effect on the structure of the grain industry in the grain surplus producing regions. Policies which affect the number and type of export elevators and feed manufacturers and mills will have similar effects on the structure of the industry in all regions. Changes in storage policies will also have the most effect on the volume of storage capacity, the ownership of stored grain and the number of plants in grain surplus producing regions where the most grain is stored. Policies which alter the price of fuels will have a major im-

pact on the grain drying function. Choosing a present or a future source of energy for drying grain will become an increasingly important decision if the cost of natural gas changes relative to the cost of alternative fuels. Investments in drying equipment will be extremely risky if inconsistent energy policies prevail.

Public or private policies which would enhance storage capacities in the grain deficit areas may reduce costs if unit train and large multiple car rates could be used to move grain into the grain deficit regions. Additional investments would also be required to enhance grain receiving capacities. Before such investments are made, additional research would be required to examine the

APPENDIX A

Definitions of Terms in 1977 NCSR Grain Survey

Firm Types

Country Elevator: A plant which primarily collects and merchandises raw grain. Classification as a country elevator requires that more than 50% of the facility's raw grain receipts come directly from farms, and more than 50% of raw grain receipts move out of the facility as raw grain. The definition is not affected by the destination of grain or whether some manufacturing of feed or ingredients takes place at the facility.

Terminal Elevator: A plant which primarily collects and merchandises raw grain. Classification as a terminal elevator requires that more than 50% of the facility's raw grain receipts originate from other grain facilities (as opposed to farms), and more than 50% of raw grain receipts move out of the facility as raw grain. Grain shipments must move to multiple destinations.

River Elevator: A plant which primarily collects and merchandises raw grain received from other grain facilities and farmers, and ships grain by river barge to domestic demand centers and export points. Classification as a river elevator requires the facility to ship by barge more than 50% of total grain receipts.

Export Elevator: A plant which primarily collects and merchandises raw grain received from other grain facilities and farmers and ships grain to foreign countries via ocean vessels. Classification as an export elevator requires the facility to export more than 50% of total grain receipts.

Feed Manufacturer: A plant where the primary activity includes manufacturing a brand name of feed. To be classified as a feed manufacturing plant, more than 50% of its revenue must come from the sale of feed products.

Feed Mill: A plant where the primary activity is grinding grain into feed for farmers and the major economic activity is not the manufacturing of a brand name of feed. More than 50% of its revenue must come from grinding and the sale of mixed feeds.

Flour Mill: A plant where the primary activity is the milling of wheat into wheat flour(s) and at least 50% of

impact on cost for the deficit regions and for the total marketing system.

REFERENCES

1. Bain, Joe S. 1959. Industrial Organization. University of California at Berkeley; John Wiley and Sons, Inc.
2. Caves, Richard E. 1977. American Industry: Structure, Conduct, Performance. Prentice-Hall, Inc., Fourth Edition.
3. Grain Stocks. U.S. Dept. of Agriculture, Crop Reporting Board, Economics, Statistics and Cooperative Service, Washington, D.C., Jan. 25, 1978.

the wheat received is milled into flour. The firm may also do blending of imported flour(s) but these cannot exceed the volume of wheat milled by the firm. This plant must earn at least 50% of its revenue from the sale of products produced from wheat.

Corn Processor: A firm where the primary activity is the processing of shelled corn into a group of diversified products such as starch, dextrin, corn syrup, corn oil, corn meal, corn flour, or grits. A firm may process either yellow corn, white corn, or both. Classification as a corn mill requires that more than 50% of corn receipts are processed.

Soybean Processor: A plant where the primary activity is extracting oil and processing meal from soybeans as joint products of the operation. To be classified as a soybean processor, the plant must receive more than 50% of its revenue from processed products of soybeans.

Integrated Livestock Firm: A firm which could otherwise be classified as a feed manufacturer or feed mill, but the operation of which involves the raising of broilers, eggs, other poultry, or other livestock as part of a total operation, and more than 50% of its revenue comes from the sale of poultry or livestock products. In order to be classified under this category, such a firm must receive at least some raw grain as part of the total operation.

Others: Those firms not fitting any of the above classifications but receiving raw grains as part of their operation. These plants tend to be small firms which are located relatively close to urban centers.

Transportation Rate Categories

Single car rates apply to the movement of a single carload of grain moving as a unit between two points.

Multiple car rates apply to several carloads moving as a unit between two points. Examples include multiples of 3, 5, 10, or 25 carloads where a rate is quoted for the multiple car units.

Unit train or train load rates are applicable on grain movements between two points operating as a single unit of 50-100 covered hopper cars. A train which consists of 50-100 cars of grain with each car moving under a single car rate is not included in this category.



The Ohio State University

Ohio Agricultural Research and Development Center