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Staff Papers Series

Staff Paper P91-35

September 1991

STRUCTURAL CHANGES IN THE UNITED STATES GRAIN MARKETING SYSTEM

by

Reynold P. Dahl



Department of Agricultural and Applied Economics

University of Minnesota
Institute of Agriculture, Forestry and Home Economics
St. Paul, Minnesota 55108

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Reynold P. Dahl*

* Reynold P. Dahl is Professor, Department of Agricultural and Applied Economics, University of Minnesota, St. Paul.

Staff Papers are published without formal review within the Department of Agricultural and Applied Economics.

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STRUCTURAL CHANGES IN THE UNITED STATES GRAIN MARKETING SYSTEM

Reynold P. Dahl*

INTRODUCTION

The U.S. grain marketing system is the vehicle through which huge quantities of grain valued at billions of dollars are moved each year from American farms to consumers in this country as well as in foreign lands. Grains and oilseeds form the base of the American food system. The U.S. is also the largest grain exporting country in the world. In 1990, exports of grains, oilseeds and products totalled \$18.3 billion, 46 percent of total U.S. agricultural exports.

Coordination of these large shipments, delivering the correct types and grades of grain when and where they are needed is not an easy task. Yet it is accomplished with a decentralized free-market system in a remarkably efficient manner. The U.S. grain marketing system is a private enterprise system where individual firms own the facilities and reap the rewards as well as the consequences of their own decisions.

Structural changes in the U.S. grain marketing system have been more extensive and far-reaching in recent years than in any time in history. The 1980's can best be characterized as a period of consolidation and increased concentration in grain marketing. To understand the economics of these changes one has to look at the stimulus to investment in marketing infrastructure resulting from the grain export boom of the 1970's.

The 1970's will go down in history as the golden decade for American agriculture and its grain marketing system. After more than 25 years when surplus stocks and government price support operations dominated grain markets and marketing, the 1972-73 marketing year ushered in a new era. U.S. grain exports more than tripled in the 1970's reaching an all-time record of nearly 5.0 billion bushels in 1980 (Figure 1). The U.S. grain marketing system

*Reynold P. Dahl is professor, Department of Agricultural and Applied Economics, University of Minnesota.

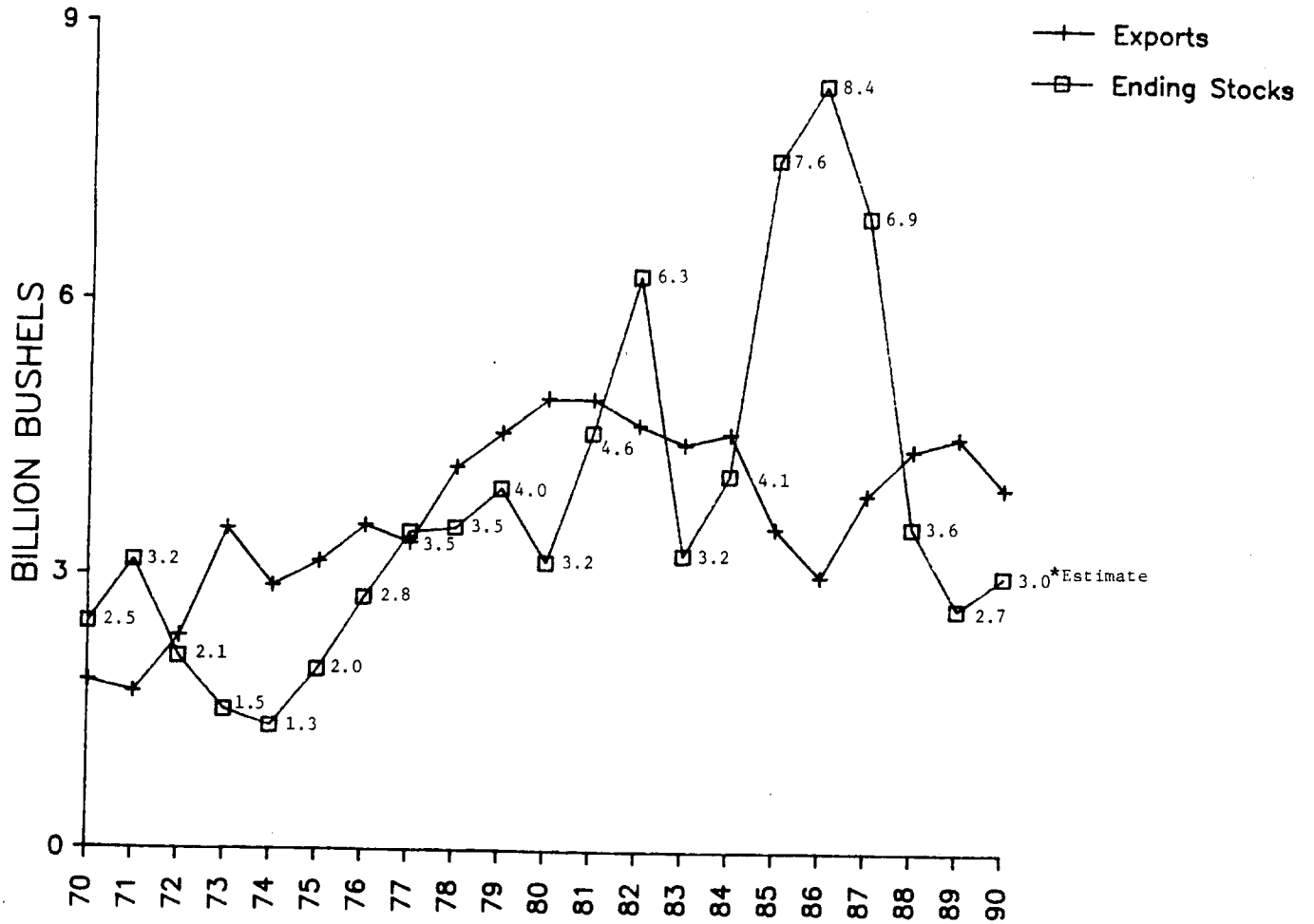


FIGURE 1: U.S. GRAIN EXPORTS and ENDING STOCKS

deserves considerable credit for accommodating this big increase in volume with a minimum of disruptions. But, marketing margins increased as the demand for marketing infrastructure exceeded the available supply. A euphoria prevailed in the industry as a continued rapid growth potential was perceived. This stimulated investments in rail cars, barges, storage, and port facilities much of which did not come on line until the 1980's when grain exports began an extended period of decline.

U.S. grain exports declined to 3.0 billion bushels in 1986 from their record high of 5.0 billion bushels in 1980. Competition for the reduced volume drove marketing margins down. The new investments in rail cars, unit-train grain loading, barges, and port elevators resulted in a surplus of such marketing infrastructure that became burdensome. U.S. grain exports increased to 4.5 billion bushels in 1989, but declined to 4.0 billion bushels in 1990, a level almost 1 billion below the 1980 record. The industry continues to be plagued by excess capacity and the associated narrow marketing margins. These have induced structural adjustments in the system that were extensive in the 1980's and continue in the present decade. The purpose of this paper is to describe and analyze these structural changes along with performance implications.

U.S. LARGEST MULTIPLE FACILITY GRAIN FIRMS

The 10 largest U.S. grain companies operated 857 grain facilities with aggregate storage capacity of 1.579 billion bushels as listed in the 1991 Grain Guide (Table 1). The facilities included 43 port, 130 river, 141 terminal, 122 sub-terminal, and 421 country elevators. The distinction between the latter two facilities is often difficult and numbers can vary with interpretation. Cargill, Inc., for example, the nation's largest grain company, lists 179 country elevators and only three sub-terminals. Some of their country elevators would undoubtedly be classified as sub-terminals if the latter is defined as an elevator located in the grain producing area that receives grain from other elevators, and sometimes directly from farmers, and has the capability of loading and shipping the grain in unit trains. Such elevators have increased in both numbers and importance in response to special

Table 1. U.S. Largest Multiple Facility Grain Companies According to Grain Storage Facilities and Capacity 1990*

Company	Number of Grain Storage Facilities					Total Number	Total Licensed Capacity (million bu.)
	Port	River	Terminal Elevators	Sub-Terminal Elevators	Country Elevators		
(Ten Largest)							
1. Cargill, Inc. (total)	15	24	24	3	179	245	370.6
Cargill, Inc. (Grain Div.)	(15)	(23)	(15)	--	(179)	(232)	(340.0)
Cargill, Inc. (Flour Mill Div.)	--	(1)	(9)	(3)	--	(13)	(30.6)
2. Con Agra, Inc. (total)	6	15	18	32	54	125	216.3
Peavey Co. (Subsidiary)	(6)	(12)	(10)	(11)	(54)	(93)	(176.3)
Con Agra, Inc. (Grain Processing)	--	(3)	(8)	(21)	--	(32)	(40.0)
3. Archer Daniels Midland Co. (total)	2	15	43	27	55	142	185.4
ADM Grain Co.	--	--	--	(3)	--	(3)	(20.0)
ADM/Growmark	(2)	(14)	--	--	--	(16)	(16.0)
ADM Milling Co.	--	--	(32)	--	--	(32)**	(39.5)
Collingwood Grain, Inc. (Subsidiary)	--	--	(4)	--	(26)	(30)	(47.0)
Smoot Grain Co. (Subsidiary)	--	--	(7)	--	(29)	(36)	(26.2)
Tabor Grain Co. (Subsidiary)	--	(1)	--	(24)	--	(25)	(36.7)
4. Continental Grain Co.	10	25	14	15	9	73	181.2
5. Union Equity Cooperative Exchange	2	1	14	--	--	17	166.5
6. Bunge Corp.	3	35	8	12	--	58***	163.6***
7. Riceland Foods, Inc.	--	2	3	30	--	35	95.7
8. Scoular Grain Co.	--	--	10	2	21	33	80.6
9. Harvest States Cooperatives	2	4	2	--	100	108	64.2
10. Louis Dreyfus Corp.	3	9	5	1	3	21	55.0
Ten Largest Total	43	130	141	122	421	857	1,579.1
(Second Ten Largest)							
11. Central Soya (Division of Gruppo Ferruzzi)	--	2	6	1	--	9	54.5
12. The Anderson's	1	--	4	2	1	8	54.0
13. Twomey Co.	--	--	--	--	6	6	49.0
14. Mid-States Terminals, Inc. (Subsidiary of Countrymark, Inc.)	2	1	12	--	--	15	46.2
15. General Mills, Inc.	1	1	10	1	28	41	41.3
16. Garvey International, Inc. (Subsidiary of Garvey Industries)	--	1	1	2	7	11	38.3
17. Merchants Grain, Inc.	--	3	2	3	9	17	36.4
18. Consolidated Grain & Barge Co.	--	16	--	--	24	40	35.5
19. Garvey Elevators, Inc.	--	--	4	--	35	39	35.0
20. Perryton Equity Exchange	--	--	8	2	27	37	34.0
Second Ten Largest Total	4	24	47	11	137	223	424.2
20 Largest Total	47	154	188	133	558	1,080	2,003.3

* Source: 1991 Grain Guide, Sosland Publishing Co., Kansas City, MO.

** Excludes three rice mills.

*** Does not include country elevator or assets of Green River Grain Corporation.

unit train rates offered by the railroads. This trend will likely continue as more grain moves directly from country gathering points to ports or to domestic processors without moving through terminal markets.

The data in the detail as shown in Table 1 are not available for previous years. The first and second ten largest grain elevator companies in 1981 are shown in Table 2, but country elevators are excluded. Only data for sub-terminal, terminal, river, and port elevators are included in the number of elevators and storage capacity. Nevertheless, one can compare Tables 1 and 2, and note that many changes have occurred.

Cargill was the largest U.S. grain company in 1990 as it was in 1981. Its lead has been challenged in recent years, by Con Agra, Inc. and the Archer Daniels Midland Co. which now rank second and third, respectively. These companies expanded rapidly in the 1980's, in large part through acquisitions. In 1990, the Continental Grain Company ranked as the fourth largest U.S. grain company. But, not included in Table 1 are the grain facilities of a new joint venture that Continental formed with Ceroilfood (N.Y.), the U.S. subsidiary of National Cereals, Oils, and Foodstuffs Corp., a state-owned independent agency in China. This new joint venture called Continental-COF Co., will manage 14 elevators that it acquired from Elders Grain Inc. and 22 elevators that previously were operated through the Southwest region of Continental Grain, which is the majority owner of the new venture and managing partner. Elders Grain, Inc., an Australian-owned company formed in 1985, divested its grain business only five years later. (Ceroilfood, Continental Grain in Joint Venture).

Union Equity Cooperative Exchange, a regional grain marketing cooperative headquartered in Enid, Oklahoma, and the nation's fifth largest multi-facility grain company in 1990, announced plans on February 25, 1991 to transfer a large portion of its assets to Harvest States Cooperatives. (Harvest States to Build Marketing Strength with Union Equity.) However, these merger talks were subsequently broken off. Union Equity reported operating difficulties in 1989 that were attributed by management to increased competition and reduced revenue from grain marketing and storage. It also announced the closing and plans for the sale of seven of its elevators that were not included in the proposed transfer to Harvest States Cooperatives. The latter firm ranked as the ninth largest grain firm in 1990 while Riceland

Table 2. U.S. Largest Grain Elevator Companies, 1981.

Company	Number of Elevators ^{1/}	Total Storage Capacity (million bu.)
(Ten Largest)		
1. Cargill, Inc.	21	148.0
2. Far-Mar-Co., Inc.	17	122.1
3. Continental Grain Co.	39	110.3
4. Union Equity Co-op Exchange	3	67.0
5. The Pillsbury Co.	44	54.3
6. Central Soya Co.	9	51.3
7. Bunge Corp.	51	47.0
8. The Andersons	7	43.0
9. Lincoln Grain, Inc.	3	39.3
10. Indiana Grain Division (Indian Farm Bureau Co-op Assn.)	12 —	38.7 —
Total	206	721.0
(Second Ten Largest)		
11. Producers Grain Corp.	6	37.9
12. C-G-F Grain Co., Inc.	1	32.0
13. Farmers Union GTA	7	30.0
14. Riceland Foods, Inc.	2	27.3
15. General Mills, Inc.	12	27.2
16. Con Agra, Inc.	16	26.5
17. Louis F. Dreyfus Corp.	9	25.5
18. Garvey Elevators, Inc.	5	24.8
19. Bartlett and Co. Grain	5	20.3
20. Agri-Industries, Inc.	8	20.2
Total	71	271.7
Total Twenty Largest	277	992.7

^{1/} Sub-Terminal, Terminal, River, and Port Elevators.

Source: "Grain Elevator Storage Capacity Grows," Milling and Baking News, Sosland Publishing Co., Kansas City, MO, Oct. 13, 1981.

Foods, Inc., another cooperative, ranked seventh. Some of the most extensive structural changes in the grain trade have occurred in farmer-owned cooperatives.

STRUCTURAL CHANGES IN GRAIN MARKETING COOPERATIVES

The Agricultural Cooperative Service (ACS) of the U.S. Department of Agriculture reported a total of 16 regional grain marketing cooperatives and three interregionals in the U.S. in 1981 with a total grain handle of three billion bushels (Thurston and Cummins). This was their zenith year that also marked the beginning of a decade in which a downsizing of these farmer-owned cooperatives would occur (Dahl).

One interregional grain marketing cooperative (The Farmers Export Company), a federation of regional grain marketing cooperatives organized to market farmers' grain for export, was liquidated in 1985 through the sale of its remaining assets to the Archer Daniels Midland Company (ADM). An interregional river barge transportation cooperative (Agri-Trans Corporation) was also re-structured in 1986 when it entered into a joint venture with the American River Transportation Company (ARTCO), a subsidiary of ADM, which is the managing partner of the new joint venture.

Two regional grain marketing cooperatives, the Producers Grain Corporation of Amarillo, Texas, and Far-Mar-Co., of Hutchinson, Kansas, closed their grain marketing operations in the 1980's. Earlier, Far-Mar-Co. had merged with Farmland Industries of Kansas City, becoming a subsidiary of this regional farm supply cooperative. A sizeable share of Far-Mar-Co.'s grain marketing assets were sold to the Union Equity Co-op Exchange of Enid, Oklahoma.

Two well-known regional cooperatives in the cornbelt, GROWMARK, of Bloomington, Illinois and AGRI Industries of Des Moines, Iowa, transferred their grain marketing operations to joint ventures with major multi-national corporations. GROWMARK transferred ownership of its seven river terminals to a new ADM subsidiary called ADM/GROWMARK in exchange for ADM common stock (GROWMARK and ADM Announce Plans for Joint Venture).

AGRI Industries also formed a joint venture with Cargill, Inc. called AGRI Grain Marketing. With the integration of AGRI's grain merchandising and related functions into the new joint venture, AGRI Industries became a holding company "functioning as a cooperative enterprise in supporting member services and other cooperative programs" (Coonrod).

Two mergers of regional grain marketing cooperatives also occurred during the 1980's. The Grain Terminal Association, St. Paul, MN, and North Pacific Grain Growers, Inc., Portland, OR, merged to form Harvest States Cooperatives on June 1, 1983. The new cooperative, headquartered in St. Paul, MN, became the nation's largest grain marketing cooperative. Harvest States has grain export facilities on the Great Lakes at Duluth Superior and the Pacific Northwest at Kalama, WA. It serves farmers in the Upper Midwest, Pacific Northwest, and adjoining areas.

Ohio Farmers Grain and Supply Association merged with Landmark, Inc. to become Countrymark, Inc. in 1985. Countrymark then purchased the assets of Agra Land, the cooperative that emerged in 1983 from the Chapter 11 bankruptcy of Michigan Farm Bureau Services. Mid-States Terminals, Inc. (the 14th largest multiple facility grain firm in the U.S.) then became a wholly owned grain subsidiary of Countrymark, Inc. (Benschneider).

Effective September 1, 1991, Countrymark, Inc. and the Indiana Farm Bureau Cooperative Association (IFBCA) merged. Countrymark and IFBCA are federated agricultural supply and grain marketing cooperatives serving farmers in Ohio, Michigan, and Indiana. The merger combines significant grain marketing resources including three Ohio River elevators, three Great Lakes terminals, and an East coast export elevator at Baltimore, MD. It also has 22 terminal elevators (Duffey).

Finally, the recent proposal to transfer a sizeable portion of the assets of the Union Equity Cooperative Exchange to Harvest States Cooperatives indicates that structural adjustments in regional grain marketing cooperatives have not been completed (Boards Endorse Proposal). As discussed previously, this proposal in its current form has been rejected. Union Equity has also announced that other of its grain facilities have been closed and are for sale.

The cooperative grain marketing system in 1990 is vastly different from that of a decade earlier when U.S. grain exports peaked. The downsizing of

interregional and regional grain marketing cooperatives during the decade was necessitated by heavy investment in grain marketing infrastructure during the grain export boom. Increased competition and reduced marketing margins on the smaller volume of grain exports in the 1980's resulted in reduced revenue and operating difficulties that necessitated structural adjustments.

CHANGES IN U.S. GRAIN EXPORT MARKET STRUCTURE

A major study by Conklin published by the U.S. General Accounting Office in 1982 categorized the market structure of the U.S. grain export system into four groups: (1) major multinational corporations, other than Japanese, (2) Japanese-owned or affiliated firms, (3) farmer-owned cooperatives, and (4) all other exporting firms. Table 3 shows these four groups ranked by market share in 1980-81 and their increase or decrease in market share since 1974-75 (GAO/CED-82-61).

Major multinational corporations are large firms which operate globally and handle much of the grain that is bought and sold in the world today. The five largest multinationals in 1980-81 were recognized as being Cargill, Inc.; Continental Grain Company; Bunge Corp.; Louis Dreyfus Corp.; and Garnac Grain Co., Inc. The first four of the above are also among the top 10 multiple facility grain companies in the U.S. in 1990 (Table 1).

Japanese firms are likewise multinational in nature and some are large ones. Trading firms such as Marubeni, Mitsui, Mitsubishi, and C-Itoh play an important role in exporting U.S. grain to Japan and other countries. Some of these firms have also acquired U.S. facilities including country elevators, sub-terminals, terminals, and port elevators. Japanese-owned firms increased their market share of U.S. grain exports from 1974-75 to 1980-81, largely at the expense of the five largest multinationals (Table 3). Farmer-owned cooperatives also increased their market share during this period.

Data on changes in U.S. grain export market shares during the decade of the 1980's are not available. However, they would probably show that the share of U.S. grain exports handled by farmer-owned cooperatives has declined. The share of total grain export elevator storage capacity controlled by cooperatives declined from 21 percent in 1981 to 15 percent in 1989 (Table 4).

Table 3. Change in Market Share of U.S. Grain Exports by Exporter Group
1974-75 to 1980-81.

Exporter Group (Ranked by Market Share)	1980-81 Market Share Minus 1974-75 Market Share (percent)
5 Largest Multinationals (excluding Japanese firms)	-5.3
Japanese-Owned or -Affiliated Firms	+4.7
Other Firms	-.5
Farmer-Owned Cooperatives	+1.1

Source: GAO Staff Study, "Market Structure and Price Efficiency of U.S. Grain Export System," GAO/CED-82-61.

Table 4. Percentage of Total Export Elevator Capacity Controlled by
Exporter Group, 1981 and 1989.

Exporter Group	1981 ¹	1989 ²
5 Major Multinationals ³	50.3	46.0
Farmer-owned Cooperatives	21.4	15.3
Others ⁴	<u>28.3</u>	<u>38.7</u>
Total	100.0	100.0

¹ Neilson C. Conklin and Reynold P. Dahl "Organization and Pricing Efficiency of the U.S. Grain Export System." Minnesota Agricultural Economist, Agric. Ext. Service, University of Minnesota, No. 635 May 1982, p.3.

² Export Elevator Directory, U.S. Dept. of Agric., Federal Grain Inspection Service, January 1989.

³ Includes Cargill, Continental, Bunge, Dreyfus, and Garnac.

⁴ Includes public elevators and elevators operated by port authorities.

Also, most of this capacity is now located in the Great Lakes, the ports through which the smallest amount of U.S. grain exports flow. Cooperatives no longer control export space at the Mississippi Gulf through which the largest share of grain exports leave the U.S.

The share of port storage capacity held by the five major multinational grain exporting firms also declined from 50 percent to 46 percent during the same period. On the other hand, the share of port capacity held by "other" firms increased from 28 to 39 percent. Two of the largest grain exporting firms in the "other" category include the Archer Daniels Midland Company and Con Agra, Inc. Both have expanded their grain operations in recent years. They would probably be classified as major multinational grain exporters in 1991.

The GAO study of 1982 concluded that the changing market structure of the U.S. grain export industry in the 1970's was inconsistent with the static make-up one would find in a monopolized industry. New firms, both large and small, have entered the industry, and others have exited, according to the study. The composition and market shares of firms in the industry have also changed significantly during this period, and these structural changes indicated competitive forces at work in the U.S. grain export system.

The above conclusions would likely apply to the U.S. grain export system today as they did a decade ago. In fact, excess capacity in the system today has squeezed marketing margins and intensified competition. The surplus in grain exporting capacity has been estimated at close to 50 percent (Facing Up to Terrible Dilemma in Grain Trade). Grain exports in 1990 stood at one billion bushels below their record level a decade earlier, and prospects are not bright for significant growth in 1991. In addition, more of our grain exports today are dependent upon favorable credit terms or subsidies provided by the U.S. government.

GRAIN STORAGE CAPACITY INCREASES

The first national survey of grain storage facilities in the U.S. was made in 1978. It showed aggregate farm and off-farm storage capacity at nearly 17 billion bushels made up of 10 billion bushels of storage on-farm (59

percent of the total) and 7 billion in off-farm facilities (41 percent of the total). This was equivalent to a full year and one-half of grain production in the U.S. which was about 12 billion bushels per year in 1978 (Table 5).

As grain exports declined in the 1980's, stocks accumulated despite sizeable acreage idled under federal farm programs. Grain stocks reached an all-time high of 8.4 billion bushels at the end of the 1986/87 marketing year (Figure 1). Most of these stocks were stored under government programs such as the farmer-owned reserve, regular price support loan, and CCC ownership.

Table 5. Grain Storage Capacity in the U.S., On-Farm and Off-Farm, by State, April 1, 1978 and December 1, 1990.

State	On-Farm	Off-Farm	Total	On-Farm	Off-Farm	Total
	(commercial)			(commercial)		
	April 1, 1978			December 1, 1990		
	(millions bu.)			(millions bu.)		
Iowa	1,492	635	2,127	1,900	1,011	2,911
Illinois	1,154	787	1,941	1,150	1,212	2,362
Minnesota	1,192	368	1,560	1,400	564	1,964
Nebraska	833	488	1,321	1,120	802	1,922
Kansas	370	831	1,201	440	892	1,332
Texas	264	838	1,102	220	924	1,144
North Dakota	691	142	833	860	230	1,090
Indiana	507	283	790	690	387	1,077
Wisconsin	437	130	567	500	180	680
Missouri	347	210	557	400	287	687
Others	<u>2,637</u>	<u>2,275</u>	<u>4,912</u>	<u>3,720</u>	<u>2,616</u>	<u>6,336</u>
Total	9,924	6,987	16,911	12,400	9,105	21,505

Source: Grain Stocks, National Agricultural Statistics Service, USDA, January 1991.

Grain storage capacity increased in response to the stock build-up reaching a record 22.9 billion bushels on December 1, 1988, an increase of 36 percent from 10 years earlier. The total of on-farm storage capacity of 13.3 billion bushels (58 percent of the total) and off-farm capacity of 9.6 billion bushels (42 percent of the total) reached about two years of U.S. grain production.

The reality, surprising as it might be, that nearly six out of ten bushels of U.S. grain storage capacity represents farm storage, reflects the steady expansion of these facilities in recent years under farm program incentives. Farmers found it advantageous to have farm storage to participate in the regular nine-month farm price support program. The farmer-owned reserve, a three-year loan program provided by Congress in the 1979 Farm Bill, also provided a big boost to new farm storage. Finally, having their own storage gives farmers more flexibility, in grain marketing.

Total grain storage capacity, both on-farm and off-farm, declined in 1989 and 1990. This was in response to the record decline in U.S. grain stocks as a result of the drought of 1988. Ending U.S. grain stocks declined from their record level of 8.4 billion bushels in 1986/87 to 3.0 billion bushels in 1990/91 (Figure 1). Total U.S. grain storage capacity was 21.5 billion bushels on December 1, 1990, down about 1.5 billion bushels from the record level of 1988.

Eight states now have over one billion bushels in total grain storage capacity. Iowa ranks first in grain storage capacity with 2.911 billion bushels followed by Illinois, 2.362 billion; Minnesota, 1.964 billion; Nebraska, 1.922 billion; Kansas, 1.332 billion; Texas, 1.144 billion; North Dakota, 1.090 billion; and Indiana, 1.077 billion (Table 5).

As grain stocks accumulated in the 1980's under federal farm programs, the grain trade derived more income from storage and handling grain for the government. The income from such operations offset, in part at least, declines in income associated with reduced grain exports and marketing margins. But, the precipitous drop in grain stocks as a result of the 1988 drought resulted in excess grain storage capacity and reduced storage income for the grain marketing system.

TRANSPORTATION ECONOMICS INDUCE STRUCTURAL CHANGE

Structural change in the U.S. grain marketing system has also been induced by the changing economics of grain transportation. Transportation cost is the largest single component of grain marketing costs because grain has a high bulk relative to its value. Hence, grain marketing firms must be alert to available opportunities to minimize transportation cost if they are to remain competitive. Changes in transportation costs as impacted by intermodal competition and railroad de-regulation over the past two decades have been important factors inducing structural change in the grain marketing system at both the country and terminal market levels.

Unit Train Rates Change Structure of Country Elevators

The grain marketing system begins at the local level with the country elevator. Country elevators have traditionally performed three important economic functions 1) grain assembly, 2) grain storage, and 3) merchandising of farm supplies and services.

Country elevators were first organized to perform the grain assembly function. They bought grain from surrounding farms and assembled it in quantities large enough to ship to terminal markets in single rail cars. Railroads remained the dominant mode of grain transportation until trucks came into heavy usage after World War II when a series of rail rate increases and the development of the interstate highway system made trucks highly competitive, particularly on short hauls. Country elevators began shipping large quantities of grain to terminal markets, particularly to river terminals, by truck. Grain transport by river barge also came into heavy usage at this time. Truck and barge transportation of grain dove-tailed well together. Both took sizeable volumes of grain business away from the railroads.

The railroads responded to increased truck-barge competition by offering special multi-car (unit train) rates on shipments of 25, 50, 75 or more cars. Unit train rates spread rapidly as railroads were given more flexibility in rate-making under de-regulation. Unit train rates were considerably lower than single car rates and provided a powerful incentive for country elevators

to modernize their load-out facilities to take advantage of these lower rates. Unit train rail rates also stimulated the investment in new sub-terminal elevators in the country specifically designed to receive grain from other elevators, and sometimes directly from farmers, and ship it out in unit trains. Unit train shipping country elevators and new sub-terminal, elevators spread rapidly in the 1970's. Investments were facilitated by record earnings from grain merchandising during this period providing equity capital for improvements.

A North Dakota study reported that by 1984 there were 544 unit train rail loading facilities, over half of which were farmer-owned cooperatives, in the four state area of Iowa, Minnesota, Nebraska, and North Dakota. This represented considerable excess grain loading capacity in all of these states, particularly in Iowa, that had 5.83 bushels of unit train loading capacity for every bushel of grain shipped out of the state by rail or truck (Cobia, Wilson, Gunn, and Coon).

Excess capacity in unit train shipping facilities at the country end of the marketing system squeezed grain merchandising margins. A study by Ginder concluded that 20 percent of the local grain marketing cooperatives in the Eighth Farm Credit District were in a financially stressed condition in late 1984. He cautioned that if these firms are forced to liquidate asset markets for grain origination would be depressed.

Reduced income from grain merchandising associated with excess capacity and reduced grain exports in the 1980's was mitigated to some extent by increased storage income as carryover stocks accumulated under government programs. However, the precipitous drop in grain stocks as a result of the 1988 drought has resulted in reduced storage income. Excess capacity in both grain storage and merchandising continues to be a problem at the country end of the marketing system. The number of grain marketing cooperatives in the U.S. declined from 2,475 in 1978 to 2,050 in 1988 (Richardson, et. al.). A continuation of this trend can be expected in the 1990's.

Cash Trade at Grain Exchanges and Terminals Declines

Grain exchanges in terminal markets such as Chicago, Kansas City, and Minneapolis have played an important role in the development of an efficient

grain marketing system in the United States. They brought together buyers and sellers for grain trading in a central marketplace. Open and competitive trading improved price discovery mechanisms and market information. This increased competition and broadened the market for the farmers' grain. Futures trading evolved out of cash grain trading at grain exchanges and its importance has increased over the years.

Grain commission merchants played a central role in the marketing of cash grain at grain exchanges for many years. Country elevators would consign single rail cars of grain with a sample to a commission firm that would display the sample on the trading floor and sell the grain at the highest possible price to a terminal elevator operator, processor, exporter, or other buyer. Commission firms also performed a variety of other services to the country elevator such as financing, hedging, and handling details of transportation in return for their fee. But, buying and selling grain on a sample basis by commission firms has largely been replaced by forward "to arrive" cash contracts between country elevators and grain merchants where price, grade, premiums and discounts for quality, are agreed to in the contract. The consignment method of marketing grain at grain exchanges has virtually disappeared except in a few grains such as malting barley and durum wheat where the grades are only partial indicators of grain quality. Grain commission firms have declined in number. Survivors have changed their operations to become grain merchants assuming title to the grain they handle. As the marketing of cash grain by sample diminished, cash grain trade at smaller exchanges such as Duluth, St. Louis, Omaha, and Toledo declined even more sharply than at the primary futures exchanges at Chicago, Kansas City, and Minneapolis.

Today most cash grain is traded by telephone. Merchants and processors telephone bid prices each day to country elevators, usually for forward delivery. Forward selling enables country elevator to fix the price as they purchase grain from farmers and have time to schedule load-out and shipping without assuming a price risk.

Changes in transportation technology and costs accelerated the decline of cash grain trade at grain exchanges in terminal markets following World War II. First, the increased volume of grain shipped by truck by-passed terminal rail markets and was not traded at grain exchanges whatsoever. Grain was

trucked directly to processors or to river terminals for shipment on interior waterways. Second, new multi-car rates offered by the railroads to compete with increased truck-barge competition were point-to-point rates that did not include the transit privilege. Transit was an integral part of the railroad rate structure under which grain could be stopped at intermediate points between origin and final destination for inspection, storage, or processing without additional charge. The thru rate applied under transit billing. As more multi-car rates were offered by the railroads, the transit privilege was eroded and virtually eliminated. The demise of the transit privilege and deregulation of the railroads as authorized by the Staggers Act of 1980 sharply reduced the flow of grain from country points to grain exchanges in terminal markets for resale.

Decentralization of Cash Grain Trade

Most grain now moves directly from gathering points in the country to domestic users such as flour mills or to export elevators without moving through a terminal market such as Minneapolis, Kansas City, or Chicago for resale. Grain merchants are still located at grain exchanges in these markets, but trading in individual cars, or unit trains, is most likely to occur near origin points in the country rather than by sample on the grain exchange floor (Changing Face of Breadstuffs).

In addition to diminishing the role of grain exchanges in the marketing of cash grain, railroad deregulation has diminished the role of terminal elevators at these markets, particularly, terminal elevators built many years ago to handle rail grain. Many of these elevators are now obsolete for grain merchandising and are suitable only for long-term storage, primarily of government-owned grain.

Cash grain marketing has become more decentralized with subterminal elevators, located in the country and shipping grain in unit trains, taking over the functions formerly held by many older terminal elevators. Subterminals are also likely to replace many country elevators which will continue to decline in number. One analyst projects that country elevators that are still operating 20 years from now will be subterminal elevators (Grain Terminals Must Adopt to New Role).

Decentralization of cash grain marketing also means that terminal cash grain price quotations are not as representative of true cash grain prices as in years past because they are based on a smaller volume of trade. Cash grain prices are now determined more at export locations than at terminal markets. Futures prices have become even more important as a "basis" for pricing cash grain in a marketing system that has become more decentralized.

FUTURES TRADING IN GRAIN REACHES NEW HIGH

Price volatility increased during the grain export boom of the 1970's as grain prices rose and the U.S. government was able to dispose of stocks that had been accumulated in the post World War II period under price support operations. This increased hedging needs which pushed the volume of futures trading in grain to a record high of 39.5 million futures contracts in 1980 (Table 6). Marketing decisions in volatile grain markets emerged as new and complex problems for farmers as well as marketing firms. Agricultural marketing economists directed more of their attention in both teaching and research to futures markets, hedging, and price risk management.

Futures trading in grain and products varies positively with price variability and inversely with government price support loan activity. As grain exports declined in the early 1980's, price volatility was reduced and stocks accumulated under government programs increased. The volume of futures trading in grain declined from its record level of 39.5 million contracts in 1980 to 26.8 million contracts in 1987 reflecting reduced hedging needs associated with lower price variability and the accumulation of grain stocks to record levels under government programs. But, futures trading in grain rebounded in 1988 to reach a new record of 40.9 million contracts as prices and price volatility increased with the drought and the precipitous draw-down in grain stocks. The volume of futures trading has again declined in each of the last two years, but remained at the relatively high level of 38.4 million futures contracts in 1990 (Table 6).

Table 6. Futures Contracts Traded on U.S. Grain Futures Markets, by Commodity, Selected Years

Exchange and Commodity	Contract Unit	Thousands Contracts				
		1973	1980	1987	1988	1990
Chicago Bd. of Trd.						
Wheat	5,000 bu.	1,567	5,428	1,929	3,378	2,876
Corn	5,000 bu.	4,075	11,947	7,253	11,106	11,423
Oats	5,000 bu.	183	321	291	355	434
Soybeans	5,000 bu.	2,743	11,768	7,379	12,497	10,302
Soybean oil	60,000 lb.	1,763	3,168	3,912	4,896	4,658
Soybean meal	100 tons	660	3,219	3,798	5,313	4,905
Total		10,991	35,851	24,562	37,545	34,598
Kansas City Bd. of Trd.						
Wheat	5,000 bu.	346	1,298	971	1,339	1,136
Grain sorghum	5,000 bu.	0	0	0	0	1
Total		346	1,298	971	1,339	1,137
Minneapolis Grain Ex.						
Spring wheat	5,000 bu.	172	334	311	424	477
White wheat	5,000 bu.	0	0	1	*	1
High fructose corn syrup	48,000 lb.	0	0	6	*	0
Oats		0	0	0	2	*
Total		172	334	318	426	478
Mid-America Commodity Ex.						
Wheat	1,000 bu.	75	551	190	294	147
Corn	1,000 bu.	103	441	312	429	455
Oats	1,000 bu.	9	2	7	13	14
Soybeans	1,000 bu.	56	1,053	418	864	1,566
Soybean meal	20 tons	0	0	3	9	5
Total		243	2,047	930	1,609	2,187
Total all markets		11,752	39,530	26,781	40,919	38,400

*Less than 1,000 contracts.

Source: Futures Industry Association.

Issues in Futures Market Performance

The declining importance of terminal markets in cash grain trade is particularly relevant to recent questions about the adequacy of deliverable stocks against Chicago Board of Trade wheat, corn, and soybean futures contracts. These questions followed the Chicago Board of Trade emergency action taken in July 1989 that ordered the liquidation of the largest positions in the July 1989 soybean

futures contract. This action was necessitated by a number of facts known at that time and later reported in a study by the Commodity Futures Trading Commission. First, the open interest on July 10, 1989, in the July future was unusually large, over 40 million bushels, and deliverable stocks were very low, less than 13 million bushels, due in large part to the drought of 1988. Second, both the long side of the July contract and the supply of deliverable soybeans were held, in large proportions, by the same trader. Third, the July futures contract was priced more than 40 cents higher than the August future on July 10. The Chicago Board of Trade took the emergency action to assure an orderly liquidation of the July soybean contract to prevent severely distorted July soybean futures prices that could have resulted in contract defaults (Hineman). The impact on this emergency action on the soybean market precipitated widespread controversy.

The National Grain and Feed Association commissioned a study by Peck and Williams of Stanford University entitled "An Evaluation of the Performance of the Chicago Board of Trade Wheat, Corn, and Soybean Futures Contracts During the Delivery Periods from 1964-65 Through 1988-89." The results of this study are significant and worthy of emphasis. First, deliveries against CBOT grain futures contracts are more important than generally believed. "CBOT wheat, corn, and soybean markets have delivery on the order of 10 percent or 20 percent of the peak open interest. Moreover, of these positions still outstanding on the day just before the delivery period, as many as 50 percent are satisfied through actual delivery." Second, there is a significant concentration of positions of the four largest traders with long and short positions at the start of and during the delivery period. This concentration along with the decline in deliverable stocks has reduced the price spread (carrying charge) between the expiring contract month and the next contract month. Third, "basis convergence in Chicago has deteriorated from the 1960's to the 1980's." Deliveries on the three CBOT contracts have been increasing as a percentage of deliverable stocks. This was considered evidence that stocks were too low. The study attributed the low level of deliverable stocks to the decline in terminal markets in cash grain trade. It rejected two proposed solutions to inadequate deliverable stocks, namely, more terminal delivery points and cash settlement. The study suggested a re-evaluation of

the delivery of grain in store and allowing for barge delivery or on-track delivery at Gulf export terminals.

An important characteristic of a good futures contract is that its terms, including delivery provisions, reflect the realities of commercial trade. This enables futures contracts to serve as temporary substitutes for later cash contracts on other terms. The realities of commercial trade in wheat, corn, and soybeans do not reflect as much movement through Chicago as was true in years past. Today, the largest share of export movements of wheat, corn, and soybeans is by rail and water to Gulf and Pacific-Northwest ports (Hill and Timmerman). Domestic processors also obtain supplies directly in the country and not through terminal markets such as Chicago.

VALUE-ADDED GRAIN PROCESSING EXPANDS

The emergence of excess capacity in grain merchandising in recent years has been accompanied by a greater emphasis in many grain firms on expanding value-added grain processing businesses. Several of the largest multiple facility grain merchandising firms have made sizeable investments in wet corn milling, wheat flour milling, livestock feed manufacturing, meat and poultry processing in the past decade. These investments have come in the form of acquisitions as well as in new plants and equipment. The changing structure of the U.S. flour milling industry is an interesting case in point.

Flour Milling Becomes a Growth Industry

For several decades prior to 1970, the U.S. flour milling industry showed little growth. Declines in per capita consumption of flour were offset by increases in population so total consumption showed only small yearly changes. But, the industry became a growth industry in the past two decades. Flour production increased from 253,094,000 cwts. in 1970 to 352,843,000 cwts. in 1990, an all-time record. This was largely attributable to increased domestic disappearance that rose from 227,351,000 cwts. to 337,762,000 cwts. during the same period. Thus, a reversal came in the long-term decline in the U.S. per capita consumption of flour. From an all-time low of 110 lbs. in the early 1970's, per capita consumption rose to 135 lbs. in 1990. This was the

highest since 1950 when it was estimated at 136 lbs. The increase resulted from many factors including a dramatic growth in the fast food industry or the so-called "bun revolution". Flour consumption was also enhanced by a rapid expansion in the demand for variety breads and improved consumer perception of the nutrition of bread and other flour foods.

Structural Change in Flour Milling

Excess flour milling capacity first appeared in the U.S. industry in the late 1880's and persisted for many years. Overcapacity was particularly burdensome following 1948 when U.S. flour exports declined with postwar world recovery. This precipitated many closures of old, inefficient, and obsolete mills between 1948 and 1953. The reduction in mill numbers has continued. Census data show a decline in the number of milling establishments from 1,243 in 1947 to 457 in 1972 and 361 in 1982. The 1991 Milling Directory listed 205 wheat flour mills, 14 durum mills and 14 rye mills in the U.S. But, while mill numbers have declined, milling capacity, that bottomed in 1973, has increased. Capacity expansion has come from increasing the capacity of existing mills and building larger mills. Along with the increase in capacity has come an improvement in flour milling economics as capacity utilization has increased.

Many structural changes have occurred in the U.S. flour milling industry in the past two decades. New entrants, well-known as primary handlers and processors of grain and other bulk commodities, have entered the business through acquisition. The nation's three largest flour milling companies in 1991 were Con Agra, Inc., Archer Daniels Midland Co., and Cargill, Inc. Collectively, they operate nearly 60 percent of the flour milling capacity in the U.S. (Table 7). None of these firms were even listed among the top 10 flour milling companies in the U.S. in 1968. In the latter year, the largest four flour milling companies were International Milling Co., the Pillsbury Co., Peavy Flour Mills, and General Mills, Inc. (The Changing Face of Breadstuffs). The flour milling operations of International Milling and Peavy Flour Mills were acquired by Con Agra, Inc. General Mills, Inc., and the Pillsbury Co. which had their origins in flour milling, have become large, diversified food marketing and processing companies. Flour milling is no

Table 7. U.S. Largest Wheat Milling Companies, 1991.*

Company	No. Wheat Flour Mills**	Cumulative Percent of Total	Total Daily Capacity Wheat Flour** (cwts.)	Cumulative Percent of Total
Con Agra, Inc.	29	14.15	276,500	22.87
Archer Daniels				
Midland Co. (total)	26	26.83	219,700	41.03
ADM Milling Co.	(22)		(188,700)	
ADM Holding Co.***	(4)		(31,000)	
Cargill, Inc.****	18	35.61	199,400	57.52
Cereal Food Processors	9	40.00	68,300	63.17
General Mills, Inc.	7	43.41	66,700	68.69
Pillsbury, Inc.	4	45.37	60,500	73.69
Bay State Milling Co.	7	48.78	48,150	77.67
Nabisco Brands, Inc.	1	49.27	28,000	79.99
Mennel Milling Co.	4	51.22	22,700	81.87
Others	<u>100</u>	<u>100.00</u>	<u>219,273</u>	<u>100.00</u>
Total U.S.	205		1,209,223	

* Source: 1991 Milling Directory and Buyers Guide, Sosland Publishing Co., Kansas City, MO.

** Includes whole wheat mills and capacity, but excludes durum and rye.

*** Formally Dixie-Portland Flour Mills, Inc.

**** Included are four mills Cargill purchased from Pillsbury in June 1991, with a total capacity of 51,700 cwts.

longer a major activity. The Pillsbury Co., now a subsidiary of Grand Metropolitan, P.L.C., has sold all but four of its flour mills, the most recent of which was the sale of four mills to Cargill, Inc. in June 1991.

It is of interest to note that Con Agra, Inc., Archer Daniels Midland Co., and Cargill, Inc., the three largest flour milling companies in the U.S. are also the three largest multiple facility grain companies in the nation.

Cooperatives Emphasize Value-Added Grain Processing

Harvest States Cooperatives, the nation's largest grain marketing cooperative, downsized its grain marketing operations in the 1980's and expanded its value-added grain processing operations to make it less vulnerable to the ups and downs of the grain business. The Feed Division has been expanded into more products such as pet food manufacturing under private labels for food chains. Harvest States also purchased an investor-oriented firm (I.O.F.) called Holsum Foods that manufactures margarines, salad dressing, peanut butter, and shortening. This is a vertical extension of its Honeymeade Processing Division that produces and refines soybean oil and meal.

The Amber Milling Division of Harvest States Cooperatives that grinds durum into semolina, the chief ingredient of pasta, has also been expanded. Pasta consumption in the U.S. has been increasing at an average annual rate of 7 to 9 percent for several years. The expected annual growth rate in the 1990's is 5 to 6 percent (Pistoria). Harvest States recently formed a partnership with the Miller Milling Company, an I.O.F., of Huron, Ohio, where its mill will be expanded from 6,000 cwt. to 12,000 cwt. per day. Harvest States is the operating partner and retains the majority interest in the partnership. With this expansion, Amber Milling becomes the second largest durum miller in the U.S. grinding about 14 million bushels of durum per year (Division Report of Amber Milling).

Finally, Harvest States Cooperatives and Union Equity Cooperative Exchange recently acquired a combined 10 percent ownership of Cereal Food Processors, the nation's fourth largest flour milling company operating nine mills with a daily total capacity of 68,300 cwt. (Table 7). This alliance will expand the cooperatives' operations in the value-added product sector and enhance the milling company's access to high quality wheat. The presidents of the two cooperatives will be elected to the board of directors of Cereal Foods (Cereal Foods Into Alliance with Two Cooperatives).

Value-added activities such as the manufacture of livestock feed and the promotion of large-scale contractual hog and poultry feeding by their members are also receiving considerable interest by many local grain marketing cooperatives in parts of the cornbelt. Such activities demand a new set of management skills in addition to those required for grain and farm supply

merchandising. But, they signify that more country elevators recognize that it may be difficult to survive in the long-run with the narrow margins that currently prevail in the grain business.

Subsidizing Value-Added Agricultural Exports

A provision of the 1990 Farm Bill set a goal of earmarking 25 percent of funds in the Export Enhancement Program (EEP) for promotion of high-value agricultural commodities and value-added food products. For example, subsidizing the export of flour rather than wheat. Most of the funds under the EEP in recent years have been used to aid wheat exports. U.S. flour exports in 1990 declined to 18,380,000 cwts., only 5 percent of total U.S. flour production. The recent high in U.S. flour exports was in 1983 when a special U.S. subsidized sale of 22 million cwts. to Egypt resulted in exports reaching 37,315,000 cwts., the highest level in more than a decade.

The export market for U.S. flour has suffered a long-term secular decline reaching record lows in the 1970's for two reasons. First, flour trade declined relative to wheat as importing countries continued to push for reduced "value-added" imports. Second, flour trade is heavily dependent upon government subsidies. The United States and the European Community (E.C.) make up 75 to 80 percent of all flour exports, most of which are subsidized. The U.S. share of world flour exports has decreased in the last 30 years to 20 percent from 80 percent, while the E.C. share has increased to 65 percent from 16 percent. (Strong Growth Prospects Seen for Trade in High-Value Food Products.)

U.S. exports of flour may increase in the next few years if more flour exports are subsidized under the EEP as provided for in the 1990 Farm Bill. However, it is difficult to be optimistic about the prospects for flour exports in the long run in the absence of government subsidies. Both developed and developing countries find it advantageous to import wheat rather than flour for several reasons. Wheat can be shipped at a lower cost than flour and locally produced millfeeds can usually be marketed more profitably for feeding local livestock. Also, flour milling is not a complex and expensive process. Flour milling technology can be readily adopted by developing countries and is often a first step in industrialization. Hence, most developing countries that

consume wheat flour have strong incentives to construct their own flour mills (Farris, Crowder, Dahl, and Thompson).

The future growth of the United States flour milling industry will likely be heavily dependent on growth in the United States domestic market. Growth in the domestic consumption of wheat flour was impressive in the 1980's and some analysts forecast that the forces generating this rapid growth will continue in the 1990's.

CONCLUSIONS

Further consolidations and closures of less efficient grain operations can be expected as the U.S. grain marketing system adjusts to excess capacity in marketing infrastructure. Cargill's lead as the nation's largest grain company has been challenged in recent years by Con Agra, Inc. and the Archer Daniels Midland Company. The latter two companies expanded rapidly in the 1980's, in large part through acquisitions. The Continental Grain Company ranks as the fourth largest company. The latter also has a new joint venture with Ceroilfood (N.Y.) the U.S. subsidiary of a state-owned independent agency in China. This is a new development in grain market structure.

The downsizing of interregional and regional grain marketing cooperatives ranked among the most significant structural changes during the past decade. This was necessitated by heavy investments in marketing infrastructure during the grain export boom and increased competition as exports declined in the 1980's. The organization of new joint ventures in grain marketing between regional cooperatives and IOF's in the late 1980's were new structural innovations. Cooperatives' share of export elevator storage capacity has declined, but a surplus of grain exporting capacity continues to squeeze margins and intensify competition in the grain export system.

Grain storage capacity, both farm and off-farm, expanded during the 1980's as stocks accumulated under federal farm programs. But, the precipitous drop in grain stocks as a result of the 1988 drought has resulted in excess grain storage capacity and reduced income from storing and handling grain for the U.S. government.

Changes in transportation costs as impacted by intermodal competition and railroad deregulation have induced structural changes in the grain marketing system at both the country and terminal market levels. Many country elevators have expanded to handle unit train shipments. Others have consolidated to form sub-terminals that are replacing many country elevators. Sub-terminals are also taking over the function of older rail terminal elevators. The demise of the transit privilege and deregulation of the railroads sharply reduced the flow of grain from country points to grain exchanges in terminal markets for resale. The grain marketing system has become more decentralized with grain moving directly from gathering points in the country to domestic users or to export elevators without moving through terminal markets such as Minneapolis, Kansas City or Chicago.

Decentralization of cash grain marketing also means that terminal cash grain price quotations are not as representative of true cash grain prices as in years past. Futures prices have become even more important as a "basis" for pricing cash grain, but the delivery provisions on CBOT grain futures contracts may need to be re-evaluated to reflect the reduced role of terminal markets such as Chicago in cash grain trade.

The three largest multi-facility grain companies have also made sizeable investments in value-added grain processing in recent years. Con Agra, Inc., ADM and Cargill, Inc. are now the three largest flour milling companies operating nearly 60 percent of the U.S. flour milling capacity. The flour milling industry has become a growth industry in the past two decades. Per capita consumption increased from 110 lbs. in 1970 to 135 lbs. in 1990 with growth in the fast food industry, expansion in demand for variety breads, and improved consumer perception of the nutrition of wheat based foods.

Harvest States Cooperatives has also expanded its value-added grain processing operations in recent years. Its Amber Milling Division that grinds durum into somolina has been expanded and now ranks as the nations second largest durum miller. Pasta consumption in the U.S. has been increasing at a rate even faster than wheat flour.

U.S. flour exports account for only 5 percent of total flour production. Flour exports may increase in the next few years if more flour exports are subsidized under the EEP as provided for in the 1990 Farm Bill. However, it is difficult to be optimistic about the prospects for flour exports in the long-

run in the absence of government subsidies. The future growth of the U.S. flour milling industry will be heavily dependent on the growth in the domestic market.

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