MINNESOTA AGRICULTURAL ECONOMIST

NO. 635 MAY 1982

Organization and Pricing Efficiency of the U.S. Grain Export System

By Neilson C. Conklin and Reynold P. Dahl*

The organization and functions of the U.S. grain export system are not well understood by the general public, academicians, and government policy makers. Little public attention was focused on U.S. grain exports before 1972. World grain markets were relatively stable and U.S. food prices were low. But, in the wake of major Soviet Union grain purchases in 1972, world grain shortages, and ensuing food price increases, public attention was focused on grain exports and the firms that moved them. Suspicions and innuendos abounded, with much concern centering on the large firms that handle U.S. grain exports. The following quotations are examples of public perceptions of the U.S. grain export system.

"The five companies (Cargill, Continental, Bunge, Dreyfus and Cook) maintain a strangle hold over the world's grain supply and constitute a food cartel unprecedented in world history. The grain companies are not at the mercy of the free market.

On the contrary, they use their enormous size to manipulate the free marketplace and maximize profits at the expense of farmer and consumer alike."[1]

Another writer wrote: "Yet the (grain) companies still were rogue elephants in the international economy, as large, central, and almost as inaccountable as ever..."[2]

These statements imply that a few major export companies constitute a cartel or shared monopoly over grain exports and are able to manipulate price without the restraint of competitive markets or the government. This article summarizes the results of a research study which examines the organization of the U.S. grain export industry and the efficiency with which export sales information is reflected in grain prices.

MARKET ORGANIZATION OF THE GRAIN EXPORT SYSTEM

For the second year in a row, total U.S. grain exports in 1981 reached 143 million metric tons (Table 1). This is nearly three times the total grain exports in 1971. Exports of all the individual grains have increased, but corn exports have grown most rapidly and now constitute the largest single share of total grain exports. During the 1980-81 marketing year, the U.S. exported 64 percent of its wheat production, 35 percent of its corn production, and 55 percent of its production of soybeans and soybean products. Grain and oilseed exports are important not only to the agricultural sector, but also to the entire U.S. economy. The total value of wheat, corn, and soybean exports in 1980 was $20.7 billion, almost 10 percent of the value of all U.S. exports.

The tripling of grain exports in a decade is a tribute to the productive capacity of the American farmer. The U.S. grain export system also deserves credit for accommodating these in-

Table 1. U.S. Grain Exports, 1971-1981

Year	Wheat	Corn	Soybeans[1]	Other[2]	Total[3]
			(million metric tons)		
1971	16	13	16	6	51
1972	21	22	16	7	67
1973	37	33	19	10	99
1974	25	30	20	9	84
1975	31	33	17	9	90
1976	27	44	21	10	101
1977	24	40	21	11	96
1978	34	50	28	10	121
1979	33	59	28	10	131
1980	36	63	30	14	143
1981[4]	44	55	29	15	143

Source: USDA

[1]Includes soybean meal and oil.

[2]Rice, barley, oats, grain, sorghum, rye, and sunflower seed.

[3]Totals may not add due to rounding.

[4]Preliminary.

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For a more detailed discussion of the research on which this article is based, see GAO staff study *Market Structure and Pricing Efficiency of the U.S. Grain Export System*, GAO/CED-82-61: To be issued May or June 1982.

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[1]Roger Burbach, "The Great Grain Robbery," *The Progressive*, July 1976, p. 25.

[2]Dan Morgan, *Merchants of Grain* (New York: Viking, 1979), p. 361.

creased grain movements with a minimum of disruptions. Needed expansion in grain handling and transportation facilities has been made when and where needed in response to market forces. Coordination of these huge grain movements, delivering the correct types and grades of grain when and where they are needed, is not an easy chore. Yet it is accomplished with a decentralized free market system in a remarkably efficient manner.

The flow of information, although less visible than the physical movement of grain, is also an important part of the grain export system. Farmers and merchandisers need information concerning the physical state of the system and changes in economic variables and government policies. Wire services, government agencies, and trade publications regularly provide information about grain prices, stocks, exports, and crop conditions.

However, large volumes of information are not useful to farmers and grain merchandisers unless they are processed into easily interpreted signals. In a market system, economic signals in the form of prices are generated by the activities of buyers and sellers. This process is referred to as "price discovery." In the U.S. grain marketing system, market institutions such as organized commodity markets have evolved to provide well-organized price-discovery mechanisms. Most important of these institutions for the U.S. grain export system are the grain futures markets.

The U.S. grain export system is highly complex and involves three major components: (1) grain merchants and exporters, (2) market institutions, where price discovery takes place, and (3) the government, which regulates and assists the first two.

The Structure of the Grain Export System

The market structure of the U.S. grain export system may be categorized into four groups: (1) major multinational corporations, (2) Japanese-owned or -affiliated firms, (3) farmer-owned cooperatives, and (4) all other grain exporting firms.

The major multinational corporations are large firms which operate globally and handle much of the grain bought and sold in the world today. The Japanese firms are likewise multinational in operations and some, at least, are large ones. Japanese-owned or -affiliated firms are listed separately as a group because in recent years they have become a real force in U.S. grain export sales. Farmer-owned cooperatives also have an important share of U.S. grain exports as do other U.S. grain firms.

A grain export firm is defined in this study as a firm that sells grain directly to a foreign buyer. It does not necessarily have to load the grain on an ocean-going vessel, because this is sometimes done by another company. This is the same definition used by USDA's Foreign Agricultural Service (FAS), which requires export sales to be reported to it. By this definition, the Export Sales Reporting Division of FAS estimated that, in the 1980-81 marketing year, approximately 100 firms reported grain exports.

Economists often use the degree of concentration, or the percentage of sales held by the largest firms in an industry, as a measure of competition in the industry. Although a substantial number of firms are engaged in grain export, the industry is relatively concentrated. That is, a small number of firms handle a large percentage of the business.

It is, however, less concentrated than commonly believed. A 1976 report by the Farmer Cooperative Service of the USDA has been widely quoted. It estimated that the six largest grain export firms, Cargill, Continental, Bunge, Dreyfus, Cook, and Garnac, controlled 90 percent of the U.S. grain export market.[3] However, this estimate was not based on documented data of export sales volumes. A detailed study conducted by USDA for market years 1974-75, based on actual reports of export sales, revealed that the largest four exporters controlled 49 percent of the total grain and oilseed exports (Table 2). The largest eight firms accounted for 69 percent of total food grain, feed grain, oilseeds, and oilseed product exports. Concentration was somewhat greater in food grain exports than in feed grains or oilseeds. It was only at the 20-firm level that concentration ratios approached 90 percent.

More recent information reported by the U.S. General Accounting Office shows a lower level of concentration during the 1980-81 marketing year than in 1974-75. Table 3 shows the four groups of grain exporters ranked by market share in 1980-81 and their increase or decrease in market share since 1974-75. Japanese-owned or -affiliated firms and farmer-owned cooperatives increased their shares of grain exports. Their increases came largely at the expense of the multinationals.

Concentration ratios alone do not adequately reflect the effective degree of competition in the grain export industry. Grain exporters must compete with domestic merchandisers and processors for supplies of grain. The domestic grain industry in the United States is much less concentrated than the export industry. The largest 20 firms handled only 55 percent of the total domestic grain sales in 1977. While concentration may be higher within specific regions, the existence of alternative marketing channels between regions makes the national market an appropriate unit of inquiry for a trading industry like grain merchandising.

Effective control of a market which has as many alternative marketing channels as the U.S. grain export system requires the control of physical facilities, especially at critical points where trans-shipment is required.

Increasing amounts of export grain are bypassing terminal elevators. More export grain is now moving directly

[3] *Improving the Export Capability of Grain Cooperatives*, Farmer Cooperative Service, U.S. Department of Agriculture, FGS Research Report 34, June 1976.

Table 2. Cumulative Concentration Ratios of Exporting Firms and Total Exports, Marketing Year 1974-75[1]

Exporting Firms	Food Grains[2]	Feed Grains[3]	Oilseeds & Products[4]	Total
Four Largest	58%	44%	42%	49%
Eight Largest	78%	64%	63%	69%
Twenty Largest	88%	93%	87%	90%

[1] Bruce H. Wright and Kenneth R. Krause, "Foreign Direct Investment in the U.S. Grain Trade," *Report to the Congress: Foreign Direct Investment in the United States*, Vol. 4, Appendix E, U.S. Department of Commerce, April 1976, p. E-13.

[2] Wheat, rye and rice.

[3] Corn, barley, oats, and sorghum.

[4] Soybeans; soybean oil, cake, and meal; cottonseed oil; cottonseed cake and meal; linseed oil; and flaxseed.

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	−5.3
Japanese-Owned or -Affiliated Firms	+4.7
Other Firms	−.5
Farmer-Owned Cooperatives	+1.1

Source: GAO Staff Study, "Market Structure and Pricing Efficiency of U.S. Grain Export System," GAO/CED-82-61. To be issued May or June 1982.

from country elevators and subterminals in the grain production areas to ports for export. This is in response to special unit train rates offered by the railroads. The control of export facilities at the ports does undoubtedly increase the flexibility and power of some firms in the export system. Hence, trends in ownership and control of port elevators are significant.

Export Elevator Control—Trends in the control of port elevator storage capacity over the last decade do not show increases in concentration. In 1968 the major exporters controlled 56 percent of storage capacity; this share shrank to 54 percent in 1976 and 50 percent in 1981. On the other hand, during the same period, farmer-owned cooperatives increased their share of port elevator capacity from 9.7 percent to 21.4 percent (Table 4). This growth was especially apparent at gulf ports where cooperatives owned no elevators in 1968 and six in 1981. The share of elevator ownership by firms other than cooperatives and major exporters has declined during the last decade. Thus, it would appear that cooperatives have been gaining in control of export elevators at the expense of both the major exporters and other firms.

In addition to changes in export elevator ownership patterns by major groups, the composition of firms making up each group has changed since 1968 as firms have entered and left the industry. For example, Cook Industries appears in the list of major exporters for 1976, but not for 1968 or 1981. The rapid rise and equally rapid demise of this company illustrates that firm size is no guarantee of success.

Entry, Exit, and Competition — Freedom of entry and exit is a more important indicator of an industry's competitiveness than concentration ratios. Capital requirements are often mentioned as barriers to entry in grain exporting. It is argued that large firms have lower costs so a new small firm would have higher costs and could not compete. The evidence shows, however, that small as well as large firms have entered the grain export business. Small firms often find an initial niche by providing a special service, product, or quality of grain. Once established, the company may expand.

The number of firms reporting export sales of wheat to USDA Foreign Agricultural Service increased by 32 percent from 1975 to 1980. Firms reporting corn and soybean exports rose by 38 and 15 percent, respectively, during the same period (Table 5).

A series of interviews with officials of both large and small grain exporters disclosed a general perception of increasing competition in the industry over the last decade. This perception seems consistent with the information presented above. In addition to changes in the number of firms in the grain export business, the results of these interviews suggest other changes in the structure of the grain export industry. Japanese trading houses such as Marubeni, Mitsui, Mitsubishi, and C-Itoh have assumed a greater role in exporting U.S. grain to Japan and other countries. Some of these firms have also acquired U.S. facilities, including country elevators, terminals, and port elevators. Philipp Brothers is an example of another group of new entrants. This company is applying its skills developed in merchandising other commodities (e.g., metals, ores, and petroleum) to the exporting of U.S. grain.

Farmer-owned cooperatives have also assumed an increased role in the export system. In recent years, cooperatives have been increasingly interested in selling their grain directly to foreign customers. Farmers Export Company, an inter-regional cooperative, was organized in 1968 by several large regional grain marketing cooperatives. Its volume of business expanded substantially in the 1970s. But, after experiencing operating difficulties in late 1980, it closed some of its facilities and sold one large export elevator to a member regional cooperative. Many regional grain marketing cooperatives are now engaging directly in grain exporting.

In conclusion, the changing market structure of the U.S. grain export industry is inconsistent with the static make-up one would expect in a monopolized industry. New firms, both large and small, have entered the industry. Others have exited. The composition and market shares of firms in the industry have changed significantly in recent years, as have patterns of export elevator ownership. These structural changes indicate competitive forces at work in the U.S. grain export system.

Table 4. Percentage of Total Export Elevator Capacity Controlled by Exporter Group, 1968, 1976, and 1981[1]

Exporter Group	1968[3]	1976[4]	1981
Major Exporters[2]	56.3%	54.1%	50.3%
Farmer-owned Cooperatives	9.7%	11.3%	21.4%
Others	34.0%	34.6%	28.3%
Total	100%	100%	100%

[1]The 1968, 1976, and 1981 data are not strictly comparable. The 1981 data should be regarded as the most comprehensive since they were obtained from the USDA, FGIS, export elevator list. Sources including USDA, ASCS approved warehouse lists and various trade directories were used to compile the data for 1968 and 1976.

[2]1968 data include Bunge, Cargill, Continental, Dreyfus, ADM, and Peavey. 1976 data include Cargill, Continental, Bunge, Dreyfus, and Cook. The 1981 data include Bunge, Cargill, Continental, Dreyfus and Garnac.

[3]Monte E. Juillerat and Paul L. Farris, *Grain Export Industry Organization and Facilities in the United States*, Research Progress Report 390, Purdue University, Agricultural Experiment Station, Lafayette Ind. August 1971, p. 6.

[4]Sarahelen R. Thompson and Reynold P. Dahl, *The Economic Performance of the U.S. Grain Export Industry*, Tech. Bulletin 352, University of Minnesota, Agricultural Experiment Station, St. Paul, MN 1979, p. 21.

Table 5. Firms Reporting Export Sales of Wheat, Corn, and Soybeans During Marketing Years 1974-75 to 1979-80[1]

Year	Wheat	Corn	Soybeans
1974-75	41	56	39
1975-76	44	55	42
1976-77	39	61	37
1977-78	44	56	41
1978-79	50	61	44
1979-80	54	77	45
Percent Increase 1974-75 to 1979-80	32	38	15

[1]Data provided by Export Sales Reporting Division, Foreign Agricultural Service, USDA. Many grain export firms export more than one commodity. Therefore, for any given year, the total number of firms exporting wheat, corn, and soybeans cannot be obtained by simply adding the number of firms shown above for each commodity.

Futures Markets and Grain Export Pricing

Highly liquid futures markets for the major export grains also increase competition in the U.S. grain export system. These market institutions provide a central location for price discovery where barriers to entry are low, and trading takes place under rules and regulations designed to insure competition. These markets provide a mechanism for hedging and pricing grain for forward delivery.

Nearly all grain export sales are made on forward cash contracts calling for delivery up to a year in advance. Some export contracts fix the price of grain at the time the sale is made. Others stipulate only the basis, which is the relationship to a designated futures price. The latter are called basis or unpriced contracts. They typically allow the buyer to fix the final price of the grain at any time of his choosing before the delivery date.[4]

U.S. exporters are able to offer these varied pricing arrangements on forward cash contracts to importers because they have futures markets available for hedging. Grain export firms are among the largest commercial users of our nation's futures markets. Certain individuals have charged that these markets afford grain exporters opportunities for monopolistic gains through price manipulation. Hence, questions have been raised regarding the pricing efficiency of futures markets. These questions also imply that government oversight of the system is ineffective. Therefore, our research attempted to analyze these questions as related to the U.S. grain export sales reporting system.

[4]For a more detailed discussion of grain export pricing, see N. Conklin, G. Wilbert, and R. Dahl, "The Pricing of Grain Exports and the Role of Futures Markets," *Minnesota Agricultural Economist*, No. 614, December 1979.

THE EXPORT SALES REPORTING SYSTEM

In 1973 Congress enacted legislation requiring that all export sales of certain agricultural commodities, including the major grains and oilseeds, be reported to USDA. The creation of this export sales reporting system was an effort to improve government oversight of the grain exporting system following the market dislocations of the early 1970s. The objectives of the system are defined as follows:

(1) To provide information to the government for the development of export policies and programs.

(2) To provide producers with information to help in their marketing decisions.

(3) To improve performance of U.S. commodity markets by making public timely information in export sales transactions.[5]

At the time an export sale is made, the company making the sale may be the only one to know about it. Large sales over 100,000 tons are reported daily to the Export Sales Reporting Division of USDA's Foreign Agricultural Service. Before June 1980, exporting companies were required each Thursday to submit reports regarding their smaller export sales for the preceding Monday through Sunday. The Export Sales Reporting Division's report for a given week's total activity was released a week later, after the close of the commodity markets, as shown in the time-frame Illustration 1 below.

Under this time frame, there was a lag of 11 to 18 days from time of sale until the weekly report of sales was publicly released.

In June 1980 the reporting week was changed and the reporting time frame was shortened. The reporting week was changed to Friday through Thursday (instead of Monday through Sunday) and reports from exporters became due to the Export sales Reporting Division the following Monday. The Export Sales Reporting Division still releases its overall report on Thursday, thereby cutting the lag to 7 to 14 days from time of sale until the time it is publicly reported, as shown in Illustration 2 below.

[5]U.S. Congress Export Grain Sales Hearing, June 11, 1979.

Illustration 1

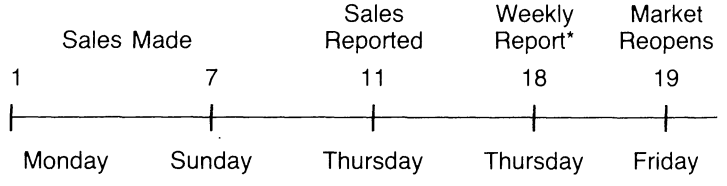
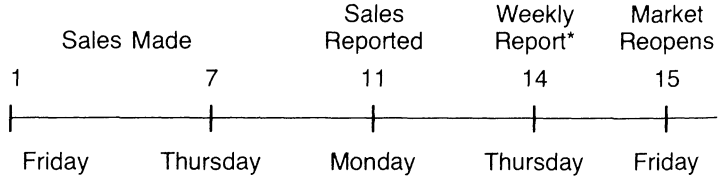


Illustration 2



*Released after Market Closes

PRICING EFFICIENCY OF THE U.S. GRAIN EXPORT SYSTEM

Pricing inefficiency has been perceived as a major economic performance problem in the U.S. grain system. For example, in congressional hearings on export grain sales in June 1979, Chairman Neal Smith said:

"Once again we see the following scenario repeated: Grain companies make substantial fixed price sales. They then purchase more than enough in the cash and futures markets before U.S. sellers of grain know of the new demand. The grain exporters then wait for the news to come out for the market to move up. They then take profits on excess long futures after the market moves up on news of the sales."[6]

How efficiently does the U.S. grain export system transform export sales information into prices? To answer this question, we analyzed the flow of information under the Export Sales Reporting Division's system described above during the five-year period from June 1975 to June 1980. We were particularly interested in the behavior of actual futures market prices and their responses to information about export sales. Data used in our analysis consisted of daily wheat, corn, and soybean futures prices at the Chicago Board of Trade, which were obtained from the Commodity Futures Trading Commission. We also used net new export sales data as reported by the Foreign Agricultural Service in its publication "U.S. Export Sales."

The type of pricing inefficiency visualized by Chairman Neal Smith would manifest itself in the form of an upward bias in the response of futures prices to the export sales report at release time. This bias, if present, would enable major exporters with inside information to purchase grain futures before the report release date and sell them at a profit when prices rose. Our statistical analysis of price changes in the wheat, corn, and soybean futures markets on days following the export sales report release revealed no such bias. The average value of price changes for these three commodities was not significantly different from zero (Table 6). This evidence indicates little potential for sustained profits from "insider" information about grain export sales.

Table 6. Test for Bias in Futures Price Responses to Export Sales Reports, 1975-1980

Commodity	Average Price Change* (cents per bu.)
Wheat	.053**
Corn	−.018**
Soybeans	.430**

*On day following release of export sales report.
**Not significantly different from zero at the 95% level.

The above analysis is not a complete test for pricing efficiency in the U.S. grain export system. Therefore, we conducted further economic and statistical analyses.

Pricing Efficiency: The Concept and Measurement

Economists have developed criteria for the efficiency of price discovery mechanisms based on the concept of a perfectly competitive market. In this market model, prices change in response to changing information about supply and demand. Prices serve as aggregators of this information through the process of price discovery.

There are a number of reasons for pricing inefficiencies in the marketplace. In a noncompetitive market, for example, those possessing inside information can manipulate prices. General uncertainty and imperfections in the flow of information can also contribute to pricing inefficiencies in some markets. In the real world, supply and demand are constantly changing and information about them is often less than perfect.

The performance of a market in price discovery depends upon its ability to transform information into prices. A market in which prices always fully reflect available information is called "efficient." This is referred to as the "efficient markets hypothesis," under which three levels of efficiency are defined:

(1) *Weak form efficiency*—where prices accurately reflect information contained in past prices.

(2) *Semi-strong form efficiency*—where present prices accurately reflect all publicly available information.

(3) *Strong form efficiency*—where present prices accurately reflect all information, including that held by insiders..

Pricing Efficiency and Grain Export Information

Our analysis of pricing efficiency in the U.S. grain export system between 1975 and 1980 compared price behavior predicted for strongly efficient and semi-strongly efficient markets to the actual response of grain futures prices to export sales information. The behavior of prices in the U.S. grain export system under these two hypothetical levels of efficiency is easy to identify, since the export sales reporting system determines the information flow. If the export system was strongly efficient, then grain prices would respond to export sales at the time they were made, days one to seven in Illustration 1. However, if the system was semi-strongly efficient, prices would respond only following the release of the export sales report on day 19. Any lag in price response beyond day 19 would indicate a substantial degree of pricing inefficiency.

Our analysis of price responses to export sales information indicated that wheat, corn, and soybean futures prices all responded, with no significant lag, to export sales during the week in which they were made. However, futures prices also responded to the release of the export sales report by USDA. The response of futures prices to export sales and the export sales report were not large in magnitude; however, they were detectable. This relatively small price response to export sales information is not surprising considering the large amount of other information which affects futures prices every day.

Our analysis indicates that the pricing efficiency of the U.S. grain export system rests somewhere between the semi-strong and strong form levels. These results imply that grain futures prices do respond as exporters make sales and hedge their transactions. However, prices do not fully adjust until the release of the export sales report. This result is due to imperfections in the flow of information, since "perfect" information does not exist until that report is made public. However, once that information becomes available, traders re-evaluate their positions and further adjustment in grain prices takes place.

[6]Export grain sales hearings before the Subcommittee on SBA [Small Business Administration] and SBIC [Small Business Investment Companies] Authority and General Small Business Problems, House Committee on Small Business (96th Congress, 1st Session) June 1979.

SUMMARY AND CONCLUSIONS

Our research strongly indicates that the U.S. grain export system is more competitive than commonly believed. It is not a static industry that one would expect of an oligopoly—as the industry is frequently characterized. Significant structural changes in the composition and market shares of firms in the industry have occurred in recent years in response to market forces.

Our economic analysis of pricing efficiency also indicates that grain futures prices efficiently reflect grain export sales information. We found no evidence to suggest sustained profits from the possession of insider information.

The system does more than provide the logistics of moving huge volumes of grain valued at billions of dollars from farm to ocean vessels. It also transforms information into prices, which in turn efficiently allocate resources and the distribution of economic rewards domestically and worldwide.

As policy makers consider proposed changes such as a grain marketing board, grain export cartels, or export levies, they should carefully consider the full impact of such changes on the total U.S. grain export system.

Dale C. Dahl . . . . . Editor
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