More than a half century ago Dr. L. D. H. Weld, head of a young Department of Agricultural Economics at the University of Minnesota made a study of grain marketing in the upper midwest. A principal conclusion of that study was the following: "Taken all in all, and considering the number and variety of services that are necessary between producer and consumer, grain is probably marketed more efficiently and more economically than any other farm product."

Available evidence supports a similar conclusion today regarding the relative efficiency of grain marketing. The grain market probably comes as close to the economists' concept of a "perfect" market as any other agricultural market. There are special reasons for this, of course, such as the relative non-perishability of grain and the early establishment of uniform grades and standards. However, the organization of the marketing system plays a most important part. Organized commodity markets fostering open, competitive trading in both the cash commodity and futures developed early in the grain trade and they continue to play an important role in price discovery. Futures trading originally emerged in the grain trade where it has achieved its highest degree of development. Roger Gray has recently argued that it is fruitful to look at futures trading with the primary focus on its "market" and prices discovery aspects rather than the risk transfer aspects. According to Gray, futures markets deserve to be cast in a competitive equilibrium model and it is doubtful if any other market organization can approach a futures market in competitiveness, owing to the impossibility of achieving certain of the requirements in such a high degree. These requirements are usually given as (1) large numbers of buyers and sellers, (2) a homogeneous product, (3) free entry; and (4) full information for all participants.

If Gray's analysis is correct, it is surprising that these markets have not been more studied as models of competitive behavior by economists.

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Further, we can regard the recent development of futures trading in commodities other than grain as welcome additions to our market price making machinery.

Many changes have occurred in grain markets and marketing since Dr. Weld's research 50 years ago. Some of the most significant developments in recent years are the following: (1) shifts in federal programs to support farm income and associated changes in the stock of grain owned by the government, (2) the increasing importance of the export market as an outlet for United States grain, (3) changes in transportation technology and the railroad rate structure, and (4) grain in marketing changes associated with changes in farm production technology.

We have witnessed other changes in grain markets and marketing, but, in my opinion they are of minor importance relative to the four developments listed above.

**Farm Income Support Programs, Surplus Stocks, and Markets**

The grain marketing industry has been affected to a greater degree by government programs to support farm income than any other part of our agricultural marketing system. Since the 1930's grain production has often exceeded market needs at prices deemed equitable to farmers. As a result public policy has been directed toward supporting farm income. Farm income was supported until 1963 principally through the support of market prices. The programs were implemented through nonrecourse loans which resulted in the government taking over and subsequently marketing substantial quantities of grain. Consequently, the government has often been the dominant firm in grain markets, influencing both prices and marketing.

Since 1963, however, we have witnessed a significant shift in the basis of supporting farm income to a greater reliance on direct income payments together with lower price support loans. This change has been accompanied by a rapid decline in government-owned grain stocks, due in part to the new program, and to increased grain exports. The shift to direct income payments in supporting farm income has important implications to markets and the performance of their traditional role in a capitalistic society as well as to marketing firms and farmers. Before attempting an analysis of these implications, they can perhaps be better
appreciated if we review the situation with respect to government grain stocks and their influence on grain markets and marketing.

During the 1950's government-owned stocks of grain were accumulated very rapidly under price-support operations reaching an all-time high in 1961. Total carryover stocks of wheat reached the record level of 1.4 billion bushels on July 1, 1961, while the carryover of feed grains also reached a record high of 85 million tons in the fall of the same year.

The Commodity Credit Corporation, the price-supporting agency of the U. S. Department of Agriculture and the principal owner of these stocks was directed by Congress to use commercial storage facilities wherever possible. Consequently, it provided incentives for commercial firms to expand their storage facilities by increasing storage rates paid. As a result, CCC approved commercial grain storage capacity in the twelve state north central region more than tripled from 805 million bushels in 1953 to 2.9 billion bushels in 1962. Increases in approved commercial storage exceeded 300 percent in Illinois, Indiana, Iowa, Nebraska, and Kansas while increases were 100 percent or less in Wisconsin, Minnesota, and North Dakota. Some of the storage expansion was in permanent vertical facilities, but a large part was in flat storage with relatively low efficiency.

Farm storage facilities were also expanded during this period due in large part to government incentive programs. From 1949 to 1962, low interest rate loans covering the construction of more than 700 million bushels of farm storage space were made or guaranteed by the CCC.

Finally, the CCC found it necessary to increase its own storage facilities. CCC-owned storage capacity rose from 45 million bushels in 1949 to 980 million bushels in 1962. These facilities were concentrated largely in the Corn Belt. Most of this was relatively inexpensive flat type storage some of which has since been sold by the CCC.

The above discussion indicates that we have a considerably larger farm and commercial grain storage capacity relative to yearly crop production today than a decade ago, so lower market returns to grain storage activities may prevail in the future.

Obviously, the federal government could not continue accumulating surplus grain stocks at the rate it did up to 1961, so a major change was subsequently made in farm income support programs. Acreage diversion programs were initiated under which farmers are required to divert acreage
to soil conserving uses as a requirement for income payments and price support loans. Farmers are also paid for diverting acreage above the minimum required for program participation.

These acreage diversion programs, together with increases in grain exports, have achieved the desired goal of reducing the level of government-owned grain stocks. By the end of the 1966-67 marketing year wheat and feed grain stocks are estimated to be 400 million bushels and 25 million tons, respectively. These carryovers are close to levels considered necessary for national emergencies. It is generally agreed that some level of grain reserves is desirable, but how much grain should we stockpile? Where should it be stored? Who should own it, the commercial trade, or the government? Under what terms and conditions should it be released? These questions merit more research attention by agricultural economists.

The decline of government-owned grain stocks will probably affect the structure and organization of the grain marketing industry. During the past decade, many grain marketing firms have grown accustomed to earning a sizeable share of their income through storage and handling grain for CCC. Opportunities to earn such income have now substantially declined or evaporated. Grain firms have entered a new era in which they can no longer rely on the CCC as a captive customer and must now compete for grain storage and merchandising income. Such elevator operators who may have forgotten how to merchandise and store grain on their own account may not be able to adjust to the change. There is good reason to believe that government grain storage and handling income may have kept some firms in business that otherwise could not have survived. It is interesting to note that in Minnesota, for example, the reduction in the number of country elevators in recent years has not been as great as the reduction in the number of creameries.

I would hypothesize that we will witness considerable adjustment in the country elevator industry in the next decade. A trend toward fewer and larger firms will be accelerated. While the initial impetus may come from the decline in government stocks, it will be reinforced by changes in transportation technology and the railroad rate structure which will be discussed later.
The grain marketing industry, as well as farmers, must also be prepared for adjustment to changes in the role of markets and market prices associated with the new farm program. The current trend in farm policy is to shift the basis of farm income support toward direct payments with lower price support loans under voluntary programs. Wheat marketing certificates that were initiated in 1964 and continued under the Food and Agriculture Act of 1965 for another four years, 1966 through 1969, represent a form of direct payment to participating wheat farmers. The wheat price support loan has been reduced from $2.24 in 1954 to $1.25 in 1966 and the Secretary of Agriculture has the authority to reduce it further under the new farm bill. The loan rate on corn was reduced from $1.62 to $1.00 during the same period with participating farmers also receiving income payments in 1966. Price support loan rates have been lowered to levels where they are much closer to competitive market prices. Consequently, the market is in a better position to determine price. This means that the price support loan has been relegated to an emergency role. While it still may be important to farmers, it is not the crucial factor in farm income that it was a few years ago.

The role of pricing, consequently, is being shifted from the government to markets which are experiencing a resurgence in activity. Sharp increases in trading volume have occurred in futures trading on the nation's principal commodity exchanges which is a reflection of greater price uncertainty and increased stock carrying by the private grain trade. The Commodity Credit Corporation is also assuming a smaller role as a marketing agency for the nation's grain. From 1953 to 1960, CCC acquired 8 to 16 percent of the corn crop each year while in 1963 through 1965 it acquired an average of 1 percent of the corn crop. From 1953 to 1960, CCC acquired an average of 27 percent of the wheat crop. In the years 1963-65, this figure fell to 4 percent. Grain marketing firms are now handling more grain on their own account and less for the CCC.

What are the implications of these changes to farmers? First, farm production decision making must now be made under conditions of greater price uncertainty. No longer will farmers be able to plan on the basis of market prices fluctuating within a narrow range around the price support loan rate. Second, market prices will likely be at levels lower than in previous years when farm income was supported solely through the support of market prices. Income payments under the current program are tied
to projected yields based on county averages not actual yields and, consequently, do not become a part of the price for decision making. To be sure, it is important in deciding whether or not to participate in the program. However, the return to marginal production is the expected market price with the lower support rates as a floor. So maximum profit is achieved at a lower output than under previous programs when loan rates were higher with no income payments. For example, the principal way in which a farmer can increase corn production on a given amount of land is to use more fertilizer, chemicals, etc. Due to diminishing returns to these inputs the marginal cost of producing corn rises as production is increased. Consequently, the

![Graph](image)

maximum profit output at a price of $1.62 per bushel is $OQ_1$, while at a price of $1.00 it is lower at a level of $OQ_2$ (Figure 5.1).
Economists have been slow to recognize the welfare implications of the shift to income payments. A welfare or social cost was involved under the old program when production resources were used to produce grains whose market value was less than the value of the resources used to produce them.2/

Professor D. Gale Johnson criticizes the current farm program on the grounds that income transfers do directly influence output decisions. He points out that since the allocation of marketing certificates to wheat farmers is based on projected farm yields defined by the program as "the yield per harvested acre of such commodity on the farm during each of the three calendar years immediately preceding the year in which the projected farm yield is determined," a farmer's yields this year will affect the value of income payments in subsequent years. This would induce farmers to produce more wheat than if there were a single price of $1.25.3/

While Johnson's point is well taken he does overlook an important factor in program administration which makes it less relevant. Projected yields are not exactly calculated for individual farms but are actually determined by township committees. They are subject to considerable error and therefore, the linkage between actual and projected yields is a good deal less direct than implied by Johnson's paper.

Marketing decisions by farmers also become more complex under a market-oriented farm policy. Decisions regarding when to sell and when to store grain were relatively simple under price support programs of previous years. Often the principal decision to be made was whether or not to take a price support loan. After a loan was obtained, the market price often did not rise above the loan rate so the grain was automatically delivered to the CCC. Farmers who did not take out loans found that prices fluctuated over a narrow seasonal range because the CCC usually was a seller when prices reached 105 percent of the price support loan rate or at lower rates when necessary to maintain the quality of its stocks. Greater price variability can be anticipated under the new farm programs.


These changes have important implications for research in farm management and production economics. Since the end of World War II, research workers have usually considered grain prices as a constant at the price support loan. Consequently, marketing decisions were not important and had relatively little effect on farm earnings. With greater price variability, however, marketing decisions become more important relative to production decisions as a variable in farm earnings.

Grain is a seasonally produced commodity while consumption is spread more evenly over the year. Consequently, someone must own and store it from the time of production to consumption. The private grain trade has traditionally performed this role in a free market because farmers are typically heavy sellers at harvest time. However, with the expansion of farm storage facilities in recent years more farmers may want to store grain when it is profitable to do so. Farmers, like grain merchandising firms, can use cash-futures price relationships as a guide to storage operations. When cash grain is at a discount to the future, often at harvest time, the market indicates that it is profitable to store. At such times farmers can store their grain and sell a future contract as a temporary substitute for the sale of cash grain later in the cash market. This is hedging -- a device through which a return on storage can be earned. On the other hand, when cash grain is at a premium to the future, usually in periods of short supply relative to demand, it is probably unprofitable to store.

In order to take advantage of profitable storage opportunities when they arise, the farmer must thoroughly study the relationship between his selling price for cash grain and the futures price over time. This is his local cash-basis. He must be a careful student of the cash-basis if he is to utilize the futures market to earn a return on storage through hedging.

Farmers might also consider using the futures market to sell their crops in advance of the completion of production when futures prices are regarded as favorable. This procedure has been described by Working as anticipatory hedging.4/ The anticipatory hedge, as the storage hedge described above, also serves as a temporary substitute for a later sale of his grain in the cash market.

In a discussion of an earlier draft of this paper, Professor Havlicek raised a question as to whether the above described uses of futures markets were really hedging. Is not hedging simply an "insurance policy" which protects the holder of stocks against a price decline? Several excellent research studies have presented convincing evidence that most hedging is not undertaken with risk aversion being the primary motive.\(^5\) Hedging is usually done in the expectation of a change in the cash-future price relationship -- a change that can reasonably be predicted at the time the hedge is placed.

The over-emphasis of risk aversion in discussions of hedging has diverted attention from the more important economic contributions of futures markets. Since farmers are beginning to raise more questions about the use of futures markets in their marketing decision making, production economists may find it worthwhile to analyze the potential use of these markets in greater depth.

**The Expanding Export Market**

A second significant change in grain marketing is the increasing importance of the export market as an outlet for United States grain. The total value of U. S. agricultural exports increased 29 percent from 1960 through 1965 reaching $6.2 billion in the later years. Almost all of the increase has been in commercial sales which were 77 percent of total exports in 1965. Exports under Government-financed programs made up 23 percent of total exports -- the smallest proportion since the beginning of the P. L. 480 program in 1954.

Exports of grains and oilseeds have increased more rapidly than other agricultural exports in recent years and, as a result, now make up a larger percentage of the total. Combined exports of wheat, feed grains, oilseeds and their products totaled $3.5 billion in 1965 or 56 percent of our total agricultural exports.

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The importance of exports to United States grain farmers is dramatically illustrated by comparing exports with domestic production. In fiscal 1965-66, wheat exports were 65 percent of our domestic production. Over two-fifths of our soybeans, one-third of our grain sorghums, and 16 percent of our corn were marketed overseas.

What has been responsible for our significant increase in agricultural exports? Most of the increase can be attributed to the increased world demand for U. S. farm products. Commercial exports of feed grains and soybeans to industrial, developed countries have increased as they have intensified animal agriculture. Livestock and poultry production in Western Europe and Japan have gained sharply in recent years as higher income has strengthened the demand for meat. While the commercial demand for our wheat has remained relatively constant in recent years, we have increased our exports of wheat under P. L. 480. Over two-thirds of our wheat exports last year were government financed under the Food for Peace Program.

What is the outlook for our agricultural exports? First, industrial countries, especially in Western Europe and Japan, will probably continue to increase their purchases of United States feed grains and soybeans as economic growth continues. It is significant to note that income elasticities of demand for meat are higher and per capita meat consumption is lower in the rest of the developed world than in the United States. In the six countries of the European Economic Community, for example, per capita consumption of beef and veal was 51 pounds in 1963-64 while the United States it was 106 pounds. Per capita consumption of poultry was 15 pounds in the EEC compared to 37 pounds in the United States.

Second, the need for food in the less developed regions of the world is increasing faster than food outputs. Population in many parts of Asia, Latin America, and Africa is rising more rapidly than the food supply. To help meet these increased food needs, a modified and expanded Food for Peace bill has been passed Congress. One of the changes is that U. S. food aid will now be contingent upon efforts in the recipient countries to increase their own food output. This is recognition of the fact that expanded food aid is not a permanent solution to food shortages in the developing countries because the day is not far off when the United States will not be able to fill the food gap. The long-run solution lies in helping these countries improve their own agricultural productivity.
Expanded United States food aid will have a larger impact on our wheat production than other grains. Indications are that our wheat exports will continue to be heavily dependent upon food aid.

In the past we have had a tendency to look upon foreign markets as a residual claimant to our domestic agricultural production. In other words, crops and food products have been produced mainly for our domestic market with foreign markets considered only when production exceeded our domestic needs. But the day has past when we could gear our agricultural production and marketing practices to the domestic market only. We cannot overlook the fact that the needs and demands of foreign consumers may be different than our own. Recognizing special tastes and preferences of foreign buyers and gearing our farm production and marketing practices to these demands is essential.

Transportation Technology and the Railroad Rate Structure

Changes in transportation technology and the railroad rate structure have also had a significant impact on grain marketing in recent years. Changing transportation patterns and rates have altered commodity price relationships among markets within a region as well as between producing and consuming regions. The competitive position of both producers and processors of farm products among regions has also changed.

Advances in transportation technology have been particularly rapid since the end of World War II. The construction of interstate highways has enabled trucks to become more competitive. Improvements to inland waterways have made it possible for barges to capture an increasing share of the long-haul grain movements. Railroads, while still important, have experienced stiff competition for agricultural traffic. Their rate structure that was developed during the early thirties when railroads had monopoly power has been under pressure in the new era of competition. This rail rate structure was originally designed to enable processors and merchandisers at different market to compete equally with respect to transportation charges for raw materials and products, even though they did not have equal geographical advantages. In other words, it was not based on costs of providing the service.
Railroads have responded to increased competition by selectively reducing rates on grain. The trend has been for them to offer new "mileage" and "multiple-car" rates for grain based on costs of providing service. The new grain rates provide fewer transportation services such as transit and routing privileges than the old rates. In general, the effect has been to reduce the rates on grain relative to grain products. This has worked to the disadvantage of many midwest grain processors that are heavily dependent upon the old rail rate structure.

Agricultural economists probably have not devoted enough research effort to analyzing the impact of changes in transportation rate structures that alter rate differentials between grain and grain products or between grain and livestock products. Changes in transportation that reduce rates on grain relative to grain products and livestock products affect the competitive position of midwest livestock producers as well as agricultural processors. The reduction of rates on feed grains into the Southeastern United States through low cost barge traffic on inland waterways certainly was one factor in the rapid growth of the broiler industry in that area. More recently there has been discussion of a possible decline in the competitive position of cattle feeding in the corn belt relative to the plains states and the far west. Population on the west coast is increasing relative to other areas in the U.S. so we can anticipate greater movements of farm products from the midwest to the west coast. Consequently, changing transportation rates between feed grain, livestock and livestock products take on added significance.

Spatial equilibrium models are useful tools to analyze the consequences of changes in transportation costs on the spatial distribution of prices and movements of commodities. The usefulness of the results of these models, however, is often no better than the quality of the data going into them. The latter deserves more attention.

We will probably see a trend toward the increased use of special mileage, multiple car railroad rates on grain at the country level. This will give an advantage to country elevators that can accumulate grain in sufficient volume to qualify for these rates. Some elevators are already offering price premiums to farmers who can deliver grain in large quantities. Here we have an interesting parallel between economies of scale in marketing and farm production. Increasing economies of scale in grain marketing may become an important contributing factor to economies to scale in agriculture.
Changes in Farm Production Technology and Marketing

Interrelationships between changes in farm production technology and marketing are well illustrated in the case of feed grains. We used to think of our feed grains being fed mostly on the farms where they were produced. In the 1930's farmers fed 75 percent of the feed grains they produced to livestock on their farms. In recent years, however, only one half of our feed grains have been fed on the farms where they are produced while the other half has moved into marketing channels. This is a reflection of increased specialization and commercialization in agriculture. The increased movement from farms also reflects an increase in the use of feed grains for food, industry, and export. U. S. exports of feed grains reached 29 million tons in 1965-66, more than double their level of 5 years ago. Exports of corn, our principal feed grain, were 700 million bushels in 1965-66 which was a third of the farm sales of corn.

One of the more significant developments in farm production technology affecting corn marketing in recent years has been the increased harvesting of corn with field shellers, particularly combines with corn heads. This has caused substantial changes in corn marketing patterns which have important implications to both country grain dealers and farmers.

The rapidity of the shifts to corn field shelling has been dramatic in the eastern part of the Corn Belt. In Indiana, for example, 52 percent of the 1964 corn crop was field shelled -- up from 18 percent for the 1960 crop. The proportion of Iowa corn field shelled is lower, 18 percent of the 1964 crop, but up substantially from 10 percent of the 1960 crop.

Many expect that field shelling of corn will continue to increase and account for substantially all of the corn crops in certain states within a few years.

Some of the marketing implications of the changes in corn harvesting methods have been discussed by Professor L. F. Stice. First, a much larger proportion of field-shelled corn than ear corn moves direct from the field to market. In 1963, 40 percent of the field shelled corn in Illinois was marketed direct from the field in contrast to only 3.5 percent of the corn harvested as ear corn. Second, field shelling causes the corn harvest to start earlier and to be completed in a shorter time. Third,
field shelled corn has too high moisture to permit storage without drying or heavy aeration. All of these factors tend to increase the pressure on country elevators at harvest time.\(^6\)

Farmers' decision making in marketing high moisture, field shelled, corn is more complex than when ear corn was harvested. The farmer can decide to sell high moisture corn directly from the field at harvest and accept a moisture discount. Otherwise, he can dry the corn and sell it immediately or store it for sale later. If he dries his corn he must decide whether to purchase his own drying equipment or have it done commercially at the elevator. Similarly, he can either store his corn at the elevator or on his own farm. Increased price variability and price uncertainty associated with the new farm program will further complicate his marketing decision making.

If the present trend of marketing a high proportion of field shelled corn at harvest continues, one would expect greater price depressions at harvest and a greater seasonal price rise in corn. Consequently, farmers will have to be careful students of seasonal price movements to maximize profits. As argued previously, the corn futures market can serve as a useful guide to corn storage with returns to storage earned through the mechanism of hedging.

Conclusions

In summary, I have argued that grain market structure and organization have been affected by government price support operations and surplus stocks owned by the CCC during the past two decades. The recent shift in farm income support to income payments and lower price supports will mean that the government will play a smaller role in grain marketing in the future than in the past. Markets will be relied on more extensively in price discovery and grain firms will again carry more stocks under private ownership. Grain firms as well as farmers will find decision making more complex with greater price uncertainty. These changes will hasten adjustments in market structure -- particularly at the country level.

The export market will become increasingly important as an outlet for United States grain. Commercial exports of both feed grains and soybeans to the developed world will continue to expand as these countries intensify animal agriculture in response to increases in the demand for meat. Income elasticities of demand for meat are higher in most of these countries than in the U. S. Wheat exports will continue to be heavily dependent upon food aid. The increased importance of the export market calls for more marketing and demand and price studies beyond the continental boundaries of the U. S.

Changes in transportation technology and the railroad rate structure have altered relationships between grain and grain products and between grain and livestock products. Such changes affect the competitive position of midwest producers and processors of agricultural products. Analyzing such problems through spatial equilibrium models with better data will prove fruitful.

Finally, the increase use of corn combines in harvesting is altering marketing patterns. Farmers' marketing decisions are more complex with high moisture corn. As the harvest period is advanced and shortened the seasonal variation in corn prices may increase. Therefore, decisions as to when to sell and store will become more important. Farmers may find it advantageous to use the futures market in making these decisions.