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The United Nation's World Food Conference in 1974 issued an urgent appeal for international cooperation to build reserve stocks of grain to assure adequate food when crops fail. Since then, governments, international groups, farmers, and other concerned citizens have debated the problems of food security and grain market instability at length. Many studies have resulted. And, in 1977, the U.S. government instituted a farmer-owned grain storage program.

This issue of *Minnesota Agricultural Economist* focuses on grain reserves. The first article looks at current U.S. policies, proposals and programs which reflect a general commitment to stabilize domestic grain markets and ensure supplies to meet foreign commercial and food aid requirements. Grain reserves are not needed to achieve domestic stability. Export controls could do that. But export controls run counter to the U.S. commitment to expand world trade, reduce trade barriers, and continue to be a dependable supplier. So grain reserves become an attractive option.

A planned grain storage program alters both national and international grain markets and requires operating rules and decisions about stock sizes. The second article highlights the findings of economic research on these points.

U.S. Grain Reserve Policies

Mary Ryan*

Bob Bergland, U.S. Secretary of Agriculture, has called grain storage the cornerstone of United States food and farm policies. A farmer-owned grain reserve is in operation. Under it, U.S. farmers voluntarily agree to hold food and feed grains off the market until the demand for grain here or abroad buoy U.S. prices to a specific level. In addition, there are proposals for a government-owned grain stockpile for international emergencies to assure supplies for poor countries dependent on the U.S. for food aid.

The current grain storage programs are the first the U.S. government has undertaken with the specific intent to store grain. In the past, grain stocks were accumulated as a consequence of government programs to buoy farm prices.

Farmer-owned grain reserve

The Food and Agriculture Act of 1977 authorizes a grain reserve program for wheat and feed grains during 1978-81. It offers farmers a long term loan on their grain plus payments for storage. In return they agree to certain restrictions on grain sales. The purpose is to steady market extremes by accumulating grain stocks when production is large and prices are falling and by selling grain when production is low and prices are rising.

Currently grain-reserve loans are for 3 years. The reserve grain can be sold without penalty before loan maturity only if national average market prices rise above release levels (the specific level mentioned earlier). If prices remain above release levels for 2 months, storage payments cease. If prices rise higher, to the call level, the government may call the grain loans for early repayment. The purpose of stopping storage payments and calling loans before due is to encourage farmers to sell their grain. Current loan, release, and call levels and May 1979 market prices follow:

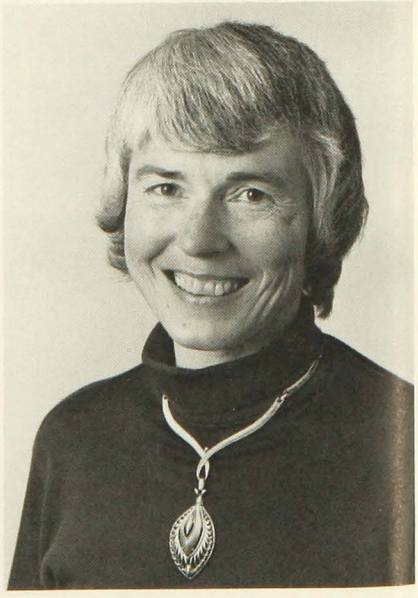
Crop	Loan level	Release level	Call level	National average farm price (May 1979)
Wheat	$2.35	$3.29	$4.11	$3.22
Corn	$2.00	$2.50	$2.80	$2.34
Barley	$1.63	$2.04	$2.28	$2.03
Oats	$1.03	$1.29	$1.44	$1.29

Under this program, farmers remain owners of the grain. Once release prices are reached, marketing decisions are theirs. They may sell or continue to hold. The government's role is to make it financially attractive for farmers to store grain when market prices are low and to sell when prices are high.

Farmers began to place grain into the reserve late in 1977. In 1980 grain reserve loans begin to mature. The accompanying tabulation gives the quantity of grain in the reserve for Minnesota and the U.S. Average carryover stocks, U.S. disappearance, and Minnesota production are given also for comparison. Carryover stocks (meaning from one harvest to the next) for wheat, barley, and oats are for June 1 and for corn, October 1.

The carryover figures are for years when supplies were tight and prices strong. The figures in parentheses are for the lowest carryover in any 1 of the 3 years. The lowest level can be considered the minimum needed for pipeline or working stocks.

The production and disappearance data are for the 3 most recent years. Nationally, the corn grain reserve is more than 12 percent of annual average disappearance and is estimated to be 43 percent of the carryover into the 1979 crop year. The comparable figures for wheat are 22 percent of annual average disappearance and 41 percent of the carryover. More corn is now in the grain reserve than the average carried over from one year's harvest to the next between 1974-76.



Mary Ryan

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United States

Crop	Average carryover 1974-76	Average disappearance (Domestic use + exports) 1976-78	Grain reserve May 1979
	million bushels		
Wheat	480 (340)*	1882	405
Corn	415 (361)	6172	729
Barley	122 (92)	387	39
Oats	245 (205)	600	42

*lowest carryover in any one year.

Minnesota

Crop	Average carryover 1974-76	Average production 1976-78	Grain reserve May 1979
	million bushels		
Wheat	19	119	56
Corn	44	525	147
Barley	20	46	11
Oats	43	119	14

These data indicate that the volume of grain stored under the farmer-owned grain reserve program is substantial. At present wheat and oats prices have reached release (selling) levels so farmers may sell those grains from the reserve. Earlier release levels were reached for barley in summer 1978 and for oats in March 1979. Both situations were temporary. Almost no barley moved out of the reserve. About 10 percent of Minnesota oats were sold from the reserve. Such short term price rises for individual crops indicate special market situations, such as transportation bottlenecks, and not a fundamental change in grain markets.

The reserve to date has supported farm incomes in 1978 and 1979 by buoying prices. As the grain is released, buyers will benefit because sharp price rises will be moderated.

Grain storage capacity

A separate government program offers loans to farmers for constructing farm storage and drying facilities. While this program is separate from the grain reserve program, it has allowed many farmers to build new storage facilities and participate in the reserve. Besides loans from the government, private credit has been widely used to expand farm storage.

A 1978 survey of storage capacity found that Minnesota farms could store 1.2 billion bushels of grain with an additional 368 million bushels available in commercial elevators and warehouses. For the U.S., 1978 farm and commercial storage capacity was 9.9 billion and 7.0 billion bushels, respectively.

International emergency wheat reserve

This is a special reserve for emergency food assistance to developing countries. The purpose is to insure that the U.S. will have enough grain for food aid programs even in years of worldwide shortages. This reserve does not exist now, but proposals are being discussed. One proposal is for a 6 million metric ton reserve, which is the equivalent of 220 million bushels of wheat. If the grain in the emergency reserve is to be held by the Commodity Credit Corporation (CCC), it would be released only for food aid shipments and would not enter commercial markets.

The U.S. has not been a constant supplier of grain under food aid programs largely because expenditures for food aid are approved on a dollar rather than volume basis. Under that method, quantities fall as prices rise. Moreover, domestic political support to increase food aid expenditures is greatest when U.S. grain prices are low, indicating large supplies. The U.S. stance frequently works counter to food needs in developing countries. When that need is greatest, the U.S. has the least to offer but encourages grain imports at time of plenty. Understandably recipient countries stress the importance of a continuing, steady flow. A special grain reserve, earmarked for food aid, could make the U.S. aid program more suitable for developing countries.

On May 2, 1979, the CCC owned 92 million bushels of corn and 50 million bushels of wheat. Probably CCC wheat would be considered part of the international emergency wheat reserve if the proposal becomes law.

The grain was acquired from growers who chose to sell grain to the CCC or deliver it to the CCC instead of repaying short term commodity loans or placing the grain in the grain reserve program. Currently this grain may be sold when the market price reaches $4.23 for wheat and $3 for corn. Selling prices are set by the Secretary of Agriculture at or above the legal minimum of 150 percent of the loan rate. The Secretary put the wheat selling price at 180 percent of the loan so CCC wheat would not be sold ahead of wheat held by farmers under the farmer-owner grain reserve program.

International agreement on grain reserves

For many months the U.S. and 66 other nations deliberated the formation of a coordinated system of nationally held stocks of wheat. Three rounds of meetings took place between February 1978 and March 1979. Agreement was not reached. Differences centered on the total stock size, trigger prices for the accumulation and disposal of stocks, and financial aid for developing countries to build and maintain stocks. Although the attempt failed, the issue is not dead, since the unpredictability and variability of grain production in the U.S. and abroad remains. Those concerned with food and farm policies will continue to seek ways to stabilize grain markets and assure worldwide food security through storage programs.

Concluding comments

The grain reserve programs and proposals described are an integral part of U.S. food and farm policy. Their chief contribution is to stabilize prices and supplies in grain markets. More stable markets prevent extreme price gyrations which disrupt domestic food and livestock sectors, U.S. commercial exports, and food aid programs. The accompanying article provides some background on the problems grain reserves are meant to solve and suggests how reserve programs might work.

What Has Been Learned About World Grain Reserves?

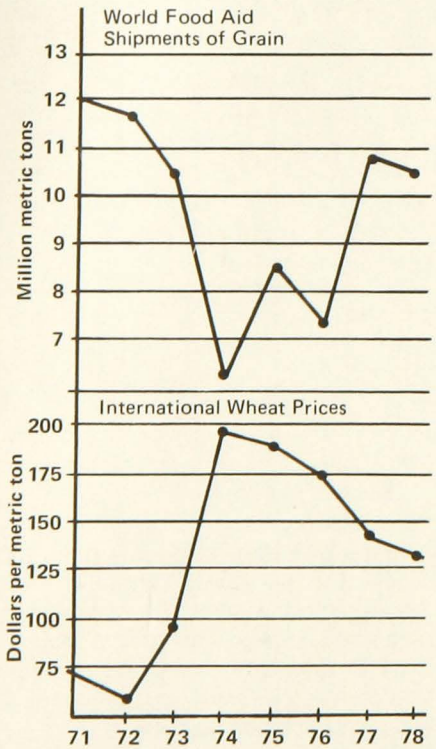
Mary Ryan and James P. Houck†

Recent widespread interest in grain reserve stocks comes from a desire to stabilize worldwide grain markets and to maintain food supplies when crop failures occur. Although these goals are not new, they are receiving renewed attention because when world grain supplies were short in the 1970's, prices climbed steeply and food aid shipments to poor countries were cut. As production recovered and stocks were rebuilt, prices eased and aid shipments revived (figure 1).

Designing and operating a national or international grain reserve program raises questions and issues very important to the U.S. as a major producer and exporter of grains. Will any particular grain reserve program meet its objectives? Will it be the best way to achieve those ends? How will it affect grain markets? What will it cost? This article looks at these questions. It draws on a University of Minnesota study which examined more than 100 research reports and analyses of grain reserves.

The grain reserves research examines a wide variety of possible reserve programs—reserves held by an international agency, reserves held by individual nations for at-home needs, and reserves held by a group of nations (or an international agency) to meet emergency food shortages in poor countries. Some studies evaluate year-by-year storage programs for 5-10 years. Others take a much longer view. This body of research does not yield single answers to questions such as: Why establish a public grain reserve? How does a grain reserve affect farmers? Consumers? Exporting nations? What size should a grain reserve be? When should grain be placed in or released from the reserve? Nonetheless, much has been learned to narrow the range of questions and reasonable answers.

Figure 1.



Source: U.S. Department of Agriculture

James P. Houck

Why stabilize markets with a grain reserve?

Grain storage programs are proposed to reduce the fluctuations in supplies and prices that typify grain markets. A continuous secure flow of grain products to consumers is paramount. Moreover, wildly fluctuating grain prices are undesirable because they add uncertainty to decisions of growers, marketing and trading firms, buyers, and policymakers. While such price movements create the opportunity for some to obtain occasionally large profits, others suffer losses, and all find planning extremely difficult.

Periods of boom and bust may cause political turmoil and can often lead to ill-advised short term actions. For instance, in the mid 1970's when prices soared, the U.S. curtailed some grain exports because of pressure from U.S. consumers. That action is still being criticized by other nations. They question U.S. dependability as a grain supplier and appear reluctant to become too dependent on U.S. grain. As a result U.S. exports may suffer in the longrun.

Humanitarian concerns encourage U.S. grain storage to meet critical food needs in poor countries. When food is short and prices high, those least able to cope suffer most. Malnutrition, starvation, and death occur among the poorest. So a crop failure in poor countries can become a disaster if a supplement is unavailable.

Of course, public grain storage is not the only way to moderate seesawing prices and supplies. For example, freer trade among nations also would reduce the extremes by spreading the impacts of surpluses and shortages more evenly among nations. However, since no nation wants to depend on another for a vital share of its food supply, completely free trade for food is unrealistic.

Another way to attack grain shortage and surplus situations is to adjust year-to-year production to meet anticipated needs. But even if accurate planning were possible, this method is unreliable because plans may go awry if weather is abnormally bad or good. Storage is costly, but it has fewer shortcomings than other options.

Even without a government grain storage program, some grain is stored from one crop to the next. Grain firms, feed manufacturers, and livestock producers store grain for expected needs between harvests. These stocks are commonly called working stocks. Grain is also stored by some farmers and firms anticipating a price rise greater than the storage cost. This is called speculative storage.

Private working stocks and speculative storage normally smooth out much of the fluctuation which otherwise would occur within and between crop years. But because no one can predict the unpredictable, private storage may be inadequate to cover extreme situa-

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tions acceptably. Private firms would find it unprofitable to carry stockpiles large enough to offset such events. Short term speculation can upset markets even more, especially when supplies are tight. So impetus for a public grain reserve program rests heavily on the argument that private storage may be inadequate in some years.

Who benefits?

There is no easy answer to this question despite much research. Producers gain when a stockpile is created or enlarged—prices go up and sales expand. They lose when the stockpile is reduced as prices fall and markets are filled with previously stored grain. Consumers lose when a stockpile is enlarged as prices rise and some supplies move into storage out of private hands. Consumers gain during draw downs of stocks as price rises are dampened and supplies become more abundant. Yet these general tendencies give no indication whether one group is the long term gainer. In fact, that question cannot be answered because it depends on many other interrelated factors.

If the poor are already protected from food shortages by dependable food aid programs, they may not benefit from storage. If producers are already protected from low prices by government price supports, storage will not benefit them. There is little gain from these arguments.

Similarly, there is no clear answer about whether exporting or importing nations benefit more from a storage program. Again, it depends on each nation's domestic programs and trading policies. Today, the U.S. is subject to more instability in its grain markets than most other developed trading countries because the others insulate their domestic markets from world market forces to a great extent. Developing countries, depending on others for grain, also must face worldwide instability. A storage program that stabilized world grain markets would reduce instability both in the U.S. and many developing countries.

Lack of certainty about how the benefits and costs of grain reserves are apportioned within and among nations explains much of the confusion and disagreement surrounding recent negotiations. Decisions will be made mainly on political grounds rather than on clear economic or social criteria.

Stock size

Recommended sizes for world reserve stocks of wheat and feed grains range from about 15 to 80 million metric tons (the equivalent of 0.5 to 3.0 billion bushels of wheat). The range is from 1 to 7 percent of world wheat and feed grain production. It suggests that there are many dimensions to the question of how much grain should be carried. Among these are the stock's purpose, the nation or nations involved, other policies in existence, and costs—all interrelated.

Since all stock programs aim to smooth out supplies between years of plenty and scarcity, the question of how much to store is closely linked with how widely grain production fluctuates. For the entire world, grain production does not vary much from year to year—perhaps 3 or 4 percent. This suggests that relatively small stocks in combination with modest consumption curtailment in some years could adequately offset most world production shortfalls. But, this is not true. Only if grain could move freely from producing to consuming parts of the world would variations in global production be relevant.

The dramatic market fluctuations of the 1970's are evidence that adjustments are not modest, that movement of grain among nations is not free. Grain trade is enmeshed in numerous obstacles, chief among them import and export barriers and, in many developing countries, inadequate marketing systems and financial constraints.

Nations erect grain trade barriers to protect food supplies. Many seek a relatively high degree of food self-sufficiency even if food usually can be obtained more cheaply abroad. Some prohibit exports even if selling food abroad would be very profitable. Commercial buyers fear export embargoes. Food aid recipients fear cuts at critical times. History has substantiated both fears. Because food is essential, governments are not willing to risk shortages despite high costs.

Many developing countries are constrained further by inadequate and inefficient distribution systems for large volumes of imported grain. Unfortunately, it is true that grain has rotted on docks while people inland have starved. Even developed countries face transportation bottlenecks when grain movement is heavy. Finance is another serious problem in poor countries. If a crop failure in a poor nation coincides with tight food supplies and high prices, an already meager foreign exchange budget can be strained to the breaking point.

The next question is how much grain market variability should be offset by a storage program? Or, stated another way, how much market stability and/or food security is desired? Virtually all research suggests that full protection against very extreme shortfalls would require an unworkably large and expensive grain stockpile. However, the size of the needed reserve dips rapidly as the risk of shortage increases.

Other studies evaluated the price-stabilizing effects of stocks. One showed that a global wheat stock of 15 million metric tons capacity could prevent prices from rising more than 40 percent above the average level, 19 years out of 20. Another estimated that a stock averaging 31 million metric tons could keep prices within 20 percent of an average level. These examples illustrate the relationship between stock size and stability—the larger the stock, the greater the potential stability.

Storage costs

There is general agreement that storage operations will not cover costs if stocks are large enough to provide adequate stability and protection to vulnerable consumers—especially poor consumers in poor nations. So financing becomes a major concern. Storage costs include handling, quality maintenance and capital investments in both warehouses and grain stored, and all depend largely on the quantity of grain. The investments reflect the value of resources tied up in storage facilities and grain not available for other uses.

Since storage for market stability or food security is likely to be a losing business over time, it requires subsidies to private storers or public storage.

To evaluate costs of government-financed storage programs, other related government programs must be considered. For example, costs of programs to protect farmers from low prices and consumers from high prices will be reduced if market price extremes are moderated by a storage program. Hence, the net cost of a government storage program may be less than its gross cost. Subsidies to U.S. farmers

to store grain can be viewed as an alternative to paying farmers to withdraw land from production.

Storage rules

A public storage system requires operating rules so managers know when to acquire and when to dispose of grain. Under some rules stocks are managed according to price levels, others use quantities, and still others combine price and quantity rules. Most storage plans operate only when prices or quantities move outside some specified range.

The U.S. farmer-owned grain reserve combines price and quantity rules. Farmers place grain in the reserve at the government loan rate. Sales from the reserve are permitted when market prices are at or above the release level. Meanwhile, the government opens and closes entry of grain to the reserve according to the supply of grain and the target stock size

Several studies investigated consequences of changing the width of price bands (ranges) governing stock activity. For example, a wider price band exists for wheat in the U.S. farmer-owned reserve than for feed grains. The wider band reduces the chances of having no stocks when major shortfalls occur. With a narrow band, stocks are released when shortfalls are modest. Market prices vary more with a wide band, but the occurrence of extremes is less. Although storage under the public program does not occur within the price band, private stock activity does occur.

If the whole price band is too high, stocks will build up rapidly to capacity. Too high production may need to be curtailed to keep the maximum storage level within a reasonable limit. If the price band is too low, the storage agency will run out of stocks frequently. No stocks may be available when a severe crop failure occurs.

Concluding comments

In recent years, economists have spent a lot of time studying the possible operation and results of world grain reserve programs. Many plausible schemes have been examined from as many angles. But because the world lacks actual experience with grain reserve programs, research conclusions are largely conjecture and informed guesswork. It does appear from the research that a feasible grain reserve/food security program could be established to both stabilize world markets to some degree and to assure poor nations of access to grain in times of emergency. However, political commitment to this on the international level is surely not evident in today's world.

A more detailed report, entitled *Economic Research on International Grain Reserves: The State of Knowledge*, will be available in September 1979 from the Department of Agricultural and Applied Economics, 1194 Buford Ave., University of Minnesota, St. Paul, MN 55108, Attn: Publications

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