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POLICY ALTERNATIVES TO MANAGE DEMAND: FOOD RESERVES AND STORAGE PROGRAMS

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This paper is designed to provide background essential to the public policy discussion on food reserve and storage programs. I will consider the role of the United States in the world grain reserve picture, current trade and stock policies of major trading countries, and summarize the resulting policy issues. I will then address U.S. policy options, such as continuation of the current farmer-owned reserve (FOR) program.

In spite of the many achievements of the 20th century, only meager global food reserves exist. At the end of each marketing season, world carryover stocks of coarse grains and rice represent roughly one month's consumption. Wheat reserves are a little larger; a two-month supply is usually carried over to the next year. The modest nature of food reserves is underscored by the fact that without food, a healthy person can stay alive for approximately the same period — one to two months.

In some ways, food security reserves are even more limited than these minimal carryovers suggest. In a global context, food reserves must be cheap to store and easy to transport. As a result, practically all of the world's food reserves are in the form of the above mentioned grains and soybeans and must undergo considerable processing before they can be consumed. Most of the world's grain reserves are stored far away from areas of likely need. Only the U.S. and a few food abundant nations have developed such reserves. Therefore, global food reserves are not immediately available to many regions facing emergency situations.

Finally, there is the variability of world food production. In the 1972 world food shortfall, food output in the developing nations collectively dropped more than 3 percent. World grain reserves dwindled to "pipeline" levels, corn and soybean prices doubled, and wheat and rice prices tripled. The vagary of nature makes food reserve management a formidable task.

Viewed as food security reserves, global food stocks are small, stored in food abundant countries in a form that must be processed before consumption, and must meet extremely variable needs. However, I want to examine these stocks from a broader perspective — their potential impact on demand and price variability — similar to that by Cochrane, Martin, and Spitze. Food reserve and storage programs have the potential of reducing the variation in farm prices and income, and much of the current debate concerns how well they perform this function.

The global nature of the problem requires that U.S. grain reserves and storage policy be considered in a world context. But the rest of the world provides us with mixed signals. World organizations such as the International Wheat Council and the Food and Agricultural Organization of the United Nations encourage building food reserves in both food abundant and deficit countries. However, most countries maintain few reserves, and in fact, aggravate world market instability through restrictive trade policies. Other policy issues include who pays for global food reserves, who makes decisions, where the reserves should be located, and what form of treaty arrangements are appropriate for policy implementation.

Grain Reserves and Buffer Stocks

First, some basic concepts need to be identified. Eaton distinguishes the four types of grain reserves shown in Table 1. The purpose of each reserve type differs as does their impact on demand. Working stocks are maintained to provide an orderly flow of grain during the marketing season. These are sometimes referred to as pipeline stocks and may be thought of as the amount required to perform the normal business of marketing and processing grain. The quantity of working stocks required is rather constant from year to year, being determined by the efficiency and size of the transportation system, the volume of grain being processed, and other factors. Thus, working stocks represent a relatively constant demand factor.

Table 1 — Four types of grain reserves

Reserve type	Demand impact	Rate of reserve turnover
Working stock	Relatively constant	Disposed of within 1 year of growing cycle
Buffer stock	Long run stabilizing	Buildup and release rules set at time in storage
Emergency reserve	Tends to stabilize	Depends upon what is defined as an emergency
Food aid reserve	Increase	Determined by need of target group

Buffer stocks are grain held from a good harvest year to use in a poor harvest year. They reduce variability in grain prices and food prices over a period of years. Private firms hold buffer stocks for speculative motives with the expectation that a profit will be made from storing. Governments hold buffer stocks for similar reasons. Since the economic factors affecting the expected profit from grain storage are volatile, the quantity of speculative buffer stocks held changes considerably from one year to the next, varying inversely to demand. It is these speculative stocks — not working stocks — that buffer grain markets by moderating the price increasing impact of shortages and the price depressing impact of surpluses. They have a long run year to year stabilizing effect on ground demand.

Additional global reserves are often held to meet emergency food needs. These food reserves are made available and distributed to developing countries in times of emergency production shortfalls, regardless of the domestic supply situation in the exporting countries. They tend to stabilize demand by preventing excessive price increases in times of unexpected shortages. Finally, food aid reserves reflect the world's commitment to alleviate hunger, irrespective of whether crops are short or ample or whether disasters have occurred. Food aid tends to increase demand rather than reduce its variability, depending on how need is defined.

The main focus here is on buffer stocks, or speculative carryover stocks of grain. Buffer stocks carry the load of moderating year to year instability in the world grain market. The size of buffer stocks, their control, location, and ownership determine how much of the variation in world supply and demand is transmitted directly to producers and consumers.

The Role of the United States in World Grain Reserves

The current level of U.S. grain exports and prospects for the future will only be summarized here. The consumption of grains and oilseeds in the world outside the United States has been increasing at the rate of over 35 million metric tons per year. Production outside the U.S. has risen 25 million tons yearly. The annual deficit of over 50 million tons at the beginning of the 1970s more than doubled to over 145 million tons in 1979. This widening shortfall in the rest of the world is filled by U.S. grain exports. The U.S. currently exports about 40 percent of its corn crop and 60 percent of its wheat crop. U.S. exports represent about 60 percent of all world trade in coarse grain, and about 40 percent of world wheat trade.

Variability in world production is increasing and will continue to increase. Much of the land likely to be brought under cultivation in the 1980s will be semi-arid land where annual swings in yield and production depend primarily on weather. Bringing these new lands

under cultivation will tend to increase global grain yield variability. O'Brien suggests that annual fluctuations in foreign demand for U.S. products will widen significantly in the 1980s, possibly resulting in a doubling of variability in the next 10 years, on top of the tripling of export variability that has occurred already in the last 15 years. The forecast that export trends of the 1970s will continue and even accelerate during the decade of the 1980s is extremely significant as we consider U.S. buffer stock policy.

U.S. Farmers Hold World's Buffer Stocks

The U.S. plays a dominant role in maintaining world grain stocks and food reserves. In recent years the United States held about one-fourth of the world's wheat stocks and 40-50 percent of the world's coarse grain stocks. However when we distinguish between working stocks and buffer stocks, the U.S. role is greatly increased. Statistical analyses by Gronewegan and Sharples and by Webb and Jabara suggest that only in the U.S. are large grain reserves clearly managed as buffer stocks. The stock management practices of most other major countries do not contribute significantly to world price stability. Thus the grain stocks held by the rest of the world appear to be working stocks — the world's buffer stocks appear to be held almost entirely by the United States.

Within the United States, evidence suggests that farmers themselves owned most of the buffer stocks during the 1970s. The fact that farmers own most of the grain stocks in the middle of the marketing year — possibly 90 percent of all U.S. corn stocks and 80 percent of all U.S. wheat stocks on January 1 — suggests that U.S. farmers hold buffer stocks and that the domestic grain trade holds the working stocks. Therefore, U.S. farmers control most of the world's buffer against price depressing surpluses and price increasing shortages. Countries linked to the grain trade depend on continued U.S. farmers stock holding as the main stabilizing force in the world market.

The Effect of Trade Policy in Other Countries

While some of the variability in world grain markets results from natural factors, the trade policies of individual countries aggravate this natural variability. A hypothetical example is useful here. Assume that the world has a 5 percent grain shortfall. If all countries share this shortfall proportionately, all would reduce consumption 5 percent and the world price would increase by 10 percent. This result represents a completely free trade situation. Alternatively, assume one-half of the world decides not to reduce consumption but to maintain it at previous levels. Then the 5 percent shortfall becomes a 10 percent shortfall for the remaining nations, requires them to restrict consumption 10 percent, and increases world prices by 20 percent. In this way, policies that insulate individual coun-

tries from world supply and demand adjustments proportionately increase the variability and the burden of the adjustment on the remaining countries.

This example is not unrealistic. In the last dozen years or so, a major block of grain deficit countries, the EC-9, USSR and PRC, have greatly increased their activity in the world grain market while strongly adhering to policies that protect internal consumption and price levels. As a group these countries consume about one-half of the world grain supply. Not surprisingly, variability of world grain prices has doubled during the 1970s.

While restrictive trade policies insulate much of the world from stock adjustments, the individual policies of countries vary greatly. The detailed review by Webb and Jabara of these policies is summarized in Table 2. Of the major grain exporting countries, only the U.S. and Canada manage grain stocks in a way to reduce world price variability. The wheat and coarse grain stocks of other exporters appear to respond more to domestic production and policy considerations than to world market conditions. Australia, Argentina, and France in the European Community operate small grain reserves but absorb very few year to year fluctuations in production and instead transmit fluctuations directly to the world market via exports of excess supplies, irrespective of world price levels. Thus, other major exporting countries appear to add to rather than moderate world grain market variability.

Reserve and stock programs in importing countries are generally motivated by the need to stabilize domestic internal prices and supplies rather than the need to maintain stable international prices. The Republic of Korea and Taiwan maintain financial reserve programs for this purpose. Other grain importing countries do not maintain large reserves but instead rely on restrictive trade policies to fix internal prices and offset production variability.

Table 2 — Effect on stock policies of major grain trading countries on world grain market variability

Exporting Countries	Effect on Market Variability	Importing Countries	Effect on Market Variability
United States	decrease	EC-9	increase
Canada	decrease	USSR	increase
Australia	increase	PRC	increase
Argentina	increase	Japan	mixed
Other exporters	increase	India	decrease
		Other importers	increase

The major state trading nations, USSR and PRC, tend to make up domestic shortfalls via the world market, regardless of price. Japan has a reserve program to protect domestic prices; there is some indication statistically that Japanese wheat stock movements have reduced world price variability during the 1970s, but Japanese coarse grain stocks have exhibited destabilizing tendencies during the same period. Stock movements in India appear to have been responsive to world price signals.

In summary, the U.S. agricultural export expansion of the 1970s will continue. World grain market instability doubled during the 1970s and will further increase during the 1980s. The need to stabilize world prices is greatly increased by the restrictive trade policies of other major exporting and importing nations. With nearly one-half of world grain trade, the United States has a great interest in preserving a degree of international grain price stability and must continue to hold large reserve stocks for this purpose. With increasing U.S. exports and an increasingly unstable world market, issues concerning food reserves and grain stocks will become more critical during the next ten years.

United States Grain Reserve Policy Options

United States grain reserve policy issues must be considered against the background of overall agricultural trade policy. Up to the present time, the U.S. has perceived that its best interest is to promote the liberalization of world agricultural trade, mainly as a means of expanding export markets. Expected events in the 1980s will likely increase the U.S. interest in trade liberalization — not only as a means of expanding export outlets but as a means of stabilizing world markets by spreading production and consumption adjustments across a larger number of countries. If successful, this push for trade liberalization could induce other major grain trading countries to share a larger proportion of world market fluctuations with the U.S. The relaxation of trade restraints may reduce to some extent the burden placed on U.S. domestic grain reserves, and assist in developing a successful, cost effective grain reserve program.

Five major grain reserve policy options for the United States will be summarized:

Continue The Present Farmer-Owned Reserve

The primary U.S. buffer stock program is the farmer-owned reserve (FOR) Farmers are encouraged to put grain in the FOR when grain is abundant and prices are low. Reserve grain is thus isolated from the market, reducing available supplies and increasing prices. When market prices become relatively high, farmers are encouraged to remove their grain from the reserve and place it on the market to prevent further price increases.

The (FOR) program thus provides a price corridor between the reserve entry price and the reserve release price where market prices are allowed to operate. This corridor is maintained by stockholding incentives and disincentives provided to producers in the form of government loans and storage payments. The entry price into the reserve is generally the price support loan rate. Since grain enters the reserve at this price, the supply on the market is reduced and the loan rate becomes a floor for market prices, protecting producers against the possibility of lower prices during times of excess supply.

When grain prices increase to the official reserve release price, generally 150 to 180 percent of the loan rate, storage payments are terminated and the loans are called. The increase in grain on the market lessens further upward pressures on price. Thus the reserve release price protects consumers against prices above the release level.

After three years of experience, the actual impacts of the FOR are coming into focus. During this past year, the General Accounting Office, USDA, Land Grant Stations and other agencies have completed studies of the effectiveness and cost of the program.

The effectiveness of the FOR is determined by the amount of increase in domestic buffer stocks. But this stock increase is difficult to measure. Each bushel of grain placed in the FOR does not represent a one bushel increase in total buffer stocks — instead, each FOR bushel partially substitutes for buffer stocks that would have been held without the program and results in a net total buffer stock addition of less than one bushel. Based on three years experience, limited statistical studies have found that total stocks may increase from 0.2 to 0.9 bushels for each FOR bushel. Bruce Gardner estimated that the ratio may be as low as 0.2. Sharples and Holland recently provided a tentative statistical estimate of 0.86. The true figure probably resides in the neighborhood of a 0.4 to 0.6 bushel increase in total buffer stocks for each bushel placed in the farmer-owned reserve. Thus, while quantities in the FOR have fluctuated in the neighborhood of 800 million bushels for corn and 300-400 bushels for wheat, the actual net increase in buffer stocks from the program may be only about one-half of these levels.

This modest stock increase must be considered against the \$1.2 billion government expenditure during the first three years of the reserve program. With this program, it may cost society about \$1 to add one bushel to corn buffer stocks and about \$.90 to add one bushel to wheat buffer stocks. The consensus of economists appears to be that the program has resulted in a small reduction in world price variability over this same three year period. Of course it is too early to tell how effective the FOR would be in stabilizing grain prices in the longer term.

Modify the Farmer-Owned Reserve

A number of modifications in the FOR have been proposed: that the size of the reserve be expanded; that the width of the price corridor be increased; and that the price corridor be raised to provide more farmer price protection. An increase in the maximum size of the farmer-owned reserve would increase potential price stability and provide a larger buffer stock to back up trade and food aid commitments, but would increase taxpayer costs considerably. An increase in release prices would on the average, increase producer revenue and provide larger stocks but consumers would pay higher prices and government expenditures would also increase under this option. Finally, raising the entire price corridor would increase stocks and producer income but again consumers would pay more and government expenditures would be higher.

Other possible modifications include making private nonfarmer stockholders eligible for the reserve, eliminating the price bands and operating the program on a storage incentive basis, and reducing storage payments. I will not go into a detailed discussion of these options here. Basically, modification of the current farmer-owned reserve involves a trade-off between public expenditures on reserves and the benefits derived by both consumers and producers from price stability.

Are the current buffer stock levels accumulated under the program adequate and is the cost acceptable to society? If the reserve is to be expanded, will the benefits from increased buffer stocks outweigh the higher costs? Policymakers must answer these questions and decide how much public money should be spent in obtaining such benefits.

Initiate A Government-Owned Buffer Stock Program

Richard Just suggests that a government-owned grain stock program would be more effective than a farmer-owned stock program. Government-owned stocks are not viewed by Just as substitutes for private stocks; storage costs could be reduced under government stock ownership since each bushel stored would be a one bushel addition to total buffer stocks. Just estimates that this lack of substitution would allow costs to be cut almost 80 percent for wheat and 50 percent for corn under government stock ownership. Other researchers have suggested that the savings would be much smaller, because there is some substitution between government stocks and private stocks, even though this substitution may be less than with farmer-owned reserve stocks.

Just also argues that government stock management could be more effective in meeting emergency needs and foreign food assistance, since the government would have specific control over when

the grain is placed back on the market. He concludes that emergency reserves should be tied to CCC ownership rather than to farmer.

Public law 96-494, provides for establishing a U.S. Food Security Reserve of up to 4 million tons of wheat. This reserve is to be used solely for emergency food needs in developing countries during periods of tight supplies and high prices in the United States or in case of a major disaster. This move towards a food security reserve represents one step towards supplementing the farmer-owned reserve with stocks owned directly by the federal government, to be released under specified conditions.

In the 1950s and '60s, U.S. government-owned stocks became excessive and were viewed with alarm by producers. During that time, the government was permitted to sell grain whenever the market price equalled 110 percent of the price support loan rate effectively "overhanging the market" and holding the market price down to the loan rate. That alarm was the reason for the farmer-owned reserve philosophy and the 1977 program was an attempt to alleviate this difficulty through farmer stock ownership. It now appears, however, that with a comparable release price of 180 percent of the loan rate, government-owned stocks could be used to defend the price corridor concept in a buffer stock program in the same manner as the current farmer-owned stocks.

Move Toward International Grain and Financial Reserves

Another U.S. option is to emphasize food reserves at the international level. The World Food Conference in 1974 set a goal to coordinate international stock policies through an international grains agreement that aims at both stabilizing grain markets and insuring grain availability for emergency food supplies. In general, the international community would agree to stock a certain amount of grain to be released during emergency times. Each donor agrees to hold a share of this global reserve, to pay storage and transportation costs, and to adhere to specified release and acquisition rules.

The Food and Agriculture Organization of the United Nations has encouraged a number of initiatives in this direction. At the present time, limited success has been achieved in answering the basic questions of who pays for the reserve, who stores the reserve, and who controls it. While many countries philosophically support this option, little progress has been made toward resolving the basic questions concerning how individual countries share the cost of such a program.

An alternative approach is the international food aid insurance plan proposed by International Food Policy Research Institute. This financial security reserve would be supported by developed countries, with food deficit countries allowed to draw appropriate amounts from the monetary fund when food shortages occur and

purchase needed grain from the world market. Although this program does not work the same as a buffer stock program, preliminary research by Castillo, Kost, and Holland suggests that if it had been in operation since 1965, it would have both increased U.S. exports and made them more stable over the period. While the ability of such a program to stabilize future U.S. and world grain prices has not been conclusively demonstrated, it is relatively inexpensive. Assuming 40 percent participation by the U.S. in this financial security reserve scheme, U.S. costs would average \$320 million per year, which may be largely offset by the resulting gain in exports.

Use Restrictive Trade Policy

There may be a limit to the length of time that the United States can unilaterally pursue a free trade policy and accept the burden of maintaining the world's buffer stocks when the rest of the world insulates themselves from any adjustment. The cost of free trade, as known and practiced largely in isolation by the United States — could increase significantly in the future. Faced with larger and larger costs of holding stocks and greater and greater world market instability, the U.S. may consider breaking the relationship between domestic markets and the world market and managing grain stocks in the context of more restrictive trade. Tariffs, embargos, and export marketing boards could insure that exports cover their full costs and could reduce demand variability in domestic markets.

Such restrictive trade policies would, however, require strict domestic policies to reduce grain price variability within the United States. Exports could be restricted when grain was in short supply in order to prevent high price extremes within the United States. However, periods of excess supply would have to be prevented by taking land out of production. Otherwise we would find ourselves holding burdensome excess stocks. Thus, increased government intervention in domestic production decisions would be required if the U.S. decides to lessen its ties with international markets. Under current conditions of relative abundance of grains in the U.S., little enthusiasm exists for increased government intervention in either our domestic production decisions or export marketing practices. We must fully understand — and be willing to accept — the increased government intervention required in domestic production before we decide to insulate ourselves from world markets to obtain domestic price stability.

Summary and Conclusions

United States storage and reserve programs must be considered in an international context. As the world's largest grain exporter, the U.S. has the greatest interest in orderly world marketing and storage programs and therefore has the most incentive to hold stocks. The outlook for the 1980s is for the grain deficit outside

the United States to increase, for U.S. exports to continue to expand to fill this gap, and for the variability of world grain market prices to increase at the same time. These developments will greatly increase the importance of issues concerning U.S. food and grain reserves.

While the objective of this paper is not to select from among the various policy options, the current U.S. policy of free trade in the world market backed up by the farmer-owned reserve program appears to be justified. Minor changes in FOR operating rules and supplementing the FOR with government-owned emergency food reserves may increase the cost-effectiveness of the program and bring more stability to the world market.

The outlook for the 1980s indicates that the United States FOR program will continue to be important. Continued increases in world market instability will also increase the need for international grain reserves and may even force the U.S. to make basic changes in agricultural trade policy to lessen its ties to the world grain market.

Views expressed in this paper are those of the author and do not necessarily reflect those of the Economic Research Service, USDA.

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