

GRAIN RESERVE POLICIES AND STRATEGIES:  
A CRITIQUE OF THE LITERATURE

by

DIETMAR GEORG

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requirements for the degree

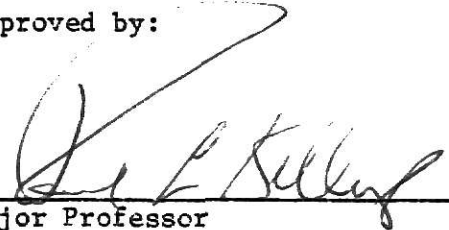
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Approved by:



Major Professor

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#### ABBREVIATIONS USED

AER, PP	-	American Economic Review, Papers and Proceedings
AJAE	-	American Journal of Agricultural Economics
E	-	Econometrica
ERAЕ	-	European Review of Agricultural Economics
FD	-	Finance and Development
IER	-	International Economic Review
JAE	-	Journal of Agricultural Economics
JFE	-	Journal of Farm Economics
JIE	-	Journal of International Economics
QJE	-	Quarterly Journal of Economics
SJAE	-	Southern Journal of Economics
WD	-	World Development

## TABLE OF CONTENTS

	Page
ACKNOWLEDGMENTS. . . . .	ii
ABBREVIATIONS USED . . . . .	iii
TABLE OF CONTENTS. . . . .	iv
LIST OF GRAPHS . . . . .	vi
 Chapter	
1. INTRODUCTION . . . . .	1
2. COMMERCIAL STORAGE POLICIES. . . . .	3
WORKING STOCKS . . . . .	3
Definition and Objective . . . . .	3
The Basic Model. . . . .	3
Welfare Analytical Implications. . . . .	4
Evaluation and Summary . . . . .	4
BUFFER STOCKS. . . . .	5
Definition and Objective . . . . .	5
The Basic Model. . . . .	8
Welfare Analytical Implications. . . . .	14
Extensions to the Model. . . . .	17
Policy Use . . . . .	19
Evaluation and Summary . . . . .	22
3. PUBLIC STORAGE POLICIES. . . . .	24
FOOD AID AND EMERGING RESERVES . . . . .	24
The Food Security Issue. . . . .	24



Chapter	Page
Definition and Objective . . . . .	25
The Relationship Between Grain Reserves and Food Security. . . . .	26
Welfare Analytical Implications. . . . .	27
Alternative Solutions to the Food Security Problem . . . . .	30
"Financial" buffer stock . . . . .	30
Food import bill insurance . . . . .	31
Trade liberalization . . . . .	32
4. SUMMARY. . . . .	35
NEED FOR FURTHER RESEARCH. . . . .	37
BIBLIOGRAPHY . . . . .	39

## LIST OF GRAPHS

Graph	Page
I. (Autonomous) Supply Reduction . . . . .	8
II. (Autonomous) Demand Increase. . . . .	9
III. (Autonomous) Supply Increase. . . . .	10
IV. (Autonomous) Demand Decrease. . . . .	11
V. "Trigger-Price" Based Decision Rule . . . . .	12
VI. The Gain in Consumer Surplus Resulting from Price Fluctuation. . . . .	15
VII. The Gains in Consumer and Producer Surplus Resulting from Buffer Stock Enhanced Price Stability . . . . .	16
VIII. The Relationship Between Grain Reserves and Food Security . . . . .	26

## Chapter 1

### INTRODUCTION

Can buffer stocks help provide greater stability in domestic and world grain markets? Are they capable of lessening the large fluctuations in prices as well as in supplies available for consumption? If so, are grain reserves therefore socially desirable? Who should keep such grain inventories, a private storage industry or some governmental authority?

These are only some of the questions of the grain reserve debate which have been discussed among economists over the last two decades. There has been considerable progress since the publication of Gustafson's seminal article in 1958 (Gustafson, 1958a), but a look at the literature--particularly the more recent work--must leave one with at least some amount of confusion. A confusion which stems mainly from failure on the part of the researchers to distinguish clearly between different types of grain reserves, all serving different functions.

We will try to clarify the major issues involved in the grain reserve debate. To us the purpose and the relevance of this study lies in our attempt to give the discussion a framework, a structure, which in turn will enable us to draw definite conclusions as to the actual policy use of grain reserves. We will follow the groundbreaking work of David Eaton (Eaton et al., 1976) in classifying four basic types of grain reserves:

- |                       |                                     |
|-----------------------|-------------------------------------|
| 1) working stocks     | for intra-year stabilization;       |
| 2) buffer stocks      | for inter-year stabilization;       |
| 3) food aid reserves  | for humanitarian and political use; |
| 4) emergency reserves | for humanitarian use only.          |

We will draw a dividing line between reserve types (2) and (3), calling (1) and (2) "commercial reserves" and classifying reserve types (3) and (4) as "public reserves"--a distinction suggested by Professor Paul Kelley. This distinction is, it should be noted, not as much an empirical one as it is an analytical one. In reality we cannot dichotomize the total amount of grain stocks in either working stocks or pure buffer stocks. It could even be argued that at least some of the privately held inventories are kept to benefit from cases of emergency. We will see, however, that our classification scheme has several distinctive advantages.

We will turn first to commercial storage activities, that subset of total storage activity towards which the economist's tool kit can be applied in a very straightforward manner. The analytical model will be discussed first, followed by an evaluation of the literature, that will deal with (1) welfare implications, (2) model extensions, and (3) the need for further research in the theoretical approach as well as in the empirical verification. Policy recommendations, including possible alternative solutions, followed by a summary will always conclude a chapter.

Public storage activity will be the concern of Chapter 3. More emphasis will be placed on international aspects of food aid and emergency reserves. This will be discussed under the heading of "Food Security." In the final chapter we will summarize our findings and point into the direction further research should aim at.

Our approach throughout this study will be to attempt a critique of only the key issues dealt with in selected research studies, rather than to give a complete review of the existing literature.

## Chapter 2

### COMMERCIAL STORAGE POLICIES

#### WORKING STOCKS

##### Definition and Objective

Working stocks of grain--"marketing reserves" in Eaton's language--are all those grain reserves held solely for the purpose of allocating grain supplies over an entire period, usually one year. The objective is intra-year stabilization of grain supplies and prices. (See page 19 for further discussion of this point.)

##### The Basic Model

There is usually only one harvest within one marketing period. Yet, there is a continuous demand for grain throughout that year. A private storage industry which works for profit has developed that manages to meet the demand for grain weeks and months after that period's harvest. Farmers, millers, and professional "speculators" are among the participants in that business. In fact, any private person may buy grain at harvest time in a self-serving endeavor to profit by selling later at a higher price. It is important to understand the basis of what and who determines prices and quantities offered during the marketing season in a private market economy: Differences among people in their willingness to bear risk and uncertainty, in their talents and facilities for storing grain, and in their estimates of future prices of grain and costs of storing it, all determine what the price of grain will be immediately after the harvest. Permitting any or

all persons to buy stocks of grain for speculative purposes keeps the price from falling at harvest time, thereby giving farmers a higher price than if some of these more optimistic buyers were not allowed to buy for speculation. In the United States anyone can buy and store grain by telephoning a commodity market broker, who will arrange to have grain purchased, stored in rented facilities, and insured against spoilage. No government intervention is necessary; intertemporal allocation is solely left to the working of the price system.

### Welfare Analytical Implications

Storage is profitable as long as the cost of storing one more unit of grain is less than the revenue stemming from the future sale of that unit. This private rationale for profit maximization guarantees at the same time profitability for the society as a whole, if (1) the private storage industry is competitive, and (2) externalities in the storage market do not exist. If these two conditions are fulfilled, private grain reserves are at the socially optimal level.<sup>1</sup>

### Evaluation and Summary

Grain reserves held as working stocks have been dealt with only briefly, because the theoretical model is a straightforward application of generally known price theory, and accord among economists appears to be widespread though not general.<sup>2</sup> Often researchers seem to take this most

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<sup>1</sup>For the time being we assume that they are fulfilled. We will discuss this point later. See Chapter 2, page 20 - 22

<sup>2</sup>Dale Hathaway, for instance, seems to believe that the private competitive storage industry operates in exactly the adverse manner. How else can one interpret his statement, "Thus, when total supplies are short, there is a tendency for individuals throughout the system to increase private stocks and reduce market supplies, actions that amplify the magnitude of market price swings" (Hathaway, 1976, p. 4).

basic buffer stock model for granted, since they do not even mention it, Stein and Smith (1977) being a notable exception.

We summarize in stating that intra-year stabilization of grain supplies is secured by a competitive private storage industry. Storage levels, resulting out of the profit motive are socially optimal in the presence of sufficient competition and non-existence of external effects in that industry.

Finally, we would like to emphasize the importance of this model, for it can serve as a reference standard for alternative reserve proposals.

## BUFFER STOCKS

### Definition and Objective

Grain reserves for inter-year stabilization purposes will be called buffer stocks. Eaton's definition, "The buffer reserve concept involves saving grain in a year of excellent harvests for use in another year plagued by poor production" (Eaton et. al., 1976, p. 41), is too vague for our purpose. All grain stocks carried over from one harvest period to future periods, regardless of whether the initial period's harvest was good, plentiful, excellent, normal or even bad, will be termed buffer stocks.

Why do we need inter-year stabilization? True, the peculiarities of agricultural production bring about variations in grain supplies available for consumption. Variations which can be quite substantial, as a quick look into the most recent past clearly shows.<sup>3</sup> But why do we have

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<sup>3</sup>The history of grain prices is portrayed in Stein and Smith. They also attempt to give an explanation for the experienced fluctuations. See also Johnson, 1978.

to worry about this fact in the presence of the most effective allocative device with which mankind has ever been equipped--the price mechanism? Prices for grain will rise if there is a production shortfall or a demand increase and will fall if one year's supply is high relative to the same year's demand.<sup>4</sup>

Proponents have advanced all kinds of arguments in favor of a buffer stock scheme. Among them only two deserve the economist's attention: The quantity fluctuations generate price fluctuations, a situation which might be inferior to a situation in which price stability prevails. In addition to that, the supply variations themselves might be considered a problem with regard to what has been called "food security," the concern of Chapter 3.

A large volume of literature has been devoted to the problem of buffer stock enhanced price stability. We will discuss the most important work in some detail. Prior to that, we will take a quick look at most of the proposed objectives or alleged advantages of stabilization of grain supplies.

Walker and Sharples provide us with a review of the respective literature (Walker and Sharples, 1975, pp. 2-3). They list Waugh's seven objectives among others:

- 1) Provide working stocks;
- 2) Reduce danger of food shortages at home and abroad;
- 3) Help maintain commercial exports; i.e., a dependable steady supply;
- 4) Help stabilize farmers' incomes and the general economy;
- 5) Along with production adjustment, to raise the level of farm prices and income;

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<sup>4</sup>Today's prices reflect, of course, expected future demand/supply relations, too, a point that will draw our attention in a later section.



- 6) Assist growth of less developed countries (LDC's);
- 7) Foster private industry.

Objective number (1) has already been dealt with above. Number (2) will be discussed in Chapter 3. A case for number (3) can only be made in the presence of non-flexible exchange rates. With freely fluctuating exchange rates there is absolutely no need to foster agricultural exports on the grounds of a perceived need for earning foreign exchange. Number (4): As long as we accept our market economy based on private property rights, we must automatically accept the fact of economic uncertainty to be born by the private decision makers. The farmer is as much an entrepreneur as is the fast food franchisee. He alone has to bear the risk of his production and investment decisions, not society. Once we start to stabilize the income of one particular group of entrepreneurs; i.e., once we shift risk bearing from the individual to society as a whole, we leave the framework of our market economy.

Number (5) can be rejected on largely the same reasoning. Number (6) will be discussed in Chapter 3; and number (7), finally, is too vague for us to elaborate on. This list is by far not exclusive, many other alleged objectives and advantages have been put forward.<sup>5</sup> Only two of them are reoccurring throughout most of the literature:

- a) society benefits from added food security provided by buffer stocks (quantity stabilization); and
- b) society benefits from the increase in price stability resulting from buffer stocks.

Both concepts are intrinsically interrelated and should therefore be discussed together. It is for the sake of more clarity that we separate

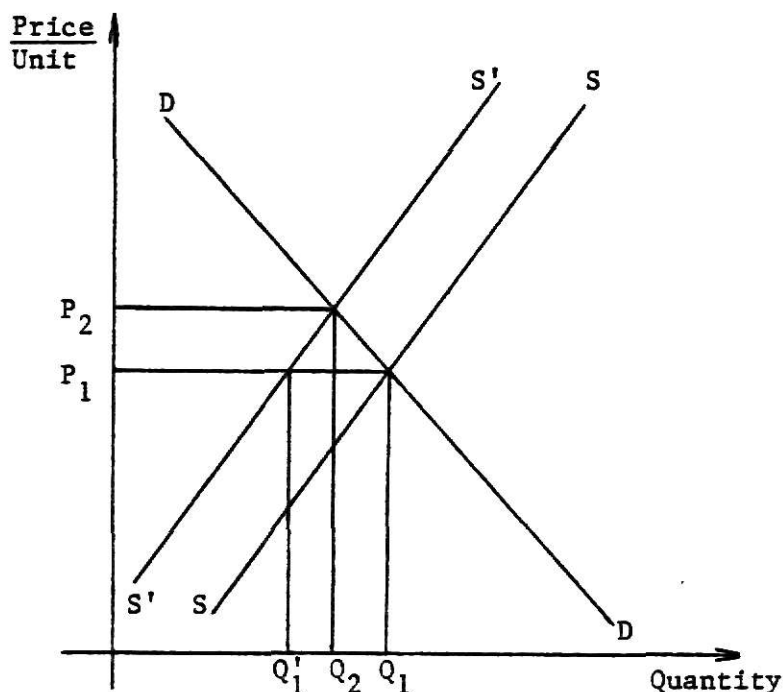
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<sup>5</sup>See Sharples and Walker (1975, pages 2-3). Stein and Smith (1977) also provide additional examples.

the discussion. Whether society does or does not benefit from buffer stock enhanced price stabilization will be analyzed in the following section; whereas, the issue of quantity stabilization will be dealt with under the heading of "Food Security" in Chapter 3.

### The Basic Model

The basic analytical model can best be illustrated by reference to the following graphical exposition.

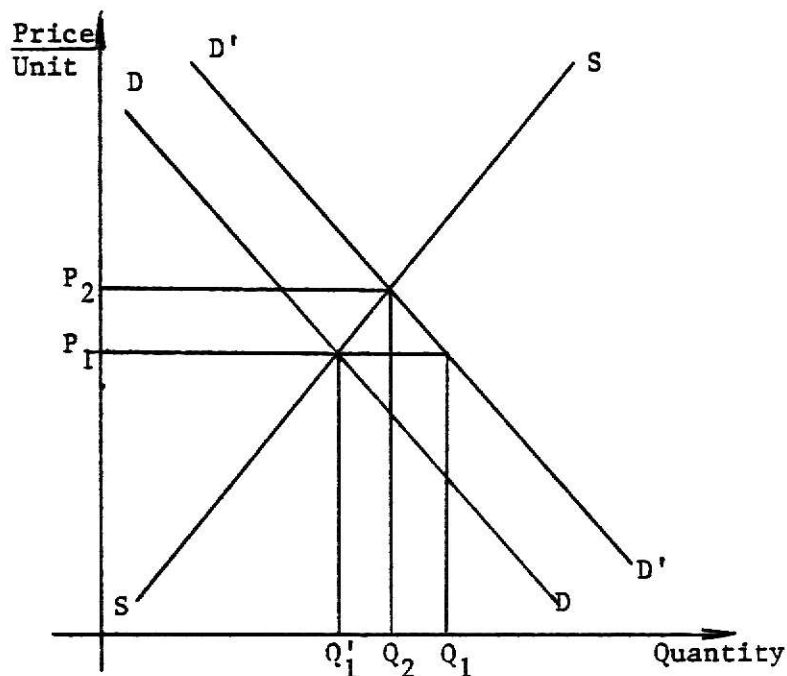


Graph I

Consider a situation in which DD and SS both are the perceived long-run demand and supply schedules for grain. Let, for instance, bad weather account for a production shortfall, which would shift the supply curve leftward (from SS to S'S' in Graph I). The new equilibrium price would be  $P_2$  with an excess demand (production shortfall) of  $Q_1 - Q_1'$  at

the old anticipated equilibrium price. The storage authority<sup>6</sup> must then release an amount of  $Q_1 - Q'_1$  out of its grain reserves in order to keep the price at  $P_1$  (to "peg" the price).

In Graph II the same action is generated by an autonomous increase in grain demand, which is represented by the shift of the demand schedule from  $DD$  to  $D'D'$ . Without any action undertaken by the storage authority, prices would climb to  $P_2$ , with a quantity supplied and demanded of  $Q_2$ . Only an additional amount of  $Q'_1 - Q_1$  can keep the price from rising, can keep it "stable."



Graph II

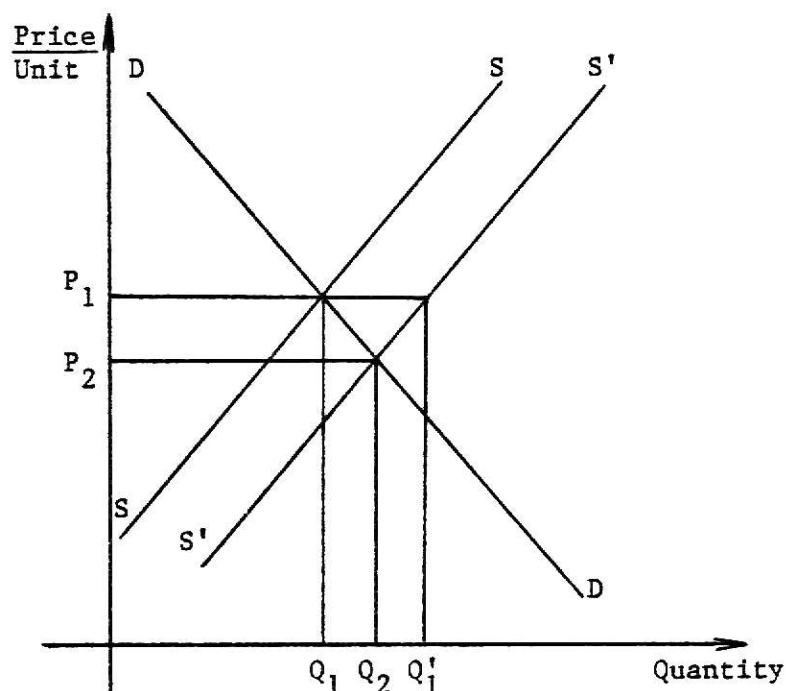
Conceptually, both the demand and supply schedule are subject to stochastic shifts in either direction. In agricultural production,

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<sup>6</sup>At this point in time we refer to the "storage authority" as a neutral agency, not labeling it either a public or a private institution.

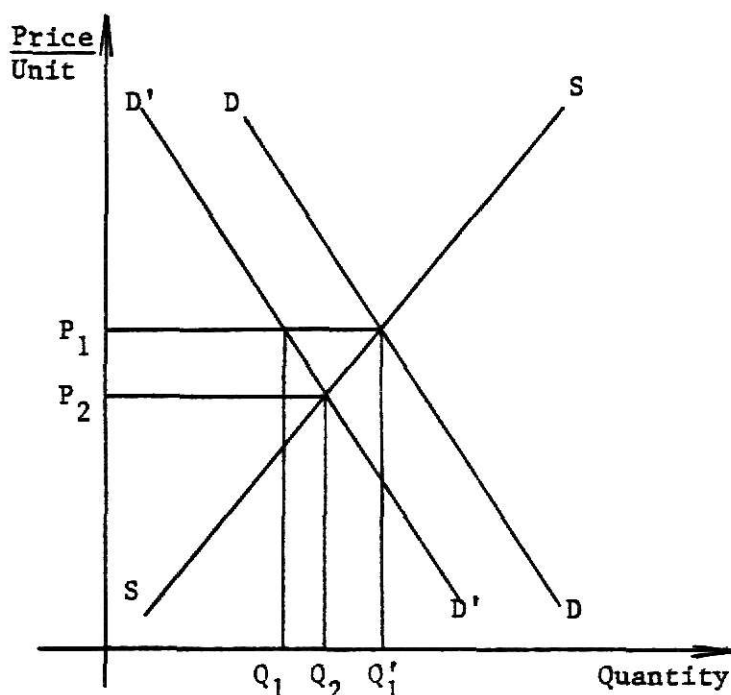
however, the supply curve usually is more uncertain than is the demand curve. For this reason stabilization policies often are referred to as "supply stabilization." Indeed, it is not easy to give an example for the autonomous demand shift in Graph II, if the market under consideration is the world market. In a national economy such a shift could have been caused by an autonomous increase in export demand (the Soviet wheat deal, for instance).

Graphs III and IV depict the opposite situations: A sudden production increase, not caused by a rise in price, or an autonomous decline in the demand for grain cause the storage authority to enter the market as a demander. The supply shift in Graph III from  $SS$  to  $S'S'$  would result in a price decline from  $P_1$  to  $P_2$ . In order to clear the market at the desired price  $P_1$  an amount equal to  $Q'_1 - Q_1$  must be purchased by the storage authority and added to the already existing stocks.



Graph III

In Graph IV it is the amount of  $Q_1 - Q'_1$  that has to be taken from the market into storage to peg the price at the initial level  $P_1$ .

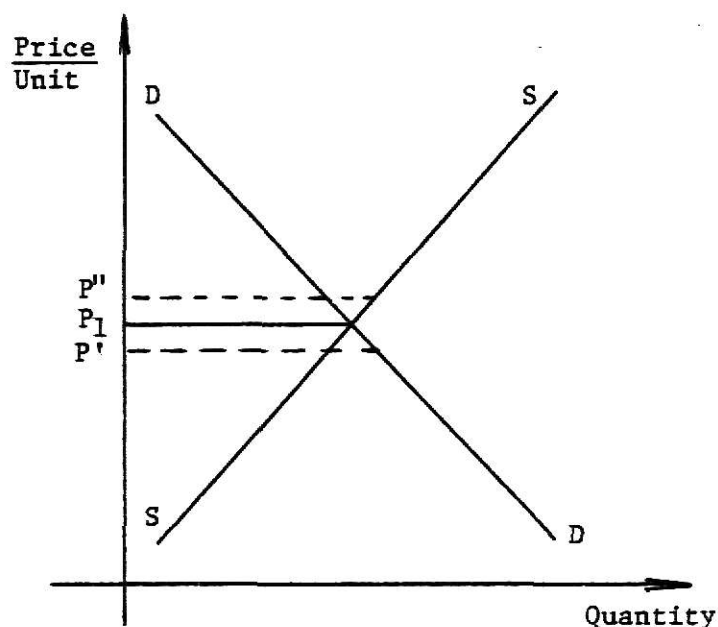


Graph IV

These are in utmost simplicity the economics of a buffer stock scheme for price stabilization. Before we proceed to discuss the welfare aspects and implications of such a concept we will briefly put forward two considerations which usually are neglected in the literature, which we nonetheless believe are of relevance and should therefore be included in the discussion. Both arise from straight forward application of general price theory: (1) The initial demand and supply curves (labeled SS and DD in Graphs I - IV) are anticipated long-run schedules. (We abstract for the time being from income changes, to keep the analysis as simple as possible.) Thus only  $P_2$  is the true equilibrium price. The shifts in both the demand and supply curves are perceived as transitory ones. In our analysis they represent temporary rather than permanent

shifts. This must not necessarily be so. The demand decrease in Graph IV could be a reflection of a permanent change in tastes, the supply increase in Graph III could be the result of a technological progress rather than the outcome of unusually good weather. To the extent that a permanent shift is held for only a temporary one, the storage authority necessarily aggravates rather than alleviates the situation by pegging a price, which no longer is the true equilibrium long-run price.

Wrong price signals are given to both consumers and producers, the result of which being a misallocation of resources, to say the least. The difficulty of finding the true market clearing price is made worse by the fluidity of economic change, especially in agricultural markets, with such enormous fluctuations in export demand, which are largely the outcome of existence of non-competitive markets in other parts of the world and the entangled network of trade restrictions and distortions. (2) Assume that the storage authority's objective is to stabilize prices effectively at level  $P_1$ , or to be less restrictive has a price range with boundaries at



Graph V

$P'$ ;  $P''$ . As soon as the price falls below  $P'$ , it enters the market as an additional demander, buying whatever amount is necessary to keep the price in the desired range. Conversely, if the price threatens to climb beyond  $P''$ , grain would be released out of storage, increasing the effective supply sufficiently to hold the price within its predesigned limits. This is the storage authority's decision rule.

Now suppose private speculators expect a shortfall in production (or an autonomous increase in demand) no matter how generated, for the next period. What ordinary price theory tells us is that those speculators will attempt to buy grain now to sell it later at a price high enough to cover storage and interest cost and still leaving them with some profit. This action will, of course, result in a rise of today's grain prices. If it rises beyond  $P''$  the storage authority counteracts the unwanted price increase by depleting its reserves. This action is taken at a time where it should have increased its reserves rather than reduced them.

The action of private speculators, acting for mere profit, would have alleviated the upcoming shortage in two ways. First, by increasing storage levels now making more grain available in the actual period of shortage, and second by reducing current demand, due to the price increase, also leaving more grain to be allocated to the future period.

In order to avoid a possible misunderstanding, we are not saying that governmental grain reserves are by and large superfluous or even disadvantages. We are showing our concern that a rigid decision rule, together with a misjudgment of the cause of the price increase, may lead the authority to policy actions not desirable for the society. We implicitly have assumed that private speculators have better knowledge of

future events than has the public storage authority. An assumption not altogether unreasonable.

### Welfare Analytical Implications

Although some aspects of the literature on welfare theoretical implications of price stabilization policies have already been reviewed elsewhere (Walker and Sharples, 1975)<sup>7</sup>, we will go over the literature again; because on the one hand a bulk of recent research has evolved in the meantime, and on the other hand because we believe the discussion has at least partially centered on the wrong problems and has, therefore, missed an important argument in favor of price stabilization. We single out Waugh (1944), Oi (1961), Massel (1969), Samuelson (1972), Oi (1972), and Just (1975) as the most important pieces of research.<sup>8</sup>

If we accept consumer and producer surpluses as a correct measure of their respective economic welfare the argument runs as follows.<sup>9</sup> Next year's supply schedule is uncertain,  $S_1$  and  $S_2$  will be realized both with a 0.5 probability. In this case the correct measure for consumer surplus, CS, would be the expected value of total consumer surplus,  $E(CS)$ :

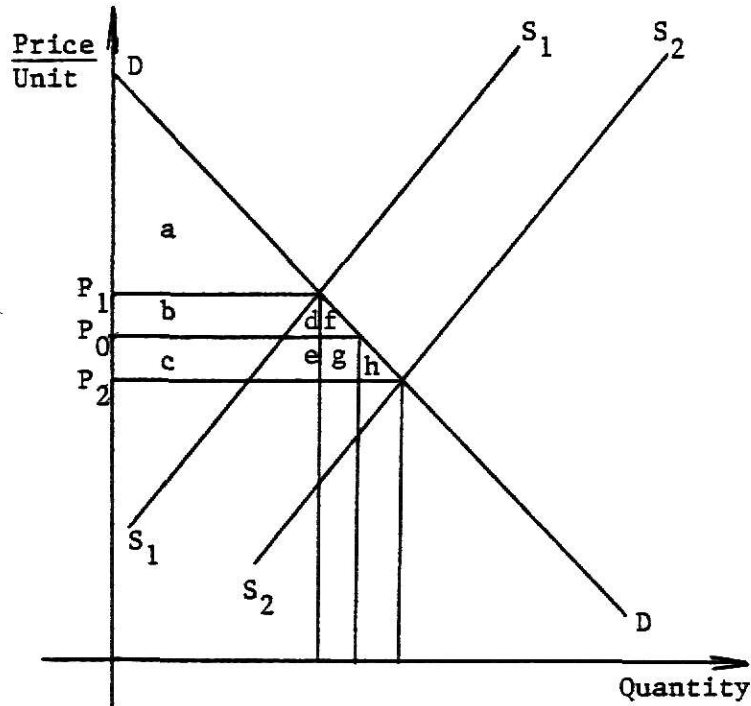
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<sup>7</sup>After completion of this study our attention was brought to Helmlinger and Weaver's (1977) paper, which is an excellent account of the welfare analytical implications of any grain storage regime. By and large, their conclusions are identical to ours.

<sup>8</sup>For additional references, the interested reader is referred to the literature given in Just (1975), Turnovsky (1978), and Oi (1972), page 497, footnote 9.

<sup>9</sup>We will only demonstrate the gain in welfare for the consumer stemming from fluctuating prices, instead of stabilized prices. We are aware that consumer and producer surplus analysis is a highly controversial topic within the field of general welfare economics. The interested reader is referred to Massel (1969), especially to the literature cited there in footnote 9 on page 289.





Graph VI

$$CS = a \quad \text{for } P = P_1$$

$$CS = a + b + c + d + e + f + g + h \quad \text{for } P = P_2$$

$$\begin{aligned} E(CS) &= \frac{1}{2} (a + a + b + c + d + e + f + g + h) \\ &= \frac{1}{2} (b + c + d + e + f + g + h) + a \end{aligned}$$

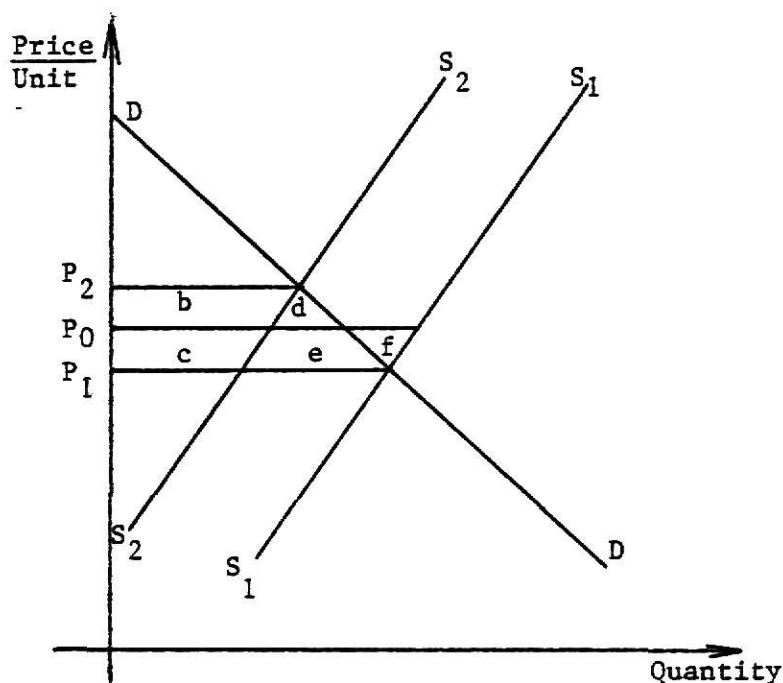
Would the price have been kept at  $P_0$  instead, which is  $\frac{1}{2} (P_1 - P_2)$ , consumer surplus would have been:

$$CS = a + b + d + f \quad \text{for } P = P_0$$

Since  $c + e + g + h > b + d + f$ , the consumer would be worse off with price stabilization.

This result has been challenged along two different lines of reasoning. First, Samuelson pointed out a basic flaw in Waugh's and Oi's analysis: The result holds true only for one consumer or one producer in isolation. If a general equilibrium analysis, rather than a partial one is employed, Samuelson (1972) argued that society as a whole does definitely gain from price stabilization.

The second counterargument was presented by Massel (1969): Let for instance both consumer and producer face the two prices  $P_1$  and  $P_2$  (Graph VII), each expected to occur with a 50 percent probability. Now a buffer stock authority is established, which guarantees price  $P_0$ . Raising the price from  $P_1$  to  $P_0$  would increase producer's surplus by an amount equal to the area  $c + e + f$  while lowering consumer surplus only by  $c + e$ , a net gain of "f" to society. Lowering the price from  $P_2$  to  $P_0$  increases consumer's surplus by an amount equal to the area  $b + d$ , whereas it lowers producer's surplus only by  $b$ , again a net gain to society of area "d." Thus, total net gain to society from price stabilization would be the area "f + d."



Graph VII

We are aware of the many restrictive assumptions underlying Massel's reasoning, the most restrictive being the assumption of zero

operating cost for the storage authority and the implied necessity of ex post compensation among the parties involved.

### Extensions to the Model

Massel's model has been refined and generalized. A substantial volume of literature has evolved over the past decade. Relaxation of the linearity assumption does not alter Massel's results substantially. The importance of the source of the assumed random shifts is stressed by Hueth and Schmitz (1972). Massel's results are independent of the source of instability only if the random shocks are multiplicative (if the slope of the supply curve is changed), but are not independent in the presence of additive shocks (shocks that shift the position of the supply curve without changing the slope); see Turnovsky (1976). An extension from the closed economy to an open one has successfully been attempted in an article by Hueth and Schmitz (1972) where they analyze the distribution of welfare gains from buffer stock enhanced price stability among different economies engaged in international trade. The shortcomings of that study--assuming international free trade without any restrictions--has been overcome by Bieri and Schmitz (1972), and subsequently Just and others (1977), who focus on the distortions present in international trade.

The introduction of storage costs can substantially alter the finding that stability of relative prices will always be beneficial to society. As far as we can see, however, nobody has yet been able to come up with a clear cut answer to that problem, although Massel (1969) and Just (1975) have made first steps in that direction. The results are inconclusive and very sensitive to the particular model employed. Thus,

although there has been considerable progress in the literature over the last 20 years, the picture is far from being clear, a general conclusion not yet in sight. As Burmeister amply stated recently (Burmeister, 1978, p. 190):

But I'm afraid that it is a basic theoretical error to presume that price oscillations are detrimental - even in deterministic models without stochastic disturbances. Price oscillations may be optimal simply because of the dynamic structure of tastes and technology. Moreover, in both the stochastic and the deterministic cases, the dynamic price equations for perfectly competitive markets are identical to the conditions necessary for intertemporal welfare maximization and economic efficiency.

If this is true, we may end up with exactly the conclusion drawn at the end of Chapter 2. We will turn to this issue after briefly noting our concern that the discussion about the welfare aspects of price stabilization provoked by a buffer stock scheme might have proceeded in the wrong direction. Focusing on the mechanical usage of traditional consumer and producer surplus analysis, which indeed has the advantage of graphical simplicity and which can be used for actual calculations, one important argument in favor of relative price stability, the implications of which can be found in everyday life, has been overlooked: Stable relative prices are preferred by consumers and producers over fluctuating prices, because they reduce information and transaction costs. For short run price stability to be achieved producers keep inventories (buffer stocks). Through this device they are able to accommodate sudden peaks in demand. Stated more eloquently: The actual inventory for a great many goods and services that producers and sellers hold is larger than the expected value of sales during a particular period. The restaurant owner, for example, does not immediately lower his prices when his restaurant is "underutilized," when some of his seats are not taken, and he does not

raise prices whenever there are some people waiting for a table. On the average, his restaurant will be underutilized, the remaining tables being his buffer stock. Other examples include the barber shop, whose chairs are not always filled, the newspaper boy who carries more copies for a day than he expects to sell on the average. Even the unemployed labor force can be thought of as some kind of "buffer stock."<sup>10</sup>

All those buffer stocks serve to stabilize prices in order to reduce information costs for potential customers. This concept apparent in everyday life gives a totally different kind of justification for buffer stocks. The reason this line of argumentation has not been pursued in the literature might be that the gains stemming from the reduction in information and transaction costs due to the buffer stock enhanced price stability are difficult to assess quantitatively.

This concept, together with Burmeister's argument, brings us to the question of who the carrier of the buffer stocks should be: some public agency or the private storage industry? It is to this question that we will address the following section.

### Policy Use

Recall our concluding remarks of the "working stock" section:

Intra-year stabilization of grain supplies is secured by a competitive private storage industry. Storage levels resulting out of the profit motive are socially optimal in the presence of sufficient competition and non-existence of external effects.

Inter-year stabilization--the objective of pure buffer stocks--can be viewed as merely an extension of intra-year stabilization. In fact,

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<sup>10</sup> The examples are taken from Alchian/Allen (1977) page 112. Chapter 5 of their book gives an excellent background discussion of this issue, see especially pages 111-113 (Buffer Stocks: Inventories and Price Predictability).

privately held grain stocks cannot be dichotomized in a working stock on the one hand and a buffer stock reserve on the other hand. The dividing line--the time horizon of one year--has been drawn for pure analytical reasons. It is not an empirical distinction. The reason grain reserves are held privately is the profit motive: buying grain now and selling it in the future at a higher price. This can be months or years from the time the purchase was made; this depends on the storage costs and the speculators' expectations towards future prices relative to today's prices.

Bearing this in mind, we ask the crucial question: Are privately held stocks at the socially desirable level? As already stated this will be the case if (1) the storage market is (sufficiently) competitive; and (2) externalities do not exist.

- 1) There can barely be any doubt that the United States agricultural sector is one of the most competitive markets of all markets. This seems to be also true for one of its sub-sectors--the agricultural storage industry. Stein and Smith (1977) provide pervasive evidence towards this point.
- 2) Existence of externalities in the storage market would mean non-optimality of the privately carried grain reserves and would henceforth justify some sort of governmental intervention. Presence of a number of such external effects has been alleged in the literature. We will discuss only the important ones.

Externalities are those costs or benefits to society that are not borne by the market participants. Thus, if there are benefits (or costs) to the society from carrying grain buffer stocks that do not accrue to the private storage industry, grain reserves will in general be non-optimal, and governmental intervention can be called for. Stein and Smith (1977) present a thorough evaluation of most of the alleged externalities that can be found in the literature. We will briefly comment on their findings and then consider another recently stated argument by Blandford and Currie (1975).

Stein and Smith (1977) consider the following argument among others. Governmental buffer stocks: (1) could be used to reduce inflationary pressure; (2) might be justified if a different discount rate is used in public sector cost-benefit analysis; (3) might be used for food aid programs; and (4) might further national objectives in U.S.-foreign policy.

- 1) To call an increase in the relative price for one good or even a group of goods that is higher than the increase in the general price level inflationary, and below average increases deflationary is nothing but to confuse cause and effect. The cause of any inflation is too high a growth in the money supply relative to the growth in money demand. The fact that prices for some goods rise faster than the average increase is due solely to shifts in the demand and supply schedules for those particular goods.
- 2) We agree with Stein and Smith that economics does not provide justification for use of a discount rate in public investment decisions that differ from the private ones. We refer the interested reader to Hirshleifer's excellent paper (Hirshleifer, 1972).
- 3) We will turn to this in Chapter 3.
- 4) When we stated that the United States' domestic agricultural sector is a sufficiently competitive one, we have to realize at the same time that the international trade arena is far away from being a distortion-free market. Trade restrictions, prevalent in agricultural trade, are numerous and the rule rather than the exception. Stein and Smith argue that governmental stockpiling could increase United States' bargaining power in international trade negotiations. We do not find this argument very convincing. We believe that Stein and Smith, in their otherwise outstanding study, overestimate the magnitude of any such bargaining power and underestimate the "stubbornness" of EEC officials defending and protecting their Common Agricultural Policy at almost any cost.

Thus, with the exception of the food aid issue, we have rejected all the externalities cited in the Rand Corporation study. Recently, Blandford and Currie (1975) have advanced another externality present in the private storage industry, justifying governmental stockpiling. In their words:

. . .to the extent that farmers are predominantly risk averse, there is no presumption that the resulting industry output would be in any sense "socially optimal." Indeed, there is a strong presumption that it would not be. This suggests the desirability of government intervention designed to eliminate uncertainty (Blandford and Currie 1975, p. 49).

Though we do not dispute their analytical procedure and theoretical finding, we are at variance with their conclusion. If the fact that risk aversion on the side of producers justifies government intervention, we would very soon be a socialistic society, for risk aversion is a predominant characteristic not only of farmers, but of the large majority of American consumers and producers.

To summarize, none of the alleged externalities inherent in the private storage market can be accepted nor is strong and convincing enough to alter our conclusion that buffer stocks, as defined at the outset, are adequately provided by the private sector without governmental intervention being necessary.

#### Evaluation and Summary

Our conclusion, that there is no need for governmental intervention, had already been obtained as early as 1958 (Gustafson, 1958a, 1958b). Despite this, a majority of studies, particularly the simulation studies,<sup>11</sup> go without even mentioning it. Stein and Smith (1977) present an excellent review of these studies. So far none of them, including the ones that have been published after 1977, have been able to include all of the following minimum requirements:

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<sup>11</sup> See for instance, Nand and Houck (1971); Tweeten, Kalbfleisch and Lu (1971); Ray, Richardson and Collins (1975); Cochraine and Danin (1976); Eaton et. al. (1976); Reutlinger (1976); Reutlinger et. al (1976); Sharples, Walker and Slaughter (1976); Zwart and Meilke (1976); Konandreas and Schmitz (1978); Bigman and Reutlinger (1979); Gardner (1979); and Taylor and Talpaz (1979).



- 1) private profit motivated stockpiling (In fact, a private storage industry often is even assumed to be nonexistent.);
- 2) supply response schemes (The majority of the simulation studies assumes random shifts around an otherwise stable supply curve.);
- 3) restrictions and distortions in international trade.

Besides these theoretical weaknesses, the results obtained are totally inconclusive. The clear cut policy recommendation thus still remains that the government should refrain from intervention in the private storage industry, as long as it can be assumed that this industry is reasonably competitive.

## Chapter 3

### PUBLIC STORAGE POLICIES

#### FOOD AID AND EMERGING RESERVES

##### The Food Security Issue

We do not attempt to discuss the pros and cons of "food aid." Rather, we take it as given, that society has made a (non-market) decision in favor of food aid for a well defined group of persons or countries. We only will try to comment on the literature as it pertains to the relationship between public grain reserves and--what has been called-- "food security."

The questions we will ask and try to answer are: How can publicly held grain stocks help solve the food security problem? Is it socially desirable to keep such reserves given the prior decision in favor of food aid? Are there alternative solutions which might render the buffer stock concept superfluous?

A note seems to be appropriate at this time. While it is feasible to differentiate between food aid reserves on one side and emergency reserves on the other side,<sup>1</sup> we deem it justified to lump both categories together under the heading of "grain reserves for food security." Although various food aid programs are in effect within the United States,<sup>2</sup>

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<sup>1</sup>Such a distinction is made in Eaton et. al., 1976, p. 41.

<sup>2</sup>For a discussion see Madden, 1976.

our main emphasis will be the proposed grain reserve scheme for food aid in the international area and there particularly the Less Developed Countries (LDC's).

We will deal with the food security problem as such only very briefly since our concern will be the relationship between buffer stocks and food security.<sup>3</sup>

By now the usefulness of our distinction between different types of grain reserves should have become clear. Considerable confusion, stemming from failure to distinguish between the different social objectives to be served, between economic theory and emotional statements as to those starving in the Third World, and between normative and positive judgments in general can be avoided.

We will try to carefully apply economic theory only, and not let emotions carry us away and cloud our analysis.

### Definition and Objective

Food security can be defined both for the short-run and the long-run. Short-run food security usually means protection of consumers from acute temporary production shortfalls; while long-run food security refers to the assurance of adequate food supplies to everybody.<sup>4</sup> What strikes the economist is that no mention in this context is made whatsoever of prices and costs.

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<sup>3</sup>For a detailed discussion of this issue the interested reader is referred to USDA, FAER, 134 (1978).

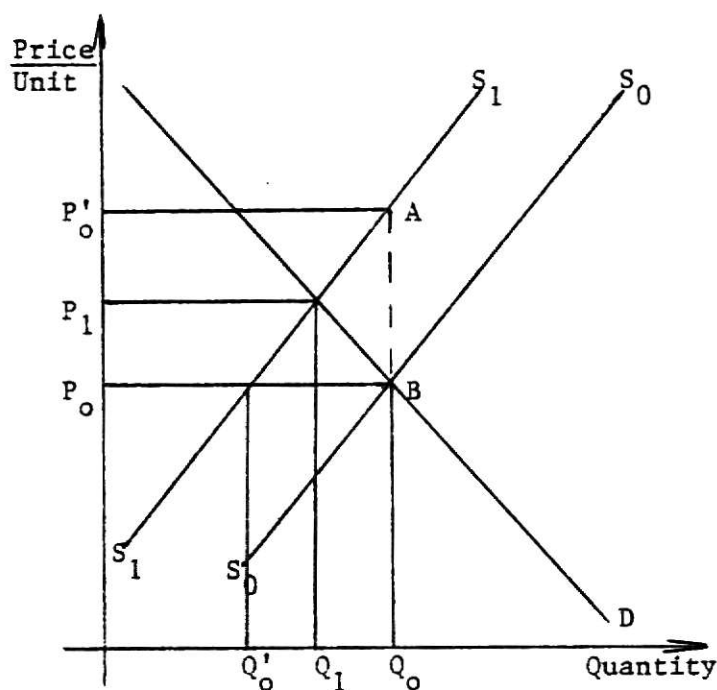
<sup>4</sup>The definitions given in the literature vary. See, for instance, Eaton et. al., 1976, pp. 41-42; Hathaway, 1978, p. 55; and Walters, 1978, p. 91.

The Relationship Between Grain  
Reserves and Food Security

Basically, three means towards the achievement of food security are currently under discussion: While buffer stocks and food import insurance schemes pertain to the short-run insecurity problem, trade liberalization and production increase through technological progress are thought to be the ways leading towards long-run food security.

Although our interest is to how buffer stocks can add to food security, we will have to discuss trade liberalization and the proposed insurance scheme too, very briefly, because if those means would turn out to be less expensive to society, buffer stocks could be dismissed on the grounds of social inefficiency.

Consider Graph VIII below:



Graph VIII

A production shortfall shown by the leftward shift of the normal supply curve  $S_0$  to  $S_1$  causes the equilibrium price to go up to  $P_1$ . Consumption

is reduced from  $Q_0$  to  $Q_1$ . (At the same time the now higher price is an incentive for increase in production.) This is basically the way a production shortfall would be handled in a market economy.

The argument of the proponents of the buffer stock regime for food security now is that:

- a) consumption of basic foodstuff is already at inadequately low levels in some of the world's poorest countries, thus the reduction in consumption of  $Q_0 - Q_1$  cannot be tolerated and must be avoided;
- b) because of the very low per capita income in those countries, maintenance of a consumption level of  $Q_0$  is impossible to achieve, because the price of  $P_0'$  cannot be afforded. In addition to that, balance of payments problems, reflected in severe shortages of foreign exchange makes the import of food needed so urgently often impossible.

Thus, a storage authority must release an amount of grain out of its stocks equal to  $Q_0 - Q_0'$ . This would keep the price and the supply at pre-shortfall levels. These are essentially the basics of the buffer stock - food security issue. And it is here where consensus among researchers involved ends.

#### Welfare Analytical Implications

What is the welfare optimizing level of grain stocks for food security? As we already have noted in the previous chapter, it is the level that results from equating marginal cost for society with marginal benefit resulting from grain storage. The problem simply being how to measure benefits and costs as they accrue to society. Several attempts have been made in the recent past, Johnson and Sumner (1976) or Reutlinger and others (1976), to mention only two.

To Johnson and Sumner the costs consist of direct storage costs plus the capital costs for the actual investment, while the grain per unit of

storage simply is measured by the difference between purchase and selling price. This, of course, is exactly the approach private investors would take, investing in commodities. The result being that privately held stocks would be optimal again. Why, then, the call for governmental buffer stocks? Johnson and Sumner are not very explicit on that and we suspect that they do not believe that an effective private storage market is existent in the LDC's.

Most of the other researchers use a totally different approach. While to all of them costs are made up of storage and capital costs, benefits to society are something hard to come by, difficult to assess quantitatively. Dale Hathaway goes even so far as to argue in this context that "the use of standard [economic] theory to rationalize and determine the size of reserves is inadequate if not irrelevant" (Hathaway, 1976, p. 2). We are strongly opposed to Hathaway's statement, which in effect would mean that economic theory could not be applied to economics with a certain low per capita income, but we acknowledge that the literature at this point has arrived at an impasse.

The problem, as it appears to us, being that positive and normative economics are not kept apart sufficiently. There is no reason why we should not be able to apply positive economics to the optimization problem. But it is one thing to dismiss buffer stocks for food security on grounds of strict economic efficiency calculations, the outcome depending on the assumption of a free market economy, and quite another thing to accept the distributional and allocational consequences of such a system.

In the presences of millions of starving people in the Third World, it is of course hard to accept those consequences, and the call for

alleviation should be understandable to every civilized person. But we must keep positive and normative judgments apart. We can abandon buffer stocks for food security for economic reasons and still try to help the people affected, maybe in other ways.

We have found one basic difference in the treatment of cost-benefit analysis of buffer stock programs for the United States domestically on one side and for LDC's on the other side. While benefits from holding buffer stocks within the United States are the increases in consumer and producer surplus stemming from price stabilization, gains to the inhabitants of the Less Developed Countries stem from quantity stabilization. This is not to say that the benefits from price stabilization would not accrue to Third World countries, rather the neglect of this aspect seems to indicate that those benefits are minor compared to those derived from added food security. But so far, apparently nobody has been able to estimate such benefits.<sup>5</sup>

Here the research is stuck in a dilemma situation. Seeing millions of people starve, knowing that food aid would help greatly, would even save lives, but not being able to assess those benefits renders all cost-benefit analysis impossible. As long as we are unable to find a solution to the benefit assessment problem, we have to confess that grain reserves are an inefficient way to achieve food security and are thus undesirable for any society on grounds of existing economic welfare analysis.

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<sup>5</sup>Phillips and Sorenson's (1978) approach can only be seen as a first step. Their calculations of benefits for Bangladesh appear to us as far too vague, to allow definite conclusions in a cost-benefit analysis. Of positive value is their attempt to get away from the rigid consumer-producer surplus analysis.

Those authors who actually have made cost benefit calculations (based on strict economic measures of cost and benefits) do generally come up with this conclusion (Johnson and Summer, 1976; Reutlinger, 1976; Reutlinger et. al., 1976). Those advocating for the establishment of grain reserves for food security have not yet been able to give accurate calculations of the benefits of such a policy measure (Hathaway, 1976; Phillips and Sorenson, 1978; Walter, 1978).

In order to avoid a possible misunderstanding, we are not saying that grain reserve policies for food security should not be adopted in any kind. What we are saying is, that if we take into account all the costs and benefits that can be quantified, such a policy does not appear to be socially desirable. But the benefits from greater food security, which so far nobody has been able to assess, and that do accrue to those who without it would starve to death might well be large enough to outweigh the costs and thus reverse our result.

#### Alternative Solutions to the Food Security Problem

"Financial" buffer stocks. One very simple solution, which amazingly has not yet found widespread endorsement,<sup>6</sup> is to establish a (money) fund, the task of which being to allocate money rather than food-stuff to the countries affected by a serious production shortfall, due to a crop failure. This approach appears to have some decisive advantages:

- 1) It is rather inexpensive, since the "storage costs of money" are definitely lower than the storage cost of grain. The transferred funds could either be grants or loans. In the loan case, welfare costs would be zero, as long as the interest rate is equal to the going market rate. The cost

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<sup>6</sup>Stein and Smith (1977) being the only ones to even mention it.



of administering these funds appears to be significantly less than those of administering the storage program. In addition to that, agreement among a great many donor nations seems to be far easier to achieve than for the grain reserve proposal, as the long and endless discussions of the 1970's have shown.

- 2) It is a well established fact that a gift in kind (food aid) is always inferior to an amount of money, nominally equal to the gift in kind.<sup>7</sup>
- 3) Another positive feature would be that the international grain markets would not be artificially distorted, as governmental interference with private "buffer stocks" would no longer be necessary.

In Graph VIII the amount of monetary assistance necessary to keep consumption at previous levels would be equal to the area  $P_0P'_0AB$ .

Why, in the presence of all the cited advantages and no apparent disadvantages, has such a proposal not been discussed in the literature? We can only speculate on this: The only losers of that solution would be all those researchers who have made the grain reserve issue their one and only research topic.

Food import bill insurance. A proposal, in some aspects similar to the one just described, has been put forward only recently. Johnson (1978) and Reutlinger (1977) among others<sup>8</sup> are the proponents of the so called "Food Import Bill Insurance." The gist of their recommendation is, according to Reutlinger:

- a) a convention given by the food exporting countries assuring any quantity of imports needed by the developing countries to maintain an agreed level of consumption; such exports would take priority over any attempt to stabilize consumption in the developed countries;

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<sup>7</sup>See any good textbook on microeconomics; for instance, Alchian and Allen, 1977, pp. 119-122.

<sup>8</sup>See also Bigman and Reutlinger (1978); Konandreas et. al. (1978); Reutlinger (1978); and Bigman and Reutlinger (1979).

- b) a Food Import Bill Insurance (FIBI) scheme which would provide financing of the cost of importing the required amount of food grains to maintain an agreed level of consumption in excess of the normal food import bill in developing countries. The scheme could be paid for by contributions in the form of annual "premiums," or could be maintained as a kind of monetary buffer stock operation (Reutlinger, 1977, pp. 5-6).

The significance of this proposal is that for the first time some analysts have raised their voice to oppose grain reserve schemes as the best measure leading towards food security. We think that this is an important and desirable change of direction in the discussion, which will have far reaching consequences. Our evaluation of the literature concerning the relationship between food aid/emergency reserves and food security is that the more recent research contributions have, at least partially, abandoned the buffer stock concept in favor of alternative solutions.<sup>9</sup>

A word of caution seems to be appropriate: The discussion about the Food Bill Import Insurance is yet in its infancy. Repercussions from the added food security in developing countries, to added instability in the developed countries in grain markets as such, are conceivable. Before actually endorsing this policy recommendation, a thorough analysis of the welfare implications is necessary.

Trade liberalization. Trade liberalization can alleviate the food insecurity problem in basically two different ways:

- 1) Productive shortfalls tend to be geographically limited.

While one region, country, or even continent may experience a serious crop failure due to bad weather conditions, other regions or countries

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<sup>9</sup> See Reutlinger, 1977, pp. 2-5.

may have above average crop yields. Johnson (1978) has estimated that the negative maximum deviation from trend production worldwide has been only three percent (Johnson, 1978, p. 82). With this fact in mind, fostering trade liberalization appears to be a very efficient measure for accomplishing food security. Surplus countries could trade their excess grain to deficit countries. This would definitely be the least expensive policy, since it is generally known for at least 200 years (Adam Smith and David Ricardo), that trade liberalization and specialization according to one's comparative advantage leads always to an increase in world welfare, while only special interest groups might lose some of their unearned privileges.

2) Trade liberalization would, among other things, mean an opening of the borders of the developed countries for LDC's products. This would sufficiently increase those countries' export earnings, thus enabling them to import greater amounts of food stuff not only in emergency cases.<sup>10</sup> Most economists would agree further that trade liberalization would be the single most effective policy measure for the development of the Third World countries, with the effect of increased capabilities for producing more grain domestically.

What then are the stepping stones that prevent us from going in the direction of trade liberalization? This is a complicated topic and beyond the realm of our study, but one brief remark appears to be warranted. There are a number of economists who believe that we first have to reduce the fluctuations in the international markets for agricultural products,

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<sup>10</sup>For some empirical estimates see Sanderson (1978) and the references given there.

before trading nations would be inclined to reduce trade barriers and move into the direction of liberalization. Dale Hathaway, for instance, writes:

In the first place, nations will be willing to reduce their trade barriers only when they believe the international market is sufficiently reliable to provide adequate supplies at reasonable prices. In this sense, a food security system is a prerequisite for trade liberalization" (Hathaway, 1978, pp. 56-57).

This view to us is highly unrealistic. Take for example the European Economic Community, as one of the most influential conglomerates of nations both as a producer and a consumer. Their so called "Common Agricultural Policy" has nothing whatsoever to do with the uncertainties prevalent in world agricultural markets. It serves the one and only purpose of protecting an influential interest group, the European farmers. By doing so, it costs the consumer in the member countries billions of dollars every year and creates a big part of the instability in the international markets for agricultural commodities. To believe that the price support programs, import tariffs, export subsidies and other effective protective devices would be abandoned, if a world grain reserve scheme would reduce some of the apparent instability, is illusionary. Establishing grain reserves in order to achieve trade liberalization is to put the cart before the horse.

We would like to summarize this section in stating that all three of the described policy recommendations other than the buffer stock concept do have a better potential for achieving world wide food security. Besides that, they all appear to be far less expensive. We emphasize, however, that the discussion is in its initial stage, and definite conclusions together with policy recommendations should not be drawn prematurely. The welfare analytical implications need to be analyzed beforehand.

## Chapter 4

### SUMMARY

Our conclusions concerning the social function and desirability of national as well as international grain reserves are:

1) The breaking up of total grain reserves into four conceptually different reserve types, each serving a distinctive social function, appears to be desirable, for a great amount of confusion can thereby be avoided rather easily.

Commercial storage activity--including "working stocks" and "buffer stocks" is needed for inter-temporal allocation of grain supplies. Private commodity speculators buy grain and store it in the expectation of a future sale at a higher price. This profit-motivated action serves two purposes:

- a) allocation of discontinuously available supply (one harvest per year) to meet a continuous demand, and in doing so,
- b) stabilizes grain prices over time.

The private storage industry's action is not limited to "intra-year stabilization," it encompasses "inter-year stabilization" as well. The term "inter-temporal stabilization" appears therefore to be more appropriate.

We have attempted to show that the storage level, resulting from the profit-motivated actions of commodity speculators, is socially desirable; i.e., approximately optimal from the viewpoint of welfare economics,

since (a) the market is (sufficiently) competitive, and (b) externalities are not apparent. Thus, we have concluded, that for the purpose of inter-temporal stabilization, governmentally held grain reserves are utterly unnecessary.

2) The desirability of public storage activities has then been discussed under the heading of international food security. Emergency reserves and food aid reserves together are designed to alleviate the problem of starvation and food inadequacy, due to sudden production shortfall in Less Developed Countries. An international institution could at least theoretically solve this urgent problem by storing grain in normal or plentiful years and allocating it in years of critical shortages to those needing it the most.

Although we have not denied that such a grain reserve scheme has the potential of moderating the food insecurity problem, we have questioned its role on the grounds of economic and social efficiency. We have only briefly discussed three alternative solutions, all of which have tentatively been found superior to the grain reserve solution.

3) We, therefore, conclude that national governments should not intervene in commercial storage activities, and that national governments or supra-national institutions should also refrain from establishing a grain reserve for international food security. All efforts should instead be made to liberalize international trade, not only for agricultural, but for all products, on the broadest possible basis. For the immediate problem of short run food insecurity we have opted for either the proposed Food Import Bill Insurance concept or our own proposition.

## NEED FOR FURTHER RESEARCH

Although we have dismissed the concept of a grain reserve for either domestic or international policy use, the buffer stock scheme as such has raised some interesting questions for the economic theorist, which are not yet adequately answered in the literature.

1) Is stability in relative prices to be preferred to freely fluctuating prices? Waugh's (1944) and Oi's (1961, 1972) conclusion that price instability is beneficial to both consumers and producers, taken separately, has been challenged and actually has been reversed by Samuelson (1972) and Massel (1969) for different reasons. Their theoretical argumentation--together with our own limited observation, only briefly sketched--do indeed suggest that price stability for commodities is beneficial to society. Yet, a clear-cut and convincing answer has not been provided in the literature. The subjects still to be clarified include the treatment of storage costs and the question of the distribution of the eventual gains among the parties involved.

2) Are agricultural commodity markets "informationally efficient"? We have implicitly, without proof, assumed that the private agricultural storage market does possess the property of informational efficiency. We have taken the view of the so called "efficient-market" theorists, whose theoretical position is by no means undisputed. We recognize that considerable research is needed in this area to provide empirical verification for their claim.

3) The "simulation-studies" cited on page 22 have the potential of providing the policymaker with reasonable calculations of costs and levels of socially optimal grain reserves; yet, they all suffer from

failure to account for two real life phenomena: (1) the existence of profit-motivated private stockpiling, and (2) the existence of supply and demand response schemes. Without those modifications, they appear to us not very meaningful.<sup>11</sup>

4) The discussion about the relationship between grain reserves and food security has suffered most from the sinister connection of positive and normative economic judgments and statements. Unless those two categories are separated sufficiently, progress is not likely.

5) Finally, we believe that there has been disillusionment over the role buffer stocks can or should play in the international area, and a movement has started to abandon the concept in favor of alternative solutions of the food security problem. The movement is not yet widespread, but very noticeable in the extensive work done by Shlomo Reutlinger. We think he, with others hopefully to follow, has proceeded in the right direction.

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<sup>11</sup>See Helmberger and Weaver, 1977.



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A CRITIQUE OF THE LITERATURE

by

DIETMAR GEORG

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## ABSTRACT

Through the analytical device of identifying different types of grain reserves, all serving distinctive functions, we have attempted a clarification of the issues involved in the grain reserve debate.

Working stocks and pure buffer stocks of grain have been called "commercial storage activities," reflecting the fact that the private sector can, given certain assumptions, provide the socially desirable level of grain reserves without government intervention. Food aid and emergency reserves, on the other hand, discussed under the heading of "Food Security," have been confined to "public storage activity." We found, however, that alternative measures do exist, which can solve the food (in)security problem more efficiently, thus questioning even the desirability of public grain stockpiling for the implied purpose. Our work is to be understood not as much as an extensive review of the literature, but rather as a critique of the key issues dealt with in selected research studies.