VALUE OF IMPROVED FORECAST INFORMATION FROM A SATELLITE-BASED CROP INFORMATION SYSTEM

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VALUE OF IMPROVED FORECAST INFORMATION

FROM A SATELLITE-BASED CROP

INFORMATION SYSTEM

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PREFACE

This study is concerned with estimating the value of improved crop forecast information resulting from the use of an assumed satellite-based crop information system. Alternative forecast accuracy levels, timeliness levels, and supply-demand scenarios are evaluated as to their effect on the value of the improved information. The National Agricultural Policy Simulator (POLYSIM) model is used in the analysis which includes the use of a consumer and producer surplus model. The results are not limited to a satellite-based system. Any system that will improved the current forecasts as assumed in this study will also generate the estimated information values.

This study would not have been possible had it not been for the assistance provided by the Foreign Agricultural Service (FAS) of the U. S. Department of Agriculture. My thanks to Mr. Jimmy D. Murphy, Director, and Mr. James R. Hickman of the Crop Condition Assessment Division of the FAS for their continued encouragement, suggestions, and patience throughout my dissertation work. To my fellow workers, who were burdened with a larger workload due to the time I spent on this study, my appreciation.

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CHAPTER I

INTRODUCTION

Background

In agriculture, estimates of crop acreage and yield, leading to forecasts of production, are essential for efficient planning in all phases and segments of agricultural production, processing, and distribution. Timely and accurate forecasts permit more precise planning for greater efficiency in the transportation and processing of commodities and help identify potential shortages while there is still time to hedge against them. From the viewpoint of the producer, more timely and accurate forecasts of foreign crop production and the resulting improved accuracy of export forecasts (and, therefore, total demand and price expectations) permit more profitable decision making with regard to production and marketing strategies. Reliable estimates of crop acreage, yield, and production provide information necessary to coordinate the input supply levels and farm level demand for inputs.

In 1972, the USSR purchased large quantities of grain before the American public and Government were aware of the actual magnitude of the purchases. These purchases sent the commodity prices dramatically upward. Even recognizing that USSR imports of such quantities represented a major policy shift, if more accurate and timely information about the USSR crop production shortfall had been available to the public, commodity traders and producers may not have been caught so unaware.

Estimates of the accuracy of the current U.S. Department of Agriculture (USDA) system wheat forecasts indicate that the performance of the USDA forecasts varies by country, by the time during the growing season that a forecast was made, and by the source of the forecast (64). Overall, the forecasts made just before harvest ranged from plus or minus 26 percent in 9 out of 10 years (74 percent accuracy level) for Australia to plus or minus 69 percent in 9 out of 10 years (31/90 accuracy) for Brazil and the USSR. Only the afterharvest estimate for Australia surpassed the 90/90 accuracy goal of the Large Area Crop Inventory Experiment (LACIE)[1]. The best USDA forecast prior to the crop's midseason was only plus or minus 56 percent in 9 out of 10 years. The forecast accuracies for crops other than wheat have not been evaluated in such detail. Under the assumptions, that the production forecasts for other crops are similar to those for wheat, there is substantial room for improvement in the foreign crop production forecasts.

The USSR wheat purchases strongly emphasized the need for more accurate and timely information about foreign crop forecasts. In 1974 the USDA began pursuing the possibility of improving foreign crop production (and, therefore, foreign demand) estimates through the

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[1]The Large Area Crop Inventory Experiment was a joint project using the Landsat satellite to estimate wheat production and involved the U.S. Departments of Agriculture and Commerce and the National Aeronautics and Space Administration (NASA). The projects goal was to estimate wheat production at-harvest within 10 percent of the true value in 9 out of 10 years (90/90).

use of satellite-derived data (e.g. the LACIE project). This technology gives promise of a substantial improvement in foreign crop estimation. Not only will the crop forecast be improved by use of the satellite data, but the use of the satellite data brings continuity of information to the Department's estimation program. The politics of the season need not affect data availability to the Government. Use of the satellite data also brings more objective information due to the digital nature of the data. The dissemination of this information to the American public in a comprehensive form and in a timely manner needs substantial improvement.

Programs to provide information for both public and governmental decisionmakers are a significant component of many Government agencies. Questions concerning how much information to provide, who benefits from the information, and the value of the information underlie decisions involving the support and management of such programs.

Even before the launch of the first Earth Resources Technology Satellite (ERTS), now called Landsat, in 1972, questions had been asked regarding the benefits to be obtained by using satellite data. Research projects, such as the LACIE, have developed some analytical tools capable of being used for crop condition assessment and early warning of crop production potentials. With the incorporation of these tools into an operational role within the U.S. Department of Agriculture, the value of the information provided by a satellite-based information system, again, has become important.

Issues involving the value of information systems have received attention in the past. Several studies have been conducted to estimate the value of information provided by a satellite-based system

(1, 2, 5, 6, 22, 23, 57). Each study has had some shortcoming in terms of model specifications, implementation errors, lack of real world applicability, etc. (Figure 1). By comparison the present study uses the POLYSIM model which contains real world constraints, is a positivistic model, and analyses seven crops on an annual basis using a recursive simulation technique. The value of information is calculated for alternative crop export forecast accuracy levels along with alternative timeliness assumptions for the information and alternative supplydemand scenarios. The current interest in the estimates of the value of information appears related to the increasing emphasis on program evaluation in the Government, led by the Office of Management and Budget. Estimates of the value of information are one of the building blocks for effective management and planning decisions. Additionally, to aid government policymakers in their decisions on future multimillion dollar satellite-based crop information systems, the value of the improvement in crop information, as it relates to the U.S. economy in general, and to consumers, producers, and traders in particular, needs to be estimated.

Objectives

The objective of this study is to measure the value of improved estimates of supply and demand quantities for feed grains,cotton, soybeans, and wheat. Primary emphasis is on improved estimates of foreign demand for U.S. commodities given alternative beginning stock and domestic production levels in the U.S. More specific objectives are:

ECON, INC.			EARTH SATELLITE CORPORATION MODEL (1974)	NATIONAL AGRICULTURAL POLICY SIMULATOR (POLYSIM) (1979)
PRODUCTION MODEL (1976)	DISTRIBUTION MODEL (1976)	INTEGRATED MODEL (1976)		
ECONOMETRIC SIMULATION TECHNIQUE	DECISION THEORETIC APPROACH -MAXIMIZE THE VALUE OF THE CONSUMPTION OF WHEAT	DECISION THEORECTI APPROACH -MAXIMIZE THE VALUE OF THE CONSUMPTION OF WHEAT	SINGLE BENEFIT EQUATION	RECURSIVE SIMULATION TECHNIQUE
FOUR YEAR TIMEFRAME	N YEARS	N YEARS	TEN YEARS	1 - 10 YEARS
STOCHASTIC	STOCHASTIC	STOCHASTIC	STATIC	STOCHASTIC
IMMEDIATE, COMPLETE INFORMATION USE	IMMEDIATE, COMPLETE INFORMATION USE	IMMEDIATE, COMPLETE INFORMATION USE	-----	IMMEDIATE BUT PARTIAL INFORMATION USE
POSITIVE ENTREPRENEURIAL BEHAVIOR	OPTIMIZING ENTREPRENEURIAL BEHAVIOR	OPTIMIZING ENTREPRENEURIAL BEHAVIOR	-----	POSITIVE ENTREPRENEURIAL BEHAVIOR
PRODUCTION EFFECT FROM ACREAGE RESPONSE TO PRICE	NO PRODUCTION EFFECT	DISTRIBUTION AND PRODUCTION EFFECT JOINTLY MEASURED	NO PRODUCTION EFFECT	PRODUCTION EFFECT FROM ACREAGE RESPONSE TO PRICE WITH STOCHASTIC YIELD
MONTHLY	BIMONTHLY	BIMONTHLY	ANNUAL	ANNUAL
LINEAR DEMAND	LINEAR DEMAND	LINEAR DEMAND	LINEAR DEMAND	VARIABLE ELASTICITY DEMAND
SIX CROPS	SIX CROPS	SIX CROPS	MOST CROPS	SEVEN CROPS
FREE MARKET ECONOMY	FREE MARKET ECONOMY	FREE MARKET ECONOMY	FREE MARKET WITH LIMITED GOVERNMENT INTERVENTION	REAL WORLD CONSTRAINTS

ECON, INC. CRITICISMS	EARTH SATELLITE CORPORATION CRITICISMS
Misspecified equations Storage costs not included Shift in supply improperly modeled. Real world constraints missing. Less optimal decision rule would reduce benefits Biannual forecasts are restictive	Does not model wheat sector. Prohibits dynamic market responses to improved forecasts prior to final estimate. Based on assumed improvements in domestic crop forecasts.

Figure 1. Differences Between ECON, Inc., Earth Satellite Corporation, and POLYSIM Models as Used to Estimate Information Value

1) Develop a model to measure the results of more timely and accurate supply and foreign demand estimates.

2) Develop alternative beginning stock, farm program, and reserve management scenarios to evaluate improvements in forecasts of supply and demand.

3) Evaluate the model results given alternative accuracy levels, alternative timeliness criteria, and alternative weightings of consumer and producer surpluses.

4) Evaluate the use of consumer and producer surplus in measuring information values.

Hypothesis of the Study

Inaccurate information leads to market distortions (i.e., resources (commodities, capital, labor) are used for tasks that would not have been undertaken or would have been undertaken at a different level if more timely, accurate information had been available for use in planning). The larger the inaccuracies, the larger the distortions. More accurate estimates of foreign crop production would lead to fewer or smaller market distortions and, therefore, more efficient use of resources. The hypothesis is that these market distortions can be evaluated to provide estimates of the potential value of the improved crop production forecasts. The study does not use satellite data directly. Certain assumptions made and methods of investigation relate the study to a satellite information system. Under alternative assumptions the value of information estimate can relate to any method of improved information.

Organization of the Study

Chapter II contains a review of the literature covering the concepts of consumer and producer surplus, uses of the concepts, the value of information, and information theory.

Chapter III introduces the study model along with relevant assumptions and the scenarios, levels of export forecast accuracy and the surplus and current year price weightings that are used.

Chapter IV discusses the agricultural sector simulation model that is used and its limitations. The specifics of the consumer-producer surplus subroutines are described along with the evaluation of accuracy levels measurement methods. The additional subroutines are described as is the flow and operation of the model.

Chapter V presents the results of the model for the alternative accuracy levels, price weights, surplus weights and supply-demand scenarios evaluated. Comparisons are made between assumptions regarding the availability of the satellite-based information. Appendix A contains the results for the selected variables discussed for each situation.

Chapter VI contains an evaluation of the value of information given the alternative situations previously described in Chapter V.

Chapter VII presents additional analyses of deterministic model results under four forecast accuracy assumptions and compares the results obtained under alternative types of satellite-based information improvements (i.e., all crops, wheat and corn only, and wheat only).

Finally, Chapter VIII presents the summary, conclusions, limitations and use of the results. Appendix A contains the results for selected variables for the nine simulations used in this study. Appendix B contains the yield and export data used in the analyses for each simulation. Appendix C contains the levels of livestock production obtained from the nine simulations. Appendix D contains the listings for the subroutines added to the computer model used. Appendix E contains a summary of the statistical tests performed.

CHAPTER II

REVIEW OF LITERATURE

Two General Schools of Thought

There is no concensus among economists about an approach, nor does a literature search reveal an integrated theory or general methodology to use in the quantification of benefits derived from information. This absence of a universal methodology is highlighted by some polarization of economists towards two different schools of thought concerning appropriate methodology. These may be characterized as the global modeling school versus the pragmatic user-oriented school.

The Global Modeling Approach

Those proposing a global modeling approach to value information generally develop a simulation or econometric model that estimates the benefits of information for the relevant sector of the economy. Within this approach, one important methodology, based on consumer surplus measurements of information value, was first proposed by Hayami -Peterson (20), and was developed in more detail by Arrow (3), Freebairn (17), Watkins (65), and the substantial work of ECON, Inc. (1, 2, 5, 22, 23, 52, 53). All of these studies estimate the net social benefits of information utilizing producer and consumer surplus concepts of welfare economics. This approach requires the traditional assumptions of perfect competition, lack of externalities, perfect mobility, constant marginal utility of money, and the other assumptions behind the concept of a global welfare function. Such studies generally assume "homogeneous information", i.e., that all decision-makers have access to and base decisions upon a specified information source. In cases where the realism of the assumptions is questionable, the method may break down (7, 16, 21, 30, 47, 58).

A second global modeling methodology estimates the value of information through the use of decision analysis or decision theory (36). The decision theory approach estimates the impact of information on the decision process and then places a value on the information in terms of its benefits to the decision maker, generally in terms of income. Dillon has prepared an excellent review of the use of decision theory in agriculture (13). Many studies of this type are firm or micro-oriented; they deal with the value of information to a particular firm rather than to society as a whole. However, such methods can also be used to estimate the aggregate value of information (6).

The Pragmatic User-oriented Approach

The second major school of thought regarding methodology for valuing information is more pragmatic and generally emphasizes the study of specific user groups. The Panel on Methodology for Statistical Priorities proposed this approach in their study of the estimation of benefits for data packages and programs (43, pp. 18-20). This general methodology was followed in 1974 to identify the scientific value and relevance of Landsat-type data (9).

Such studies usually begin with identification of the users of an information system and their specific needs for information. Subsequent steps often involve identifying appropriate improvements or changes in the system and estimating the value accruing to users. A key empirical work utilizing the user-oriented approach is provided by Moulton (41), in a feasibility study measuring benefits of the California Federal-State Market News Service. Chapter 3 of the Moulton report concerning theoretical concepts and application is a particularly useful explanation of the approach. While the useroriented approach often leads to the quantification of the value of information, it also recognizes that benefits for some user groups are particularly difficult to assess.

The more pragmatic methods tend to be structural rather than substantive. That is, while they utilize a systematic sequence of steps, they generally involve no specific formula that guarantees the answer to be true or reproducible. Such an approach attempts to develop procedures to insure that a systematic and creative process is followed in identifying the value of information. Each different information system involves different kinds of value issues; following a systematic step by step procedure assures that no aspects of the question are overlooked.

The Concept of Economic Surplus

While there is a need to estimate the value of information systems, this lack of a proven and general methodology limits success in meeting this need. No generally accepted integrated theory or general methodological framework exists for placing a value on information.

The lack of a general methodological framework occurs because a well defined market system for information does not exist. Thus, there is no established "price" for public information systems. Information is not a physical good and, therefore, lacks the concreteness that provides a basis for valuing many items. Also, many information systems do not have an observable impact, even in secondary data. Finally, many types of information possess characteristics of a public good, and the private value may be substantially different from the social value. One suggested approach to such a valuation is the concept of economic surplus; i.e., consumer and producer surplus. Currie, Murphy, and Schmitz present an excellent discussion of the concept of economic surplus and its uses (10).

Consumer Surplus

The concept of consumer surplus dates back to Dupuit (15) who, in 1844, claimed that a buyer may receive a surplus from a transaction. He defined this surplus as the difference between the sacrifice which the purchaser would be willing to make in order to get it and the purchase price he has to pay in exchange. The concept was popularized by Marshall (37).

To illustrate the concept, assume a demand schedule as shown in Table I and Figure 2. If the price of X is \$5 per unit, the buyer will purchase 1 unit. Now if the price falls to \$4.50 per unit, the buyer purchases 2 units. The consumer/buyer was willing to pay \$5 for the first unit and \$4.50 to get the second unit, but he had to pay only \$4.50 for each unit. Thus, the consumer had a gain of \$.50 which is considered the surplus. This surplus, then, can be measured by the

TABLE I

DEMAND SCHEDULE

Price of X	Quantity Demanded
$5.00 / unit	1 unit
4.50 / unit	2 units
4.00 / unit	3 units
3.50 / unit	4 units
3.00 / unit	5 units
2.50 / unit	6 units

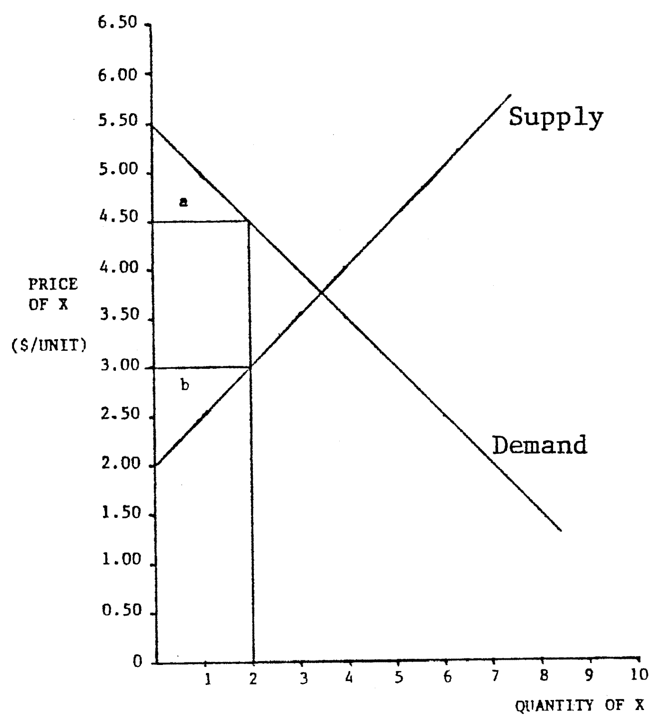


Figure 2. Demand and Supply Curves for Commodity X

area below the demand curve and above the price line, area "a" in Figure 2. With a continuous, linear demand curve, this area is a triangular area beneath the demand curve and above the price line.

Producer Surplus

Marshall (37) also introduced the concept of producer surplus to formalize the notion that a seller as well as a buyer may receive some sort of surplus from a transaction. When he makes a sale, an individual generally receives something which has a greater direct or indirect utility to him than the utility of the thing he gives up. To this extent he receives a surplus. The traditional measure of producer surplus is the area above the product supply curve and below the price line.

To illustrate the concept, assume a supply schedule as shown in Table II and depicted in Figure 2, and recall that the supply schedule represents the marginal cost of producing an additional unit of X in a pure competition framework. Then, if the price of X was $2.50 per unit, the producer could just produce one unit of X. Now if the price X rises to $3 per unit, the producer can produce 2 units of X, the first unit cost $2.50 to produce and the second unit cost $3 to produce for a total cost of $5.50. If the producer receives a total of $6 for the 2 units, in effect, he receives a surplus of $0.50, which is equal to the area below the price line and above the supply curve, area "b" in Figure 2. Again, assuming infinitely small units and a continuous, linear supply curve, the producer surplus area is a triangular area.

TABLE II

SUPPLY SCHEDULE FOR COMMODITY X

Price	Quantity
$/Unit	Units
2.50	1
3.00	2
3.50	3
4.00	4
4.50	5
5.00	6

Uses of the Concept of Economic Surplus

Implicit in most of the studies which attempt to identify and measure the welfare effects of resource misallocation is the traditional belief that the competitive equilibrium represents an optimum. The concept of economic surplus isn't necessary for defining an optimum. However, it has been useful for measuring the welfare effects of deviations from a perceived optimum.

Technological Innovation

Economic surplus has been used to evaluate the economic effects of public and private investments. The basic type of model is given in Figure 3. Assume that prior to some technological innovation, equilibrium price and quantity are P_o and Q_o, respectively, given supply curve, S_o and demand curve D_o. As discussed above, the consumer surplus is equal to area D and producer surplus is area B plus area C.

Further assume that following the development of the new technology, production costs are lowered and, thereby, the supply curve shifts to S_1. Now consumer surplus is equal to areas C+D+E+F and producer surplus is equal to areas A+B+G. The net social or economic surplus is areas A+E+F+G, since the change in producer's surplus is areas A+G−C, while the gain in consumer's surplus is areas C+E+F.

Input Limitation

Wallace (63) analyzed the effects of output restrictions through controlling the input of a particular factor of production (for example, through acreage control). In Figure 4, the effect of such a program is to shift the marginal cost or supply curve from S_0 to S_1 as a result of the less efficient use of other inputs with the limited input. The net loss is measured by areas D+E+F+G. Of this loss, areas F and G are associated with the reduced output and areas D and E are attributed to the inefficient use of other resources with the limited input.

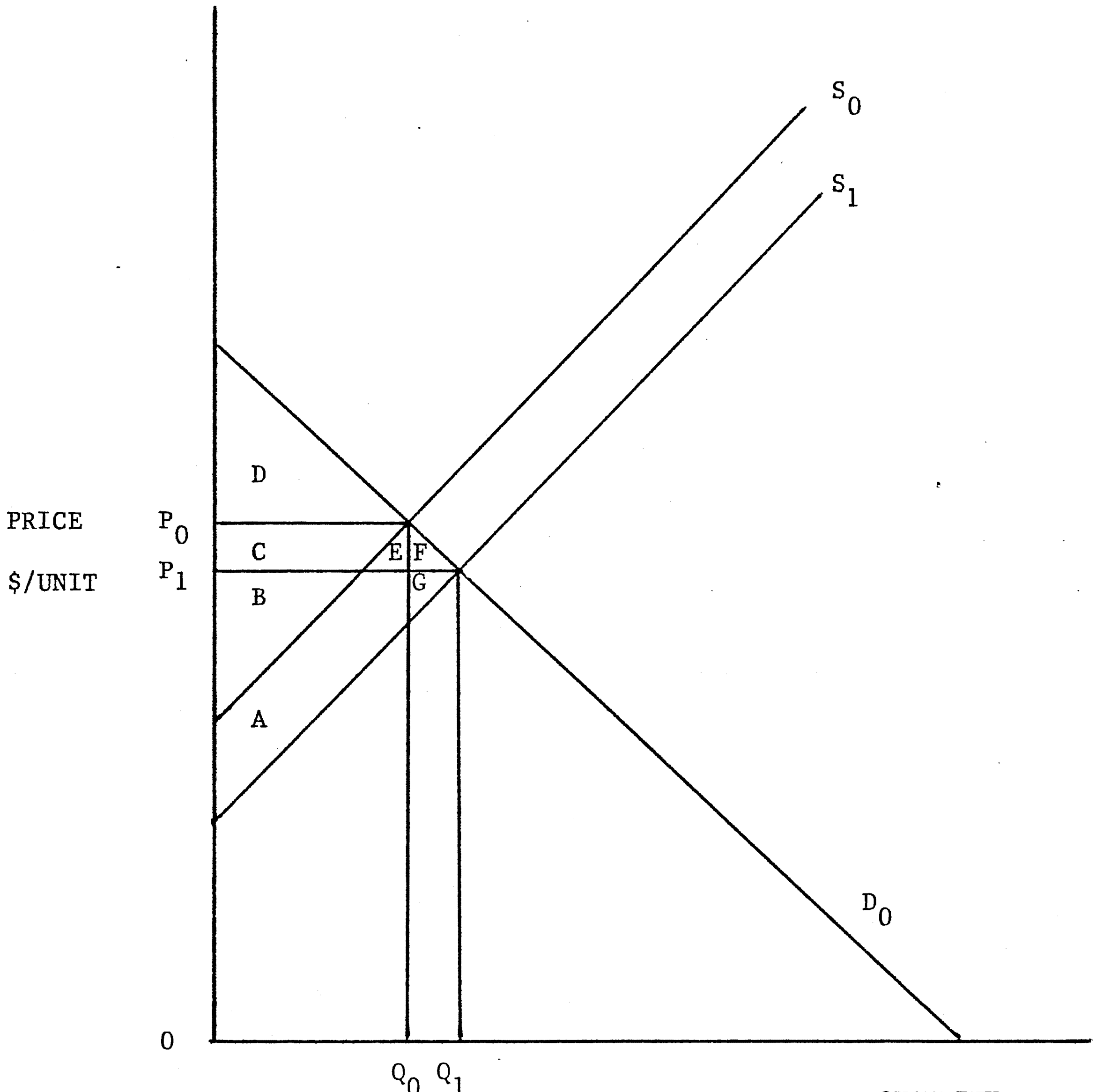


Figure 3. Effect of a Technological Innovation

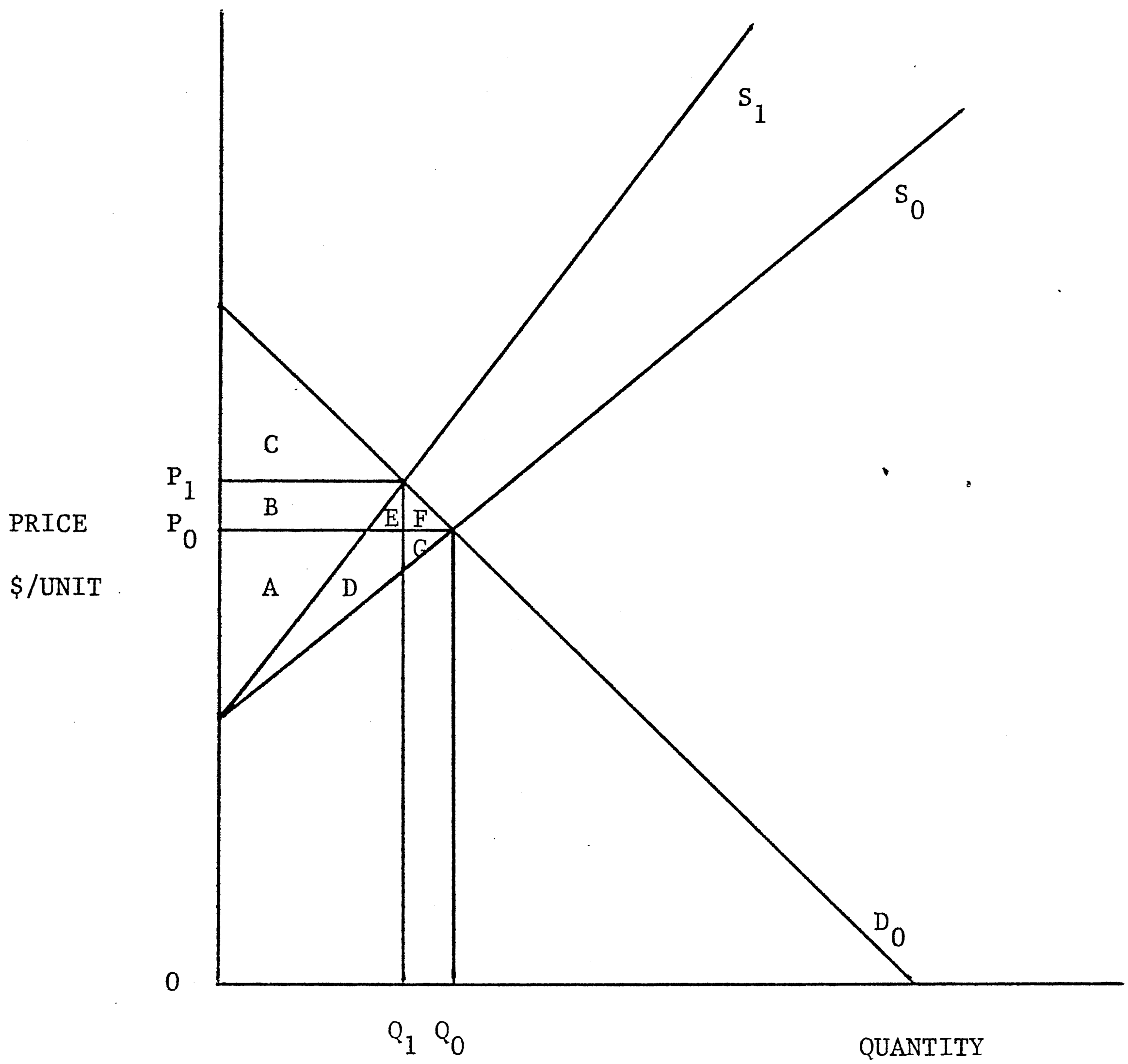


Figure 4. Effect of an Input Limitation

This framework of analysis was used by Johnson (27) to estimate the net social cost of the U.S. tobacco programs. He extended the analysis to take into account the strong monopoly position which the U.S. holds in the world market for flue-cured tobacco. The monopoly structure resulted in a gain which he used to offset the losses from the output restriction and from the less efficient use of other factors with the limited acreage.

Hushak (25) analyzed the effects of the corn diversion program from 1961 to 1966. A three-sector (corn, other crops, and the rest of the economy) supply-demand model was developed to incorporate substitution in production and consumption between corn and other crops. Hushak used observed data as the restricted market equilibrium and estimated the free market equilibrium from parameters derived in previous studies. He then computed the net welfare costs and income transfers using these two equilibrium points. In general, he determined that net welfare costs were small but that income transfers from consumers to producers were substantial.

International Trade

Most countries engage in some form of international trade. The commonly held presumption is that in some sense a country gains from trading with other countries. Economists have long wanted to measure this gain. In 1960, Johnson (26) provided a demonstration of the potential of economic surplus in the formulation of trade policies. Other recent studies have been conducted to evaluate the social costs of trade barriers (11, 12, 35).

Price Stability

Another application of the concept of economic surplus has been in the area of price instability. In 1944, Waugh (66) used consumer surplus to demonstrate that consumers may benefit from price stability generated by fluctuating shifts in supply. A number of years later, Oi (42) showed that producers may benefit from price instability generated by fluctuating shifts in the demand curve. In 1969 and 1970, Massell (38) argued that the payment of compensation would mean that both producers and consumers would prefer price stability, no matter whether supply or demand shifts cause the instability.

An important conceptual advancement was Turnovsky's (62) analysis of economic surplus gains from price stabilization in an environment of price uncertainty, rather than price variability. Just (28) has recently added several dimensions to the supply function (e.g., the stochastic variation of actual production about planned production and the partial adjustment of productive resources to random price variation). The results of Just's analysis confirm Massell's conclusions that the source of the instability is a crucial determinant in evaluating the winners and losers from stabilization efforts.

Investments

The concept of economic surplus has been used to evaluate the societal effects of public and private investments. The basic type of model was presented in Figure 3. This model is representative of the one used by Peterson (46) to evaluate the effects of poultry research. Griliches (18) assumed a perfectly elastic supply curve in order to estimate the rate of return on the investment in hybrid corn research. In 1970, Schmitz and Seckler (54) used the basic framework (Figure 3) to compute the rate of return on the investment in the development of a labor-saving technological innovation - the mechanical tomato harvester. Several other studies have evaluated rates of return on investments (4, 14, 34, 55).

Chayat (8) used the concepts of consumer and producer surplus to evaluate the impact of giving bargaining power to the farmer. The study indicated that some social gain could be realized through stability in egg production and marketing and that the gains to society would occur at the same time that producers gained in income. The study implied that the potential gains to society from giving the egg industry bargaining power were not large in the short run but could be substantial in the longer run.

Value of Information

A complete and annotated bibliography on information value has been prepared by Lawrence (32 and 33). This bibliography covers major aspects of information value including (a) the use and value of information in organizations, (b) decision making under uncertainity, (c) the economics of lack of perfect knowledge, (d) information and Government policy, and (e) entropy and related measures of the amount of information. Those interested in conducting research relating to the value of information should study the Lawrence bibliography thoroughly.

In addition, Miller (39 and 40) conducted a thorough review of literature in his preparation of a project prospectus concerning the value of information and an evaluation of the Large Area Crop Inventory Experiment (LACIE).

Information Theory

Information theory is closely akin to decision analysis or decision theory. However, information theory may be distinguished by its view of information as an "economic good", often with appropriate demand and supply relationships. In contrast, decision theory emphasizes the manner in which information is used by decision makers. Information theory provides additional understanding of the possible benefits of information and the distribution of such benefits. A brief review of information theory is contained in the work of Riemenschneider (51).

The Riemenschneider paper contains some useful insights for understanding the value of information. The paper develops the concept of the supply and demand for information and discusses the characteristics of information as an economic good. It relates the level of competition to the availability of private information and sketches the means by which large firms often benefit the most from information (51, page 18). The paper emphasizes that public information systems have important structural impacts on industries and impacts on income distributions, as well as impacts on economic efficiency.

Riemenschneider (51, pp. 23-24) lists five justifications for Government information systems. First, the current income distribution may be so undesirable that the redistributional side effects of an information system may alone provide a rationale for Government reporting. Secondly, accurate information can enhance competition in a given market. Thirdly, an improved information system might be needed to prevent further concentration in an industry and its subsequent detrimental effects on competition and consumer prices. Fourth, inasmuch as the Government remains an objective reporter, information serves a useful function in the resolution of disputes about the value of certain commodities. Fifth, and finally, the need for information to conduct public programs also justifies its collection by Government.

While a public information system can have substantial impacts on the structural characteristics of a market, concentrated markets also have implications for the nature and role of information. In concentrated markets, participants often devote substantial quantities of resources to private information collection activities in order to maintain an "information edge" on competitors. Because of costs and scale economies in information gathering, larger firms are often more successful in this activity. Such a market structure leads to the concept of "differential information" (19, page 13). This concept suggests that the participants in highly concentrated industries possess varying levels of information at any point in time--in such a situation, those originally possessing the poorest information benefit the most from a new public information system. Furthermore, they benefit at the expense of the firms who originally had the better information.

Information and Price Variation

A relationship exists between the concepts of uncertainty, price variability, and information that may provide a basis for understanding information value in certain situations. Smyth (59) has considered this relationship directly in his article on public price forecast and price variation. A recent article by Bullock (7) also investigates the linkage between forecasts and price variability. This article is particularly interesting in its conclusion that all forecast errors do not generate social costs and that the size of the error is often unrelated to the size of the social cost--a conclusion that suggests that some improvements in information quality may not have a value to society. Paul, Heifner, and Mann (45) discuss informational services as one of the possible options available for stabilizing agricultural prices.

These studies all suggest that one likely impact of public information systems is price stabilization. To the extent that this relationship can be empirically estimated, it may be the key to estimating information value in terms of the value of the resulting price stability. Considerable attention has already been paid to the linkage between price stability and economic surplus.

The earlier studies of price stabilization indicate that the desirability of stabilization from the U.S. viewpoint depended largely on the source of the instability, whether generated internally or abroad (31). Just (29) used a two-country model (US and rest of World) with distortions and general demand and supply functions to analyze the implications of international price stabilizaton. The degree of nonlinearity of the excess demand function in the free trade exporting country, as well as the distortions, were found to be crucial in determining who gains from stabilization. With a high degree of nonlinearity, producers in both countries, as well as the exporting country as a whole, lose from stabilization, whereas consumers in both countries and the importing country gain. This is contrary to results obtained with linearity.

Other studies include the implications of stabilizing consumption and production, the impacts of trade restrictions on price stability, and implications of commodity storage under uncertainty (24, 50, 56, 60, 61).

CHAPTER III

CONCEPTUAL DEVELOPMENT

Introduction

The estimation of the value of improved foreign crop production forecasts as they relate to the U.S economy, the agricultural sector and to producers and consumers requires the use of a model that includes the imperfections in the economic system. An economic surplus routine can be added to estimate the impact of improved information.

The approach taken to value information is to evaluate consumer and producer surpluses resulting from varying levels of U.S. exports under alternative assumptions of forecast accuracy, timeliness and supply-demand situations. The primary impact of the improved information is in the potential adjustment by producers in crop acreages and yields. These production adjustments result from the disclosure of foreign crop demands in a timely manner and the resulting effect on the producer's price expectations. Accuracy levels of the foreign crop demand forecasts are simulated by the use of a final export demand, drawn at random from a normal distribution about a baseline value, and a preliminary export demand drawn at random from a normal distribution with a mean of the final value.

Domestic Production

As previously mentioned, one of the earliest studies to measure the value of information was conducted by Hayami and Peterson in 1972 (20). In the study, they developed a theoretical framework for estimating the social returns to government expenditures on public information services and applied that framework to the information reported by the Statistical Reporting Service of the USDA (now the part of Economics, Statistics, and Cooperatives Service of the USDA). They measured the social returns of reducing the sampling error of crop and livestock statistics reported by USDA.

Following Hayami and Peterson's discussion, if rational profit and utility maximizing behavior by producers, consumers, and marketing firms is assumed, a net decrease in social welfare could be expected from a sampling error in the statistical reporting of the production or the stocks of commodities. This erroneous information causes producers to make erroneous production decisions and distorts their optimal marketing strategy. Thus, an improvement in the accuracy of information provided would reduce the social cost of misinformation, which can be interpreted as an increase in the net social welfare.

Hayami and Peterson developed two models for estimating the social returns to the improvements in information: (a) an inventory adjustment model and (b) a production adjustment model. The inventory adjustment model applied to situations where production could not be altered significantly in response to output predictions, but where there is an opportunity for inventory holders to adjust stocks. A good example occurs in the food and feed grains sector of the agricultural industry. Once crops are planted, it is difficult and usually not profitable for producers to significantly expand or contract the output.

For products of this type, the social cost of misreporting future production, through such errors as acreage or yield estimates, arises because of distortions in the optimum consumption patterns of the products. Because products of this type are realized during a relatively short period of time within the year, their consumption patterns depend very much on the inventory policy of marketing firms. For example, the expectation of an abnormally small crop in the forthcoming production period and a higher price can be expected to result in a decreased rate of inventory depletion during the remainder of the current period. This, in turn, results in increased prices and a decreased rate of consumption during the current period.

This increased price and decreased rate of consumption reflects a negative benefit to consumers. On the other hand, producers gain from higher prices and lose from a smaller quantity. However, whether producers gain or lose overall depends on the slope (elasticity) of the demand curve.

Assume the supply and demand curves, S_0 and D, respectively, as shown in Figure 5. Note the supply curve is perfectly inelastic which represents the situation as described above. The market equilibrium points are P_0 for price and Q_0 for quantity. Given this situation, the area of consumer surplus is indicated by areas C+D+G and the area of producer surplus is indicated as areas A+B+E+F.

Now suppose that the reporting service erroneously estimates the supply to be S_1 rather than the actual S_0. Assuming that consumers and producers perceive the new estimate of supply as being correct, the new market equilibrium conditions are price, P_1, and quantity, Q_1. With the anticipated larger supply, inventory holders increase the

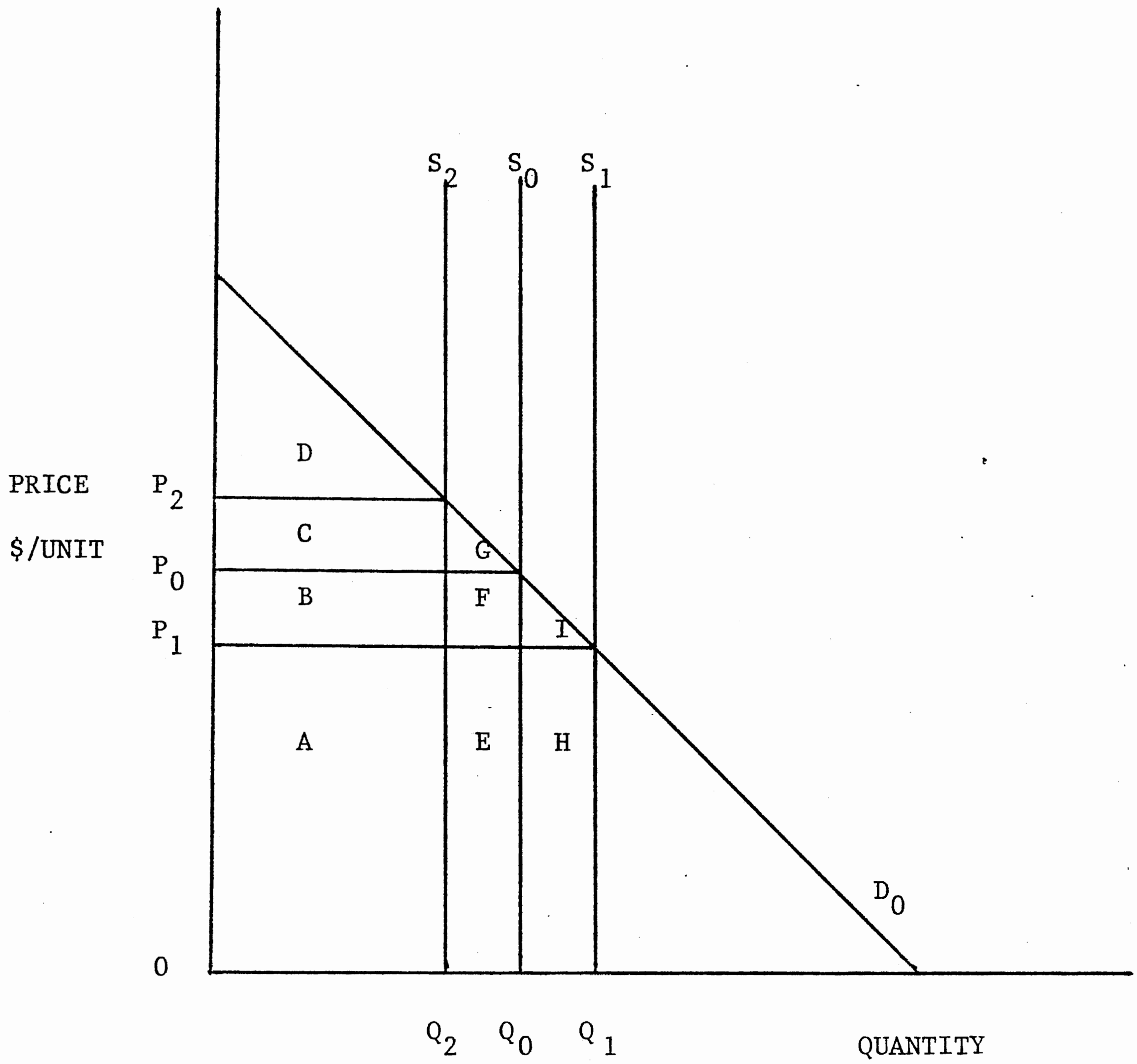


Figure 5. The Hayami-Peterson Model

rate of inventory depletion during the current period until price has fallen to P_1. Note that the consumer surplus is now equal to areas B+C+D+F+G+I and that producer surplus is areas A+E+H. Consumers have gained areas B+F+I while producers have lost areas B+F but gained area H. At the end of the current period, the actual supply S_0 is realized. Since inventories were depleted by the amount (Q_0Q_2), the market equilibrium price will be P_2 and quantity, Q_2. The area of consumer surplus is area D and the area of producer surplus is areas A+B+C. The consumer surplus has decreased by areas C+G and the producer surplus has decreased by areas E+F while increasing by area C over those surpluses that would have existed if no reporting error had occurred.

The result of the reporting error in period 1 is equal to an increase of area F for consumer surplus and a decrease of 2 times area F for producer surplus. Society's surplus has decreased by area F due to the error in reporting which occurred in period 1. Hayami and Peterson argue that improved information will decrease this loss and this decrease, then, is the value of the improved information.

The most severe limitation of the model is the lack of a positive production adjustment capability by crop producers over the longer run (i.e. What is the value of more accurate information in terms of next year's production levels?). The model does not take into account the interactions among the various commodities involved. The model does not allow within year adjustments to crop inventories and, therefore, does not capture the dynamic within year adjustments to changing forecasts information. No storage cost function is used to offset the benefits of shifts in inventory holdings. Finally, international trade is not considered as a part of the model.

Foreign Production

The situation described above represents the result of erroneous information concerning domestic crop production levels. The primary value of a satellite-based crop condition assessment capability will be the ability to improve estimates of foreign crop production prospects. The result of erroneous information on foreign crop production will affect the supply-demand situation through errors in expected export demand. Thus, one would have a situation as depicted in Figure 6.

In Figure 6 we have an upward sloping supply curve which is appropriate for longer term production situations for food and feedgrains. Assume that the original expected demand curve for commodity X is D_0. Further, assume that prices respond to any change in this expected demand as reported by the information reporting service and that any announcement of expected demand changes are made early enough so that producers can adjust their output along their supply schedules in response to changes in their price expectations. Also, assume that once crops are planted it is not profitable, and frequently impossible, for producers to significantly expand or contract the output. With supply curve, S, and demand curve, D_0, the equilibrium price and quantity are P_0 and Q_0, respectively.

Now suppose that the information service erroneously reports that export demand will increase, thereby, resulting in a new expected demand curve, D_1. Producers faced with their supply curve and this new demand curve expect the price of the commodity to be P_1 and,

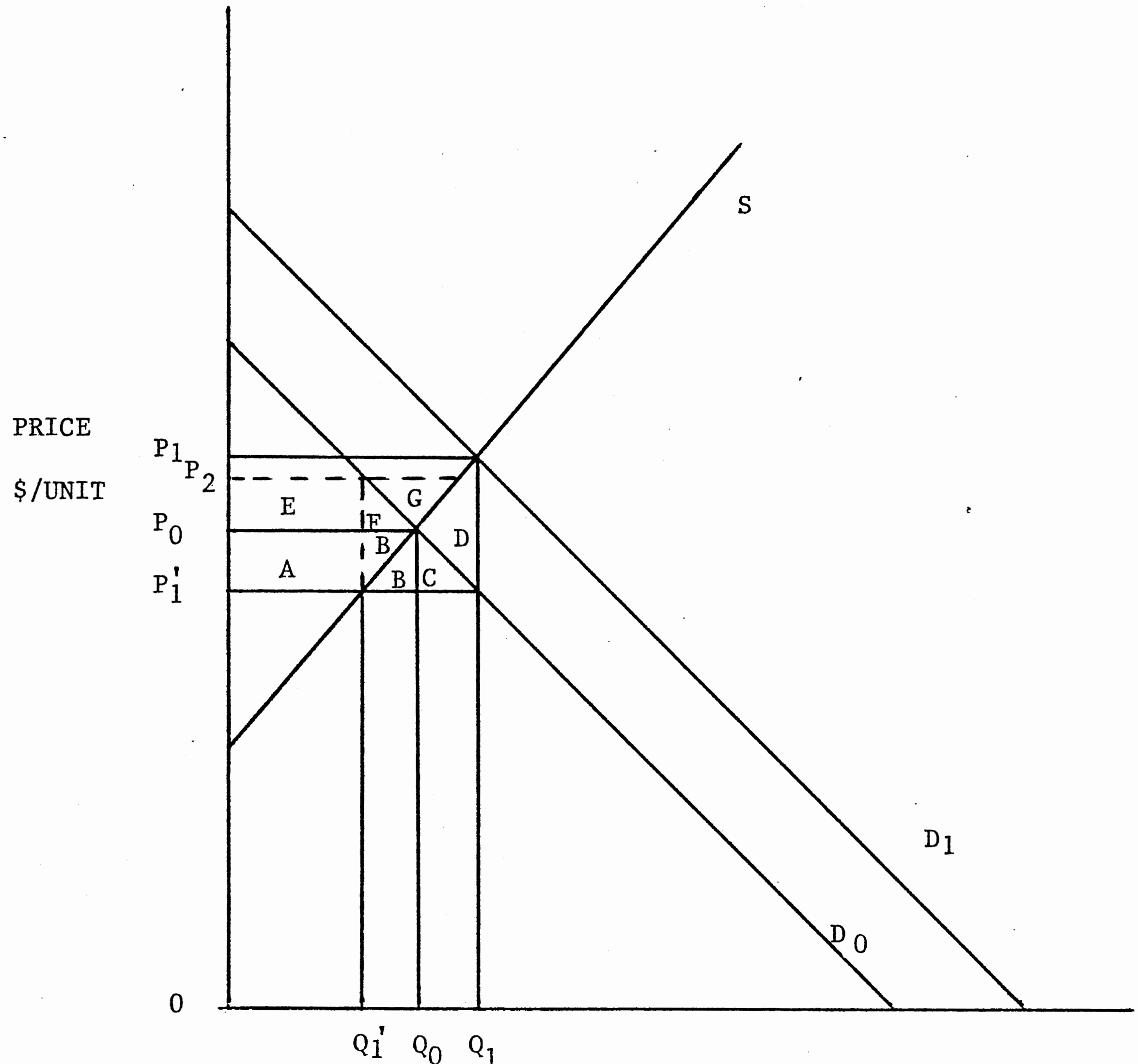


Figure 6. Effect of a Shift in the Foreign Demand

correspondingly, increase their production to quantity, Q_1. Now when this quantity, Q_1, is actually realized, consumers are willing to pay a price of P'_1, according to the correct demand schedule, D_0.

Note that consumer surplus increases by areas A, B, B' and C and that producer surplus decreases by areas A and B plus the variable costs of producing the quantity between Q'_1 and Q_1 that are not covered by gross returns, areas B', C, and D. Total surplus decreases by an area equal to area D. If one considers the supply curve as the cost of resources given up to produce the commodity and the demand curve as the value of the product produced as viewed by society, then for quantity, Q_1, the resource cost is greater than the value of the commodity perceived by consumers. This is the case for all quantities greater than Q_0. The area of this resource cost greater than product value is equal to area D in Figure 6.

For the next production period, producers perceive price, P_1', as the expected price and plan production accordingly at quantity, Q_1'. However, a misallocation of resources occurs again since consumers value the product at price, P_2, and the resources cost producers P_1'. From a consumer surplus viewpoint consumers lose areas E+F while producers gain area E and lose area B. Thus, the net loss to society is areas F+B which equals the area bounded by Q_1' and Q_0 between P_1' and P_2.

Note that the above adjustment process is similar to the cobweb model. It is important to note that the stability conditions of the supply and demand curves become important in this situation. With the cobweb model, convergence to equilibrium occurs only if the supply curve is steeper (less elastic) than the demand curve at least within the area of any erroneous demand and the equilibrium point. As Hayami and Peterson (20, p. 124) point out, if the slope of the demand curve is steeper than that of the supply curve, information provided by a reporting service results in a net loss to society.

Information Value

At this point, it is important to distinguish between the cost of erroneous information and the value of additional information. The Hayami-Peterson approach measures the costs of erroneous information resulting in inefficient resource utilization. The value of information results from the use of the new information in the decision making process. If the additional information allows the producer to expand (reduce) planned production to take advantage of expected increases (decreases) in product prices, then the value of that information should be the increased revenue obtained from that production response less the added costs. From the consumer viewpoint, information as value if it allows better use of resources, (e.g., better timing of purchases to take full advantage of anticipated price changes). For inventory holders, the value of information results from better purchase and sales timing with relation to price changes.

Substantial work has been done by ECON, Inc. to provide estimates of the value of the satellite based information (1, 2, 5, 6, 22, 23). The latest model is the integrated model which uses a decision theoretic (optimal control theory) approach to maximize the value of the consumption of wheat (2). The model assumed a linear demand with the distribution effects modeled bimonthly and with optimizing entrepreneurial behavior in the choice of inventories, plantings, and exports. The model was used for six crops.

The control theory approach involves the division of variables into a state vector and a control vector. The state vector contains four elements, the mean estimate of crop inventories and production of the exporter and the mean estimate of crop inventories and production of the importer. Consumption and intended production plantings in the exporting country, consumption and intended production in the importing country, and the quantity exported are included as the control vector.

In the final model, the variable values in the state vector respond to changes in the control vector. For given variable values in the state vector, the decision rules governing the values of the control vector are assumed to be optional. The optimization assumption is defined such that the decision rules maximize the economic value of current and future consumption patterns discounted to the present. Economic value is measured as the area under the demand curve from zero to the amount consumed.

Criticisms of the ECON, Inc. distribution model (1) generally apply to the integrated model (16,47). Primary criticisms are the lack of real world constraints, lack of storage costs, the optional decision rule tends to overstate actual benefits, and the biannual forecast assumption is too restrictive.

Under the assumption that satellite-based information will be available in a timely enough manner to allow some supply response by producers (and, implicitly, that producers find the new information credible), the measure of the value of the information will be the difference between consumer and producer surplus when the satellite-based information is available and the surpluses when the information is not available to producers and consumers. In this study, foreign production levels are used to influence domestic production and consumption decisions through their effect on commodity prices.

For producers, higher than normal foreign production levels mean lower expected export demand and the resulting lower commodity price. Producers may try to contract portions of their production at the current baseline or futures price, whichever is higher, or producers would reduce production in response to the lower expected price. Producer surplus, in this situation, is the weighted average of producer surplus using the ending price and quantity and the price and quantity resulting from the preliminary export forecast.

On the other hand, lower than normal foreign production levels lead to higher expected prices. In addition to their supply response, some producers may contract their crop at the higher future price. Again, producers surplus is a weighted average of that surplus using the preliminary price and quantity and using the final price and quantity.

Foreign production levels also affect levels of consumption. Higher than normal production levels would result in consumers buying commodities at the lower expected futures price. If all consumers believe the forecast of higher production levels, all consumers would purchase at this lower price. Some level of nonbelief in the accuracy of such a forecast means that fewer than all consumers would purchase at the lower price. The consumer surplus value would then be a weighted value of the surplus using the preliminary price and quantity and the surplus using the final price and quantity.

For the situation where foreign production is forecast to be lower than normal, consumers would contract as much as possible at the lower baseline or futures price in order to postpone paying the expected higher prices. However, once actual production levels are known, the consumer will pay the final price. Consumer surplus is again a weighted average of the surplus resulting from the preliminary price and quantity and the surplus resulting from the final price and quantity.

Accuracy Levels

A question of the value of the satellite-based information given various accuracies of the new system is an important one. For low accuracies of crop production forecasts relative to the actual production levels, one would expect lower values of the new information. Conversely, for high accuracy levels, one would expect high values of information. With alternative levels of accuracies and the associated value of information, investment decisions can be made regarding future satellite-based systems on a "cost/benefit" basis.

For this study, three accuracy levels will be evaluated using the stochastic simulator. Additional deterministic simulations will be run with additional alternative accuracy levels. The accuracies to be evaluated with the stochastic simulator are plus or minus 10 percent error, plus or minus 25 percent error, and plus or minus 50 percent error. An error larger than these levels is allowed only in one out of one hundred years (e.g. an error of greater than 10 percent is allowed in 1 year out of 100 years). The error is measured by the forecast value relative to the actual or final value. The incorporation of these accuracy levels into the simulation model will be detailed in the next chapter.

Timeliness

The timeliness of the satellite-base crop production forecast has a bearing on the amount of production response that would occur with such an information system. In the production of crops, once the crop is in the ground, little can be done to significantly increase the crop output and the individual farmer has little incentive to destroy a crop to decrease the expected output. Thus, to be of most value to producers, the crop forecast needs to be available prior to planting of a particular crop. It is not expected that all producers will believe the new information from the satellite-based system. Thus, not all producers will base their production decisions on the futures price resulting from the new crop forecast.

The timeliness criteria is entered into the simulation model through the use of weights for the previous year's price and the estimated futures price. The weighting factors are used to determine the amount of importance the estimated price will have in the producer's price expectations. The more timely the crop forecast, then more producers will base their production decisions on the estimated price. This situation is represented by a 0.90 weight on the price simulated using the crop forecast and a 0.10 weight on the previous year's final price.

If the crop forecast comes at a time when producers have made most of their production decisions, fewer producers will be willing or able to alter those decisions based on the newer information. To represent this situation, a 0.25 weighting factor is used for the price resulting from the crop forecast and a 0.75 factor for the previous year's final price.

These two weighting schemes are selected to represent a broad range of timeliness possibilities. The higher weight on the estimated current year price represents the situation when the information is available long enough before planting to allow all producers to use the information in their decision making process. Even then not all producers will believe the new information. Thus, the 0.90 weight is used to account for the nonbelievability even though the information is available in a timely manner. The 0.25 estimated current year price weight is selected to represent a level of information timeliness sufficient to allow some producers to use the information in their decision-making process. Some level of nonbelievability is still inherent in the weight. Actual timing relative to crop planting date is not specified.

In the model, then, these expected prices, resulting from the weighting of the price estimated using the crop forecast and the price from the previus year, are used to compute the current year's producer supply response. The value of information calculated from the situation then may be interpreted as values resulting from timeliness plus believability with the difference closely approximating values for timeliness assuming the level of believability is the same regardless of the timing.

Surplus Weighting

The alternative potentials for forward contracting of crop sales by producers and contracting of crop purchases by consumers is evaluated through the use of weighting factors applied to the consumer and producer surpluses estimated using the crop forecasts. The use of these weights assume that under certain circumstances some producers will or must choose to sell all or part of the crop on contract at an existing price (or may "hedge" his position through use of the futures market). If this situation occurs then the appropriate surplus values resulting from the crop forecast simulation needs to be accounted for. A similar situation occurs with consumers, who may alter purchasing patterns depending on their price expectations.

It is felt that these producers and consumers are not large in numbers. Assuming that no more than 10 percent of the crop producers take advantage of the forward contracting or futures price hedging, a weight of 0.10 is used for the preliminary producers surplus measurement. Also, assuming that, with fewer consumers than producers, relatively more sonsumers take advantage of contracting or futures price hedging, a weight of 0.20 is used for the preliminary consumer surplus measurement. These values,therefore, assume that 10 percent of the producers and 20 percent of the consumers take advantage of contracting or hedging. As an alternative set of preliminary surplus weights, a conservative approach is taken by using 0.05 and 0.10 for the preliminary producer and consumer surplus weights, respectively.

Scenarios Evaluated

The value of satellite-based information is evaluated over several scenarios. They include: 1) three alternative accuracy levels; 2) two alternative current year (futures) price weighting (timeliness levels); 3) two alternative surplus weights; and 4) three alternative supply-demand situations. Figure 7 details these alternative simulations.

The alternative accuracy levels evaluated are $\pm$ 10 percent, $\pm$25 percent, and $\pm$50 percent. These represent the allowable errors in the forecast export levels versus the final export levels as discussed in the previous sections. The simulation model is run for 300 iterations with each of these accuracy levels assumed.

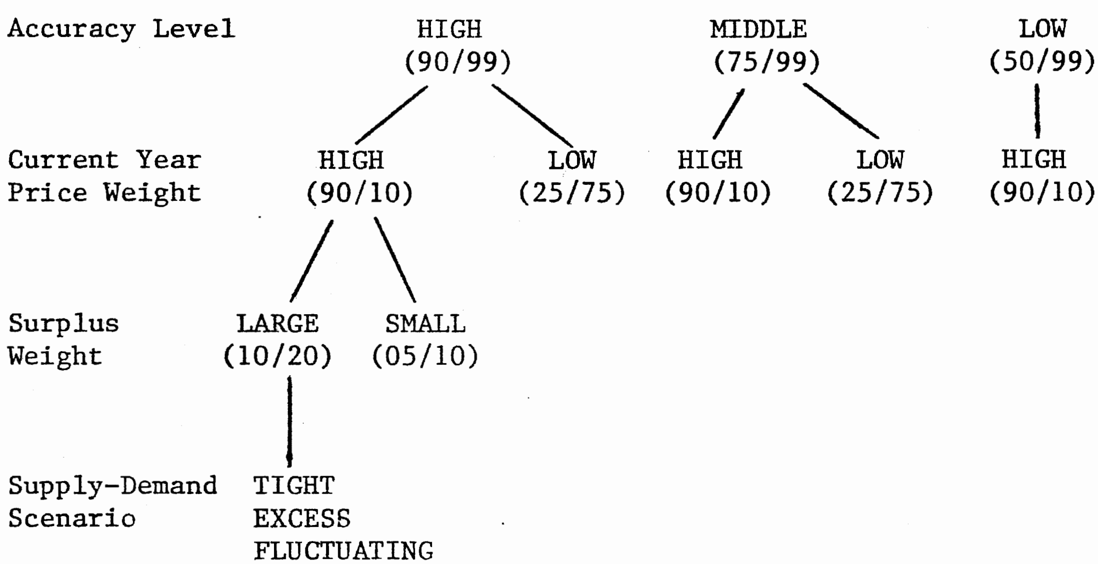


Figure 7. Alternative Simulations

The 10 percent and 25 percent forecast error simulations also are evaluated over 2 alternative price weights for the estimation of the producer's price expectation. One situation involves the use of the 0.9 and 0.1 price weights (referred to as a 90/10 price weight) for the futures price and previous year's price, respectively. The second situation assumes a 0.25/0.75 price weighting scheme (referred to as a 25/75 price weight). As discussed above, these price weight alternatives are viewed as a timeliness criteria. Again, these simulations are replicated 300 times.

The 10 percent forecast error situation also includes two surplus weighting schemes. In one situation the preliminary producer surplus values are weighted at 0.10 and the preliminary consumer surplus values at 0.20; in the other situation, these preliminary weighting factors will be halved. Each simulation is replicated 300 times.

The three alternative supply-demand scenarios evaluated are: 1) excess supply of crops, 2) tight supply of crops, and 3) fluctuating yields and exports of crops resulting in alternating excess and tight supply situation. The tight supply scenario could be the result of demand increasing faster than supply, supply decreasing faster than demand, or a falling supply and constant demand. As carryover relative to demand becomes smaller, one expects the value of information to increase relative to an excess supply situation. The excess supply situation would result from supply increasing faster than demand, demand decreasing faster than supply, or falling demand and a constant supply. The value of information resulting from fluctuating yields and exports indicates a wider range of yield and export possibilities and is more representative of the real world where cycles in production are apparent.

These situations are predetermined by selecting the alternative yield and final export values for each crop. The excess supply (increasing ending inventory, decreasing prices) scenario is represented by the increase of crop yields above and the decrease of the crop exports below the POLYSIM baseline level (Table III). The reverse is true for the tight supply (decreasing ending inventory, increasing price) scenario. Two alternative fluctuating supply-demand scenarios were developed. One starts with higher exports and lower yields than the POLYSIM baseline for the first year (tight supply), lower exports and higher yields for the next two years (excess supply), and back to higher exports and lower yields (tight supply) for the final two years. The other scenario starts with excess supply, goes to a tight supply situation, and returns to an excess supply situation. After preliminary analysis of deterministic simulations the latter scenario was selected for use in the stochastic simulator. Each of these scenarios are replicated 300 times.

Assumptions

The estimation of the net social benefits of information utilizing producer and consumer surplus concepts of welfare economics require the traditional assumptions of perfect competition, lack of externalities, perfect mobility and a constant marginal utility of money. Other specific assumptions made in the previous discussion includes:

1) Rational profit and utility maximizing behavior by producers, consumer, and marketing firms;

2) Consumers and producers perceive the new information as being correct and base their decisions on that new information;

3) Prices respond to the new information on crop supply and demand and

4) Demand and supply curves are linear and all shifts result from changes in intercept, not slope.

TABLE III

BASELINE MODIFICATIONS TO OBTAIN THE TIGHT, EXCESS, AND FLUCTUATING CROP SUPPLY-DEMAND SCENARIOS

Scenario	Year 1	Year 2	Year 3	Year 4	Year 5
Tight:					
Yields	-3.0%	-3.5%	-4.0%	-4.5%	-4.5%
Exports	+10.0%	+12.0%	+14.0%	+16.0%	+18.0%
Excess:					
Yields	+3.0%	+3.5%	+4.0%	+4.5%	+4.5%
Exports	-10.0%	-12.0%	-14.0%	-16.0%	-18.0%
Fluctuating:					
Yields	+3.0%	-3.5%	-4.0%	+4.5%	+4.5%
Exports	-12.0%	+12.0%	+14.0%	-16.0%	-18.0%

CHAPTER IV

THE SIMULATION MODEL

Changes in the demand for U.S. exports and supplies of commodities translate into U.S. price impacts and changes in the temporal allocation of its grain inventories. More accurate and timely information on the U.S. production and export levels can lower the "opportunity losses" to the U.S. as we have seen in Chapter III. Quantification of impacts on the U.S. economy requires a model that captures existing imperfections in the U.S. economic system. For this reason the POLYSIM model is used in this study. It will still be necessary to make assumptions concerning the relationships about how information is used in the decision making processes, including the strategies employed to reduce risk, and the slippage in the analytical process of transferring improved foreign crop information to forecasts of export demand and prices.

The next section briefly describes the POLYSIM model, its data requirements, assumptions, and limitations. Following that is a description of the use of POLYSIM, within the surplus concept, additional POLYSIM subroutines, and operation of the model.

POLYSIM: A National Agricultural Policy Simulator

The agricultural policy simulator (POLYSIM) was initially developed at Oklahoma State University in 1972 and has since been expanded and refined for use by the U.S. Department of Agriculture. The model makes full use of forecasted data as a reference baseline (Table XLIII, Appendix A). Included are the five-year baseline projections of commodity supplies, prices, and use made by Economics, Statistics, and Cooperatives Service (ESCS) economists. These projections contain explicit assumptions concerning the rates of change in population, per capita incomes, consumer preferences, export demand, technology, and other supply and demand shifters. A specific set of Government farm programs is also assumed.

Commodity supply and demand elasticities represent an important part of POLYSIM. The driving forces in the model are the initial and subsequent changes in commodity prices resulting from changes in policy conditions. The effect of yield and export levels different from those in the baseline conditions can also be investigated. The magnitude of the impacts is determined by direct and cross supply and demand elasticities.

Commodities included in the model include corn, grain sorghum, oats, barley, wheat, soybeans, cotton, cattle and calves, hogs, sheep and lambs, chickens, turkeys, eggs, and milk. The model provides estimates of acreage, yield, production, variable expenses, total supply, price commercial domestic demand, exports, carryover, cash receipts, and Government payments for each of the crops. Estimates of production, market price, and cash receipts for the seven livestock categories.

Estimates for the various commodity variables are summed and added to exogenous data for commodities not included in the model to develop aggregate estimates of production expenses, Government payments, gross income, and realized net income. POLYSIM also provides data on grain reserves, including commercial and Government-held stocks. Descriptions of the model operation are available (44, 48, 49).

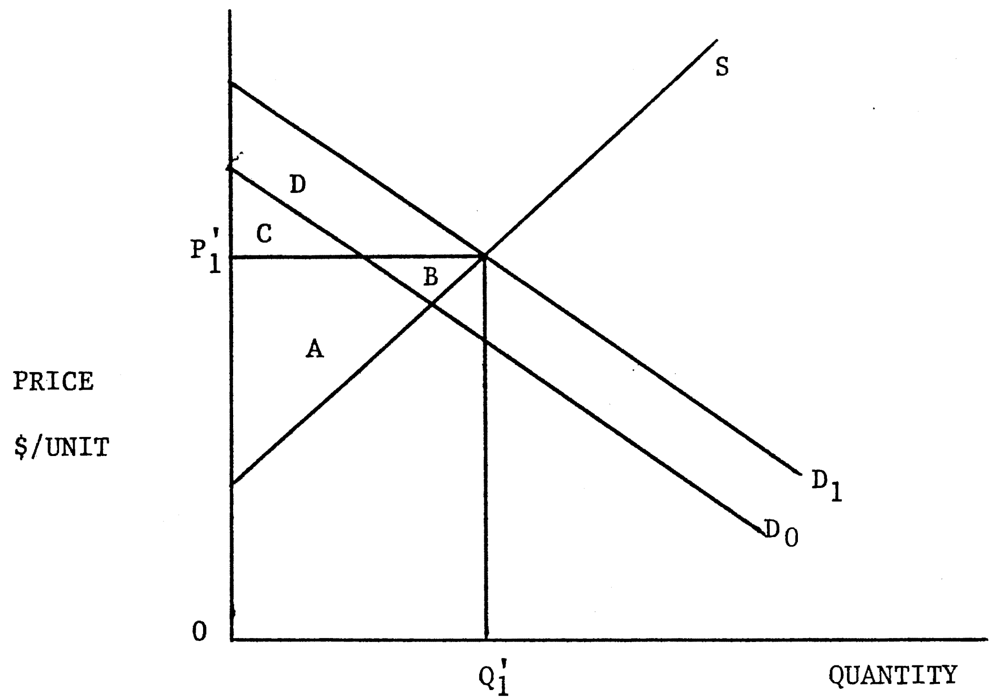
Limitations

POLYSIM is not a tool for all problems. Analyses of international stock reserve schemes are hindered due to the fact that the world grain market is exogenous to the system. As with econometric projection models, users must anticipate and build in structural changes in supply and demand parameters. The model does not provide estimates of changes in the organizational makeup of agriculture, in land values, or in liability and asset variables found in national balance sheets of agriculture. However, output from the model could be input into other models designed to make these estimates. Price variations within the year cannot be analyzed because the prices in POLYSIM are season averages for crops and calendar year averages for livestock. The model cannot extend beyond the baseline.

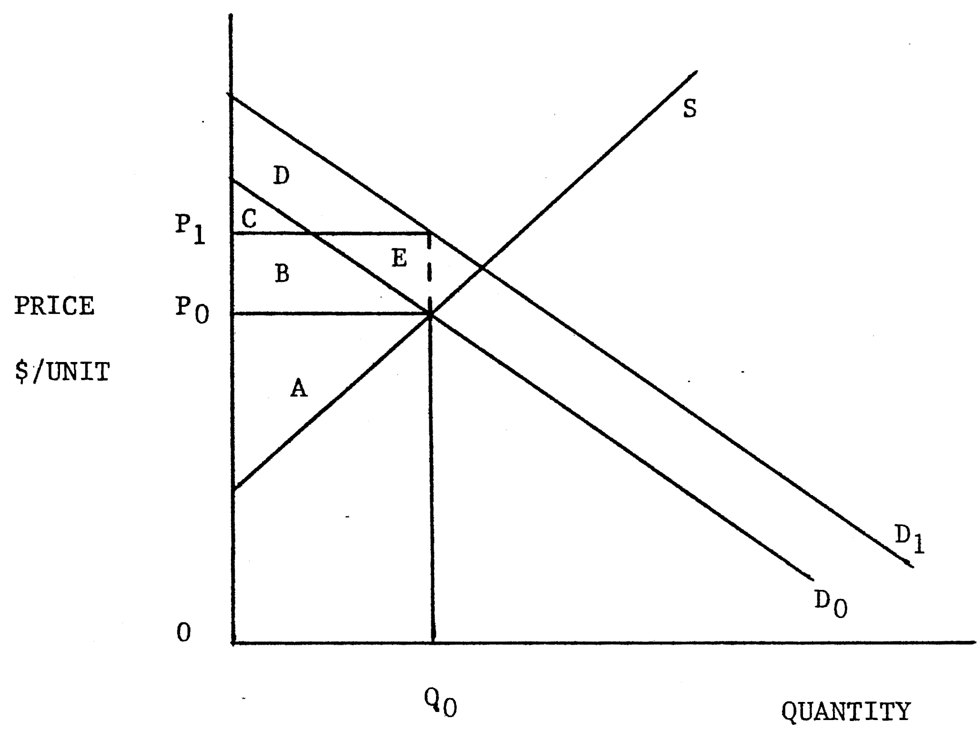
Surplus Subroutine Development

Consumer Surplus

The consumer surplus resulting from information concerning expected supply or demand levels, given the assumptions of linear curves and parallel shifts in the curves, can be measured by one-half the product of the squared equilibrium quantities and the inverse of the slope of the demand curve. For the case of no satellite information for crop i (shown in Figure 8a), the consumer surplus



b.) With Satellite-Based Information



a.) Without Satellite-Based Information

Figure 8. Illustration of the Areas of Consumer and Producer Surpluses

resulting from correct information is areas C+D for curves S and D_1. This area can be measured as follows:

$$CS_{ti} = 1/2\ (n_{ti}\ Q_{oti})\ Q_{oti} = 1/2\ n_{ti}\ Q_{oti}^{\ 2}$$

where CS_{ti} is the consumer surplus for time period t crop i, resulting from supply curve, S, and demand curve, D_1, n_{ti} is the inverse of the absolute value of the slope of the demand curve for period t, crop i where slope is change in price divided by change in quantity, and Q_{oti} is the equilibrium quantity for period t, crop i given supply curve, S, and demand curve, D_0.

Similarly for the case with satellite information available consumer surplus is areas C+D in Figure 8b or:

$$CS'_{ti} = 1/2\ n_{ti}\ Q'_{1ti}{}^{2}$$

where Q'_{1ti} is the equilibrium quantity for period t, crop i supply curve, S, and demand curve, D_1.

The change in consumer surplus resulting from the satellite-based information is then:

$$\begin{aligned} CSC_{ti} &= CS'_{ti} - CS_{ti} \\ &= 1/2\ n_{ti}\ Q'_{1ti}{}^{2} - 1/2\ n_{ti}\ Q_{oti}^{\ 2} \\ &= 1/2\ n_{ti}\ (Q'_{1ti}{}^{2} - Q_{oti}^{\ 2}) \end{aligned}$$

where CSC_{ti} is the change in consumer surplus for time period t for crop i resulting from the new information.

The effect over time periods for crop i is a summation of the change in consumer surplus for each time period:

$$CSC_i = \sum_{t=1}^{5} CSC_{ti}$$

and the total change in consumer surplus for all crops is:

$$CSC = \sum_{i=1}^{7} CSC_i$$

Total consumer surplus resulting from both the preliminary estimate of foreign crop production and the final estimate of production is a weighted average of the surplus resulting from the preliminary price and quantities and the surplus resulting from the final prices and quantities. The weights are varied as discussed in Chapter III.

Producer Surplus

The change in producer surplus resulting from satellite-based information, given the assumptions of linear curves and parallel shifts in the curves, can be measured similarly to the change in consumer surplus with the exception of using the inverse of the slope of the supply curve. However, an easier technique is available. Producer surplus can be measured as the gross receipts, price times quantity, minus variable costs which is represented by the area under the supply curve.

Therefore, producer surplus (areas A+B+E in Figure 8a) is:

$$PS_{ti} = P_{1ti}\, Q_{oti} - VC_{ti}$$

where PS_{ti} = producer surplus for time period t, ith crop, no satellite-based information, P_{1ti} = price received for time t, i^{th} crop, Q_{oti} = quantity for time t, i^{th} crop, and VC_{ti} = variable costs of production for time t, crop i.

For the case of satellite-based information (Figure 8b), the producer surplus (areas A+B) is :

$$PS'_{ti} = P'_{1ti}\, Q'_{1ti} - VC'_{ti}$$

where each symbol is an defined above, except that the new demand curve is used to determine equilibrium conditions.

The change in producer surplus resulting from satellite-based information is measured as:

$$CPS_{ti} = PS'_{ti} - PS_{ti}$$

Summing across time periods results in the total change in producer surplus resulting from the satellite-based information for the ith crop:

$$CPS_i = \sum_{t=1}^{5} CPS_{ti}$$

Summing across crops will give the total change in producer surplus for each time period:

$$CPS_t = \sum_{i=1}^{7} CPS_{ti}$$

$$= \sum_{i=1}^{7} (PS'_{ti} - PS_{ti})$$

The total producer surplus resulting from both the preliminary estimate and the final estimate is a weighted average of the surpluses resulting from each situation. These weights may be varied for the preliminary and final values (see Chapter III).

Areas of Measurement

Since the commodity demand curve is the sum of the domestic and export demand curves, the resulting consumer surplus is also a sum of the consumer surplus obtained from the domestic demand curve and the consumer surplus resulting from the export demand curve. However, since the objective of this study is to evaluate the effects of improved information on U.S. consumers, only the consumer surplus changes resulting from the domestic demand portion of the commodity demand needs to be considered.

The production of a commodity is utilized in both the domestic and export markets and, therefore, the producer surplus aspect of this study encompasses both these markets. It is assumed that the expected price resulting from the new information is weighted with the prior years price to determine current year acreage, yield, and production costs.

Net Domestic Surplus

The economic surplus from the use of information is the sum of the consumer surplus measured using the domestic demand curve and the producer surplus.

For the case of no satellite information we have:

$$NDS_{ti} = DCS_{ti} + PS_{ti}$$

where NDS_{ti} is the net domestic surplus time t, crop i, DCS_{ti} is the consumer surplus measured as above using the domestic demand curve parameters only and PS_{ti} is the producer surplus described above.

For the situation of satellite-based information a similar equation results:

$NDS'_{ti} = DCS'_{ti} + PS_{ti}$

The value of the satellite-based information is the difference in the economic surpluses resulting with and without the use of satellite-based information.

$VOI_{ti} = NDS'_{ti} - NDS_{ti}$

where VOI_{ti} is the value of information for time t and crop i and NDS_{ti} and NDS_{ti} are as defined above.

This value of information parameter is summed across the 5 time periods and/or the 7 crops to estimate the value by crop, the value by time period, or the value for all crops in all time periods.

Use of POLYSIM Within the Concept

The effects of information concerning the supply or demand of a particular commodity will be demonstrated through the use of yields and exports as stochastic variables. By varying yields and exports, random shocks to the U.S. agricultural economy represent the range of possibilities for a satellite-based information system.

In order to estimate the value of information on foreign crop production, the export variable within POLYSIM will be used. U.S. exports represent the link to foreign crop production estimates. Further study is required to determine the precise relationship between foreign crop production and U.S. crop exports or foreign crop production forecast errors.

Accuracy Levels of Information

In order to represent various accuracy levels of the satellite-based information, two random draws of crop export values will be made for each year of the model. The first random draw will use the POLYSIM baseline value as the mean and a standard deviation of the detrended data using recent historical export data in a normal distribution (equation 1). This draw will be the final export value. More explictly:

$$\text{Final Crop Export} = \text{Baseline Crop Export} + \text{Crop Standard Deviation} \times \text{Random Standard Normal Deviation} \quad (1)$$

Crop exports and yields are correlated based on historical data.

A preliminary (forecast) export value is drawn which uses the final export value as the mean and a calculated standard deviation in a normal distribution as shown in equation (2).

$$\text{Preliminary Export} = \text{Final Crop Export} + \text{Calculated Std. Deviation} \times \text{Random Standard Normal Deviation} \quad (2)$$

This preliminary export value is used to determine producer response to satellite-based information by allowing the simulation model to use this export value to determine total crop demand and, therefore, prices. These new prices are then used to adjust the prior year prices, which POLYSIM uses to make production responses. Consumer and producer surpluses are calculated using this supply and demand information. Again the crop exports are correlated based on historical crop forecast data.

The standard deviation used in equation 2 above is computed to represent various accuracy levels of the preliminary satellite-based information. Assuming a normally distributed error function, an accuracy level of plus or minus 15 percent nine out of ten years can be represented as shown in Figure 9. Ninety percent of the area ($\pm$1.645 standard deviations, S) under the normal curve is between plus or minus 15 percent of the final export value. Therefore,

$$S = (.15X/1.645) \qquad (3)$$

where S is the standard deviation required to support the accuracy goal, X is the final export value, and 1.645 is the factor in the normal curve that equates to 90 percent of the area being within $\pm$1.645 S of the mean. This standard deviation then, will, be different depending upon the accuracy goal being simulated.

The standard deviation representing an accuracy goal of plus or minus 10 percent for 99 years out of 100 years will be:

$$S = (.10\ X/3.719) \qquad (4)$$

This standard deviation is then used in equation (2) to determine the crop forecast value.

The final export value is used to compute final demands and all other endogenous POLYSIM variables plus the final surplus values.

Random crop yields are calculated similar to the final exports and are used along with the final export value to determine the resulting equilibrium conditions.

Additional POLYSIM Subroutines

Four subroutines were added to the general POLYSIM model along with minor changes in other subroutines and the main calling program in order to estimate the value of information. The listings for these subroutines are in Appendix D. One subroutine, NUPREX was added to calculate the new weighted crop prices based on current and previous year's prices. NUPREX also puts final yields and exports in place to

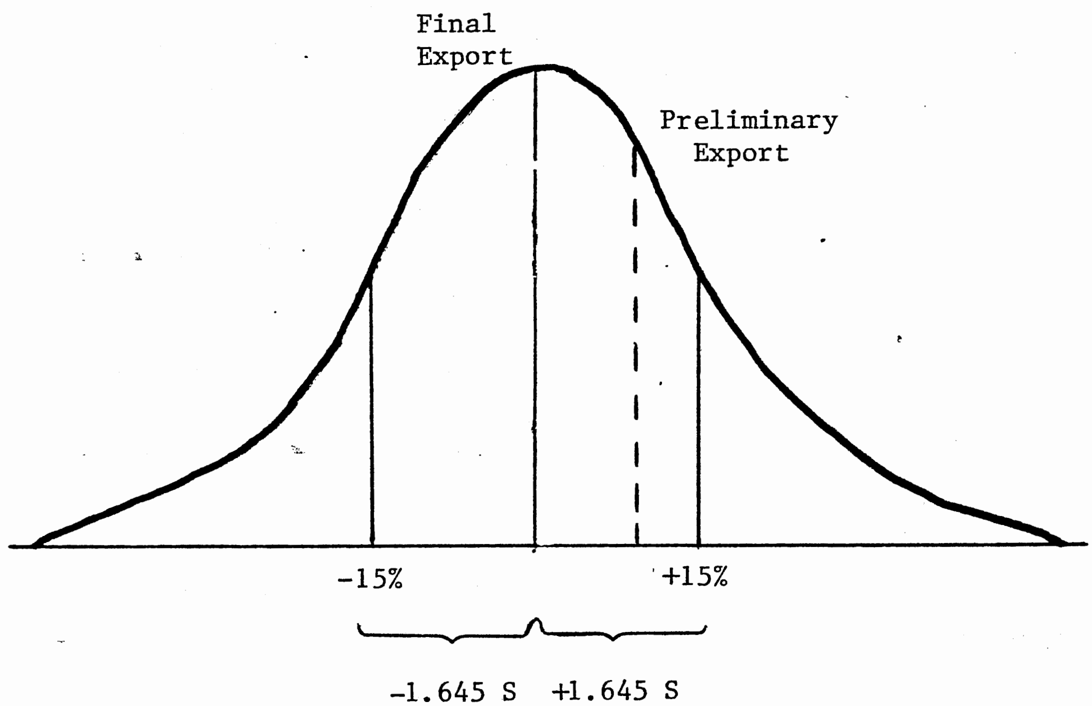


Figure 9. Representation of an Accuracy Goal of $\pm$ 15 Percent for Nine out of Ten Years (85/90)

be used for the final run through the model.

Subroutine RESET copies the results from the satellite-based information pass into a second matrix, reinitializes the output matrix, and adds the final yields and exports to be used for the "no information" pass through POLYSIM.

Subroutine SURPLS calculates both producer and consumer surpluses. The subroutine weights together the surpluses calculated using the preliminary export information and the final export value in the "with information" case. SURPLS calculates the surpluses for the "no information" case and then calculates the value of information as the difference between the "with information" surpluses and the "without information" surpluses.

Subroutine RITSUR prints out the values for domestic and foreign export consumer surpluses, producer surplus, and net domestic surplus for each of the seven crops and a total for all seven crops for each year simulated. RITSUR also prints the preliminary and final export values used in the calculations.

Minor changes and additions were required in subroutines CROPQ, INT2 and YAEXCN. Finally, the main calling program was modified to reflect the necessary iterations and loops to calculate value of information. These subroutines are also listed in Appendix D. The main program flow is discussed in the next section.

Operation of the Model

Figure 10 shows the flow of the POLYSIM model to accommodate this value of information study. The simulator begins by reading the baseline data and user policy changes. The correlated random yields and

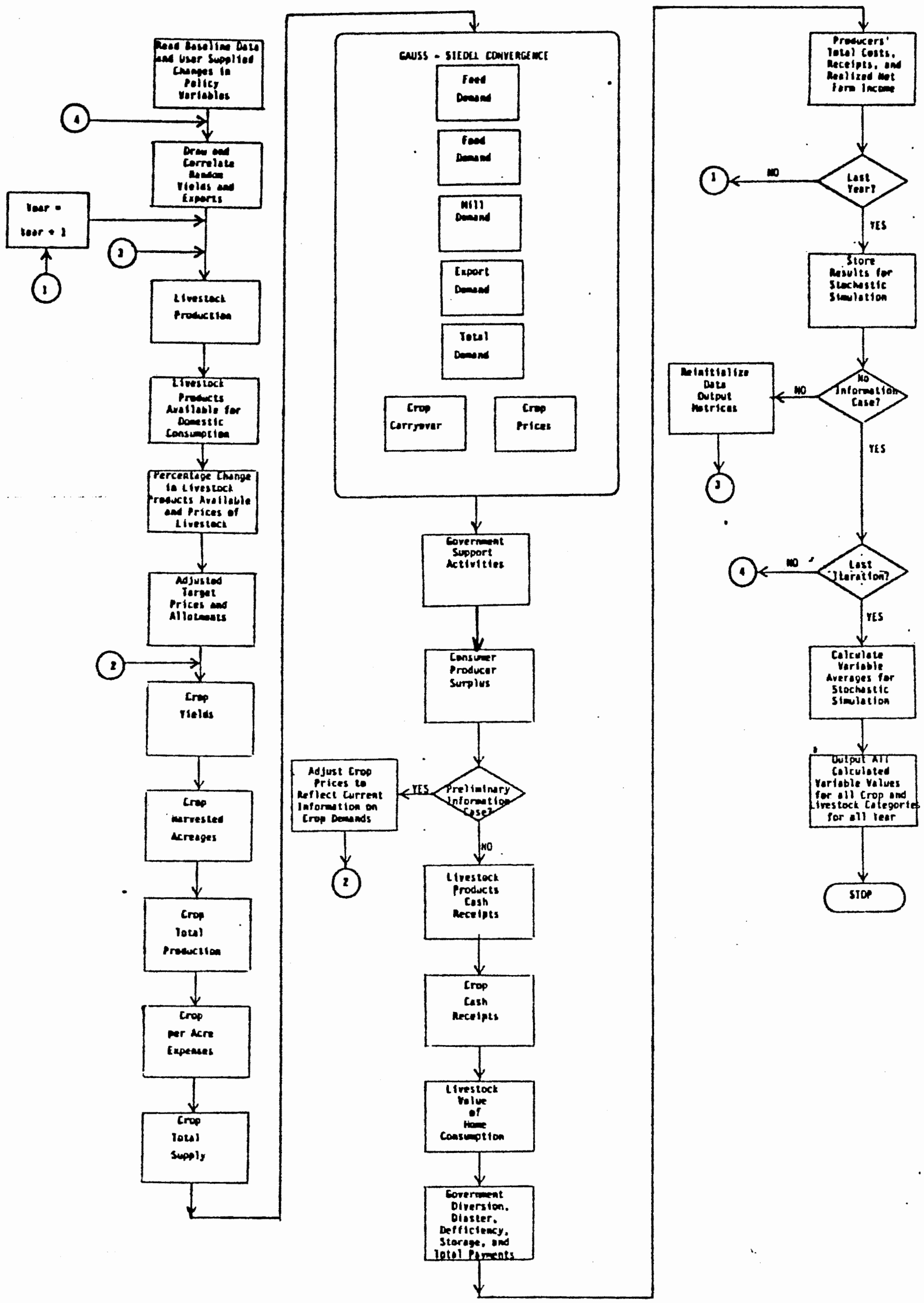


Figure 10. Flow Chart of the POLYSIM Model for the Value of Information Study

preliminary and final export values are drawn. The model begins simulating for the first year by calculating livestock production and prices. Production levels are calculated for cattle and calves, hogs, sheep and lambs, chickens, turkeys, eggs, and milk. The production calculations are based on the product's price in the previous year, the percentage difference between the previous year's baseline and the simulated corn prices, and the differences in prices of competing products times the appropriate direct and cross supply elasticities. The production information is used to estimate feed demand for the crops. The next step is to use this production information and the import and export demand to compute the amounts of livestock products available for domestic consumption. The last step in this part of the model is to calculate the change in livestock products availability. By using farm direct and cross price flexibilities, the current year's price for each of the livestock products can be estimated.

The next series of blocks determines crop supplies, production costs, demands, and prices. If the user desires, calculations will determine the adjusted target prices and allotted acreages of the feed grain crops, wheat, and cotton. If the loan rate exceeds the previous year's calculated market price, this rate is used as the expected price in calculating the supply response.

The harvested acreage is determined as a deviation from the baseline acreage, based on the percentage deviation in last year's market price for the crop from the baseline projections times the appropriate direct and cross elasticities. Yield and per acre production expenses are calculated in a similar manner. The total production of a crop is calculated directly as the product of the harvested acreage and yield. Total expense equals expense per acre times harvested acreages.

Total crop supply is then determined as the sum of calculated production, imports, and previous year carryover. Domestic (food, feed, and mill) and export demands depend on the percentage change in prices and the appropriate elasticities. The amount of feed demand is a function of crop and livestock prices. In the value of information framework preliminary export forecasts are used along with the domestic demands to determine total demand. The carryover stocks are computed as supplies minus demands. Crop prices are computed using price flexibilities and the percentage change in crop supplies and demands.

Once the initial domestic, export, and total demands, crop carryover, and crop prices are determined, a Gauss-Siedel solution technique is employed to adjust these variables until they converge. Government support activities are also included as part of the Gauss-Siedel solution procedure for the feed grains and wheat. These support activities include increasing or decreasing various crop reserves to alter prices.

Consumer and producer surpluses are calculated using the prices, quantities and costs calculated using the preliminary export information. At this point in the value of information schema, a set of crop prices is calculated based on the weighting of previous year's price and the current year's price calculated using the preliminary export information. Control is then passed back to a calculation of crop acreage and production using the new weighted crop price or the loan rate, whichever is higher, and the random yields. Again, crop supply, demand, carryover and prices are calculated using the Gauss-Siedel solution procedure and the final export demand value drawn at random. Consumer and producer surplus is calculated using these final prices, quantities and costs and the values previously calculated using the preliminary export forecast. At this point, the consumer and producer surplus values represent the surpluses resulting from the use of satellite-based information.

The next series of blocks within the model's simulation loop treats producer's costs, receipts, and income. Government payments depend on which farm program is being simulated. Included are possible deficiency payments based on assumed target prices, market prices, and loan rates, diversion payments, storage payments, and disaster payments. All such payments are simulated to determine total Government payments for the farm program simulated. National estimates are made for total receipt; realized gross income; crop expenses, protein, feed, roughage, and non-feed costs for livestock; total production costs; realized net farm income; indices of crop and livestock prices; and retail meat prices.

If all years of the simulation are completed, the results of the model, assuming the availability of satellite-based information, then are stored on disk to allow further analysis once all iterations are completed; otherwise, the additional years are calculated. The data arrays are reinitialized to allow calculation of the "no satellite information" results. Control is passed back to the calculation of livestock production, etc., using only the final yield and export values assuming no supply response from preliminary export forecasts. All POLYSIM variables are calculated including consumer and producer surpluses. The value of the information is calculated as the difference between the surpluses when the information was available and the surpluses when the information was not available.

The results of the "no information" case are stored when all years are simulated. This whole process can be repeated for the number of iterations desired. When all iterations are completed, the means of the iterations for each of the variables are calculated and output in a table format. Additional programs analyze the iterative results, calculating the means, standard deviations, maximum, minimum, coefficient of variation, number of zero observations, and the frequency distribution of selected variables.

CHAPTER V

PRESENTATION OF THE RESULTS

In this chapter the results of the nine stochastic simulations are presented. Tables XXX through XLII in Appendix A present the results. Table XLIII presents the POLYSIM baseline vlaues used in the model. These results are discussed for selected variables relating the "with satellite-based information" case to the "no satellite-based information" case. The selected variables are: acreage harvested, acreage set aside, total supply, domestic demand, ending year inventory, reserve actions and levels, price, government costs, net farm income, and the consumer, producer, and net domestic surpluses. An analysis of the random yields and exports is presented in Appendix B. Also in Appendix B is an evaluation of the preliminary exports drawn at random around the final exports. An evaluation of the effect of the various accuracy levels, timeliness levels, and supply-demand scenarios on the livestock production is contained in Appendix C. Appendix D contains the statistical analyses of the results involved tests for the equality of means for the five year averages plus tests on individual years for the surpluses. The specifics of these statistical tests are presented in Appendix E.

First, the results are presented for the "without satellite-based information" situation. The analysis describes the relation of these results with the POLYSIM baseline levels. Following this analysis is the discussion of the with information results for the three accuracy levels and the three supply-demand scenarios. Three simulations are presented for the high accuracy level: 1) high current year price weight and small surplus weight; 2) high current year price weight and large surplus weight; and 3) low current year price weight. The price weights represent the timeliness assumptions. The presentation includes a comparison of the with and without information results and a comparison of the alternative with information results. The high and low current year price weight results are presented for the middle accuracy situation in a similar manner. Next, the low accuracy, high current year price weight results are discussed. The three supply-demand scenarios each assume the high accuracy level, high current year price weight and large surplus weight. they are presented first, for the excess supply (commodity surplus) situation, then, for the tight supply (commodity shortage) situation, and, finally, for the fluctuating supply-demand scenario.

Figures are used to present the data by comparing the with and without information results for each year simulated. Tables show the variability of selected variables and the results for tests for equal means between the with and without information result.

Without Satellite-Based Information

Table XXX in Appendix A contains the averages over 300 iterations of the stochastic simulation assuming that no satellite-based information was available. The six various accuracy level, price and surplus weight situations (described above), assuming the availability of satellite-based information, will be compared to these base level results in order to determine the changes resulting from the use of the new information.

By comparison to the beginning POLYSIM baseline scenario, crop acreages, production, total supply, domestic demand, ending year inventories, and reserves are generally below the baseline value for each of the five years for the seven crops. Set aside acreage[1], and prices are above the baseline. Total government costs fluctuate around the baseline value.

The consumer surplus values reflect deviations from the baseline. Most indicate that the average consumer surplus resulting from the 300 iteration stochastic simulation is less than that calculated for the baseline. Producer surplus, on the other hand, was larger for the simulation than calculated for the baseline. The net domestic surplus was more likely to be less than that calculated for the baseline. However, exceptions occurred to these generalizations for given crops in given years.

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[1]Set aside acreage is calculated to achieve a desired level of stocks. The amount of set aside calculated is essentially the simulated beginning year inventory minus the desired level of stocks divided by the crop yield and an assumed slippage rate.

High Accuracy Satellite-Based Information

High Current Year Price Weight (More Timely)

The results presented here apply for both the large and the small surplus weights with the differences occurring only in the consumer, producer and net domestic surpluses. Table XXXI (Appendix A) contains the "with information" results for the high accuracy level 90/99, high current year price weight 90/10, and small surplus weights 05/10. In the discussion that follows these data are compared to the "without satellite-based information" presented above.

Figure 11 shows the comparison of the average production (over the 300 iterations) for wheat, soybeans, corn, and cotton for each of the five years simulated, "with information" versus "without information" assumptions. Since the yields were the same in each year for both cases, the figure also shows relative differences in acreage. Area harvested averaged over the five years simulated with information was significantly different from that without information for wheat, soybeans, and corn. Production differences were significant for wheat and corn.

In all five years wheat production (acreage) "with information" was greater than "without information". Soybean production in 1979 and 1982 was below the without information level and was above in 1980, 1981 and 1983. Corn production was above the without information level in 1979, 1982 and 1983 and below in 1980 and 1981. Cotton production in 1979 and 1983 was below the without information case and above in the other three years. The crop production with information was less variable (more stable) than resulted without the

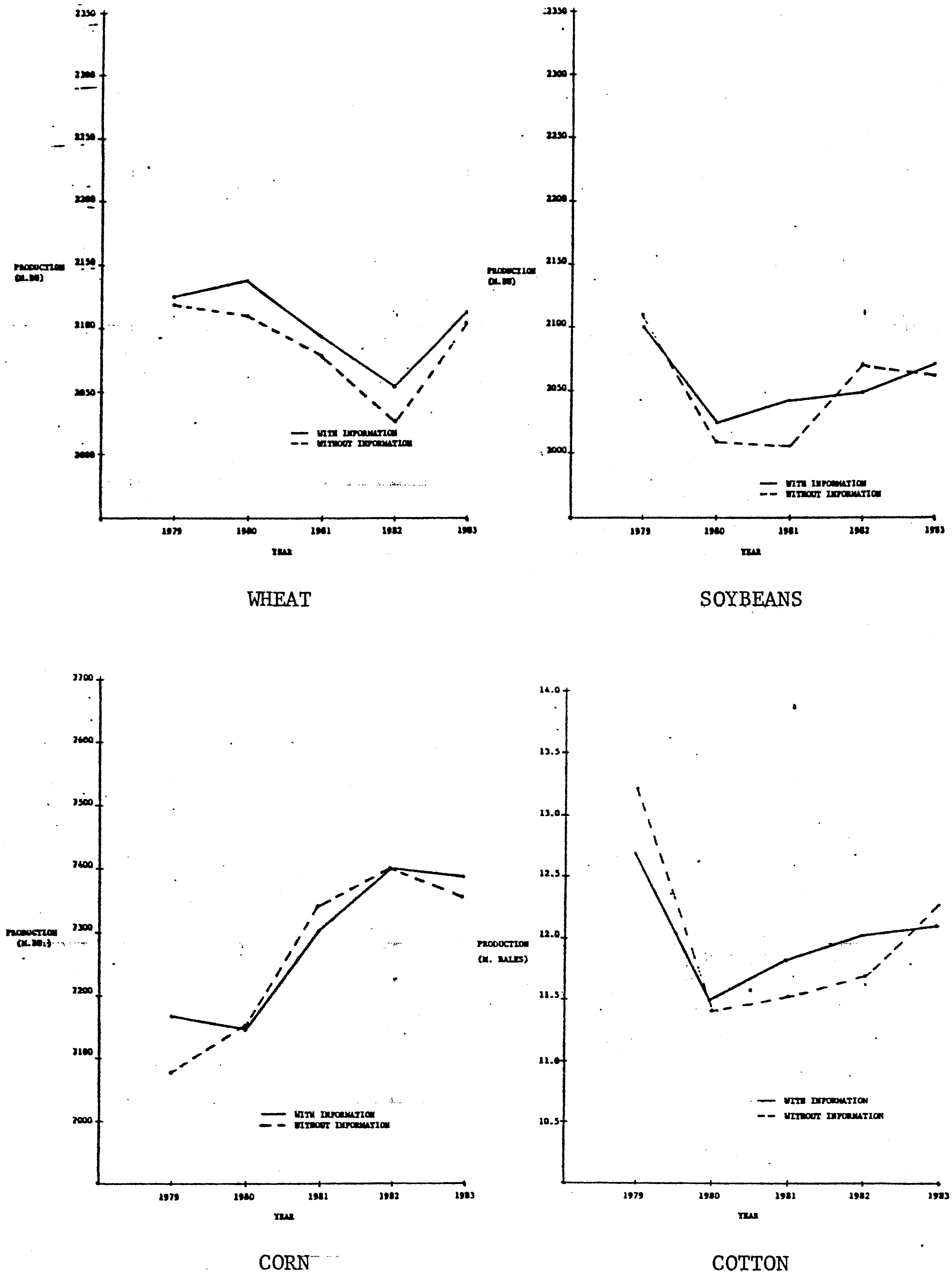


Figure 11. Comparison of Production, by Crop, With and Without Information, High Accuracy, High Price Weight

improved information, as measured by the coefficient of variation (Table IV).

The crop set aside acreages on the average were higher for wheat with satellite information and lower for the other crops (Table XXXI, Appendix A). The change in the level of set aside was generally in an opposite direction from the change in the level of acres harvested.

The average total domestic demand for the four crops show small differences due to the availability of satellite-based information (Figure 12). The variability of the domestic demand for wheat and corn was smaller with information available (Table IV). Corn showed the largest difference of the crops. The domestic demands for wheat and corn were significantly different from the without information level (Table XXXI, Appendix A). Total supply less domestic use and exports leaves ending year inventories. Figure 13 shows the average ending year inventories for the four crops. These results are consistent with the differences in the crop production results discussed earlier. Only the five year average ending inventory for corn was not significantly different from the no information level. The variability of the ending inventories for all four crops is reduced from the without information level (Table IV).

The average reserve levels for wheat and corn are shown in Figure 14. Both reserves declined throughout the five years simulated, with an average decline of 35 million bushels per year for wheat and 20 million bushels per year for corn, compared to 39 million bushels per year and 23 million bushels per year, respectively, without the information. The ending reserve level for wheat is nearly 17 million bushels higher for wheat and nearly 13 million bushels higher for corn

TABLE IV

COEFFICIENT OF VARIATION FOR THE FIVE YEAR AVERAGES FOR SELECTED VARIABLES BY CROP FOR THE WITH AND WITHOUT INFORMATION ASSUMPTIONS, BY ACCURACY LEVEL AND TIMELINESS LEVEL

Crop	Variable	WITHOUT INFORMATION	WITH INFORMATION				
			High Accuracy		Middle Accuracy		Low Accuracy
			More Timely	Less Timely	More Timely	Less Timely	
WHEAT:	Production	6.60	6.23	6.37	6.29	6.37	6.70
	Domestic Demand	2.58	1.91	2.30	1.94	2.30	2.06
	Ending Year Inventory	20.33	17.61	19.34	17.88	19.34	18.52
	Price	11.89	8.44	10.60	8.49	10.51	9.25
SOYBEANS:	Production	6.18	5.84	5.80	6.16	5.85	7.14
	Domestic Demand	5.29	5.71	5.13	5.86	5.10	6.47
	Ending Year Inventory	37.42	34.38	34.59	38.64	35.05	47.96
	Price	10.72	10.19	10.03	10.80	10.07	12.60
CORN:	Production	4.15	3.68	3.96	3.69	3.96	3.77
	Domestic Demand	3.12	2.93	3.05	2.96	3.06	3.09
	Ending Year Inventory	14.76	12.82	14.04	12.96	14.12	13.38
	Price	5.67	5.43	5.60	5.50	5.61	5.61
COTTON:	Production	11.98	8.75	10.74	9.04	10.78	10.01
	Domestic Demand	2.24	2.33	2.20	2.37	2.21	2.49
	Ending Year Inventory	26.30	18.60	23.74	19.20	23.66	21.86
	Price	15.76	10.85	13.77	11.47	13.82	12.82
NET FARM INCOME:		7.92	7.03	7.60	7.07	7.62	7.15

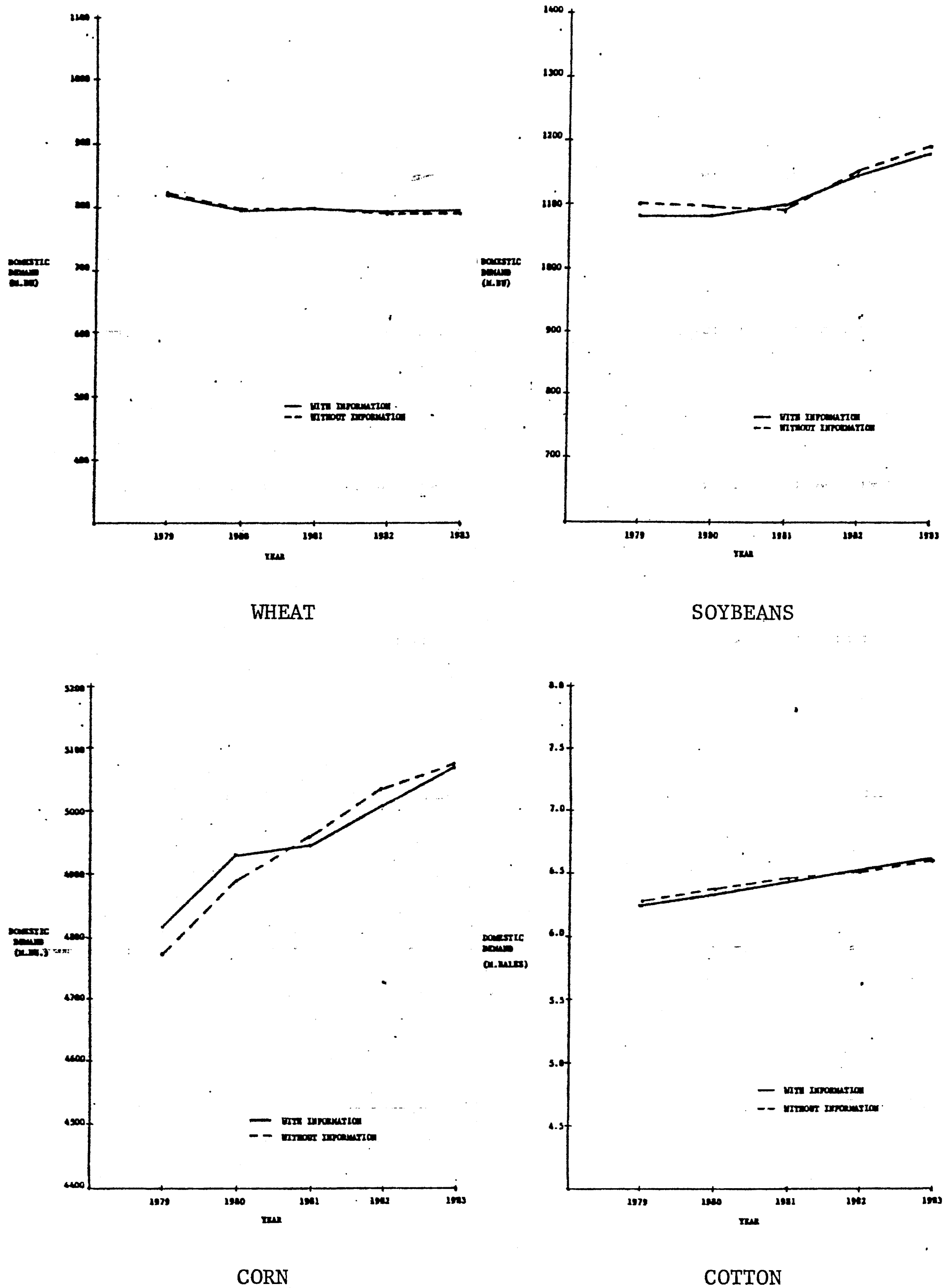


Figure 12. Comparison of Domestic Demand, by Crop, With and Without Information, High Accuracy, High Price Weight

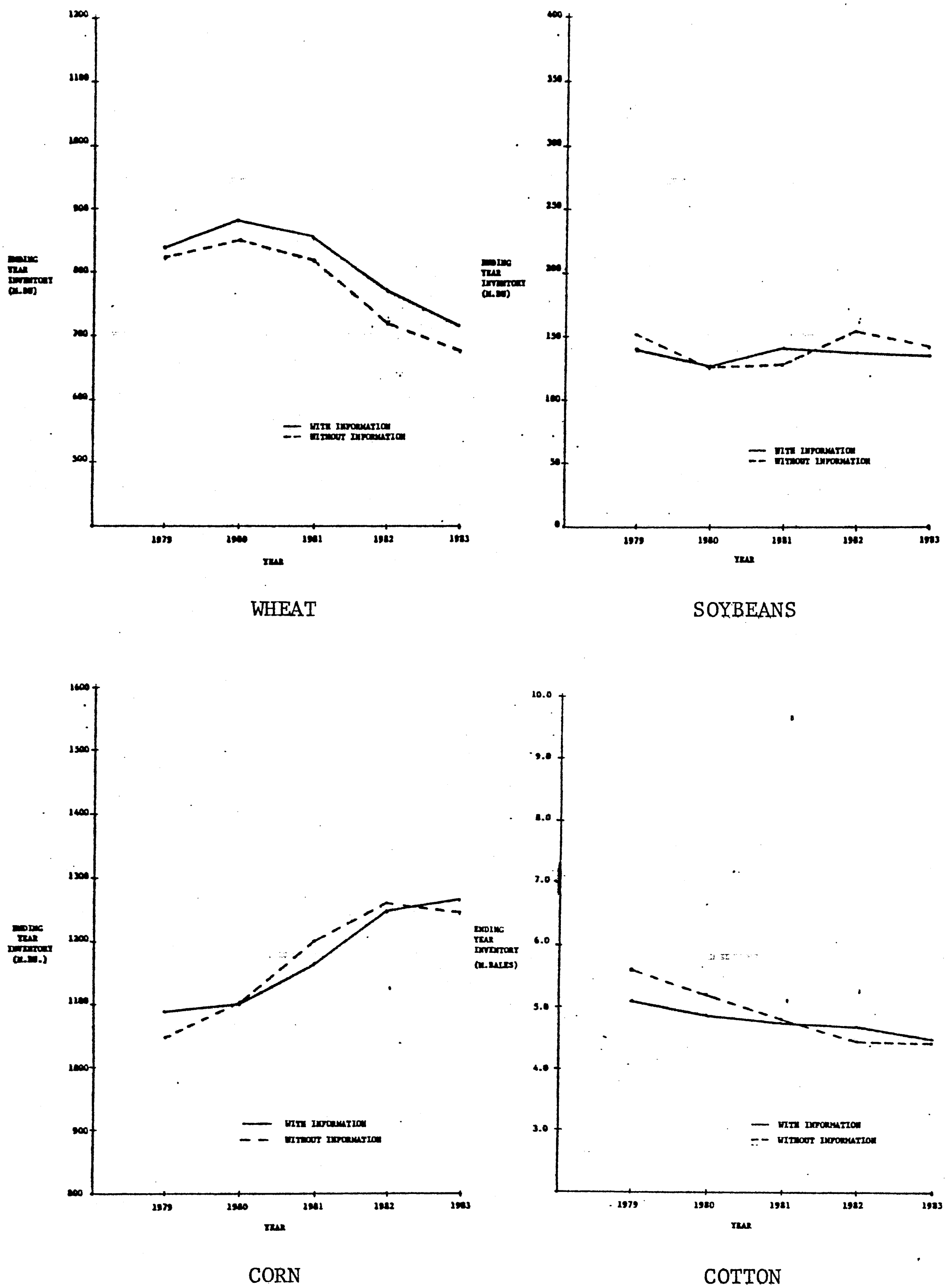
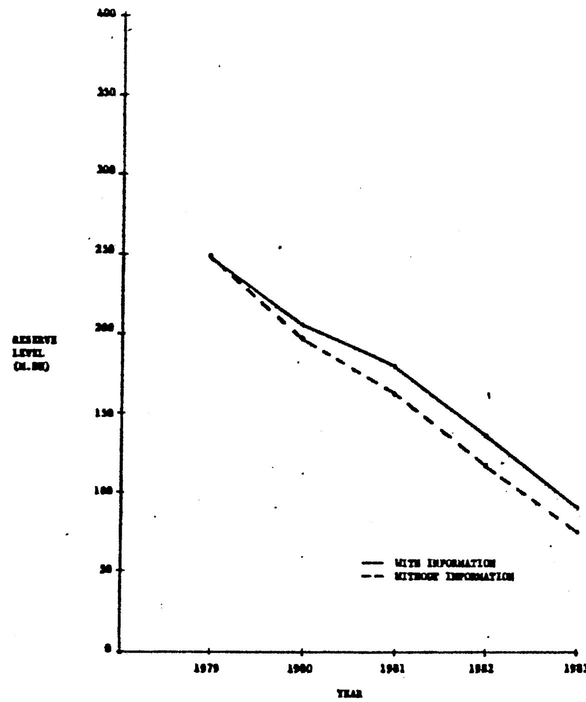
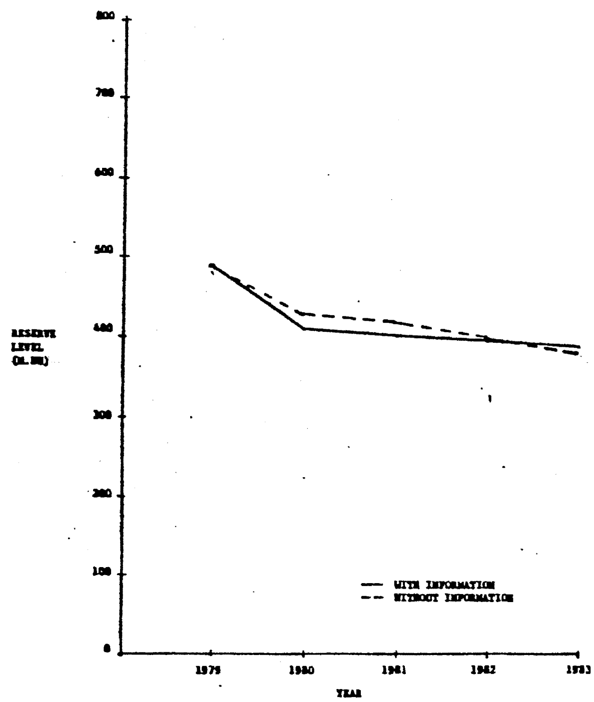


Figure 13. Comparison of Ending Year Inventory, by Crop, With and Without Information, High Accuracy, High Price Weight



WHEAT



CORN

Figure 14. Comparison of Reserve Level, by Crop, With and Without Information, High Accuracy, High Price Weight

when satellite-based information was assumed.

Also, in relation to the crop production and ending year inventories was the average crop price (Figure 15). The price differences between the with and without information cases are the opposite of the differences in ending year inventories for each crop in each year. If the ending year inventory with information was greater than the ending inventory without information, then the with information price level was less than the without information price. Also note the more stabilized prices when satellite-based information was available. For each crop, the price changes from one year to the next are more gradual. Only the cotton price, averaged over the five years, was not significantly different from the base. Wheat and cotton price variability with information are 30 percent lower than the variability without information (Table IV).

Figure 16 shows the with and without information comparison of the average deficiency payments and the average total government costs for wheat, corn and cotton. The lower line (either solid or dashed) represents the deficiency payments. The difference between total government costs and deficiency payments was storage costs (at 25 cents per bushel per year) and diversion payments. For wheat, both deficiency payments and total costs were slightly higher when information was available in the last four years simulated reflecting the lower price in those years. The five year average deficiency payments for wheat were not significantly different. For corn, total costs were slightly less with information available, but deficiency payments were over twice as much in the last three years. Total costs for cotton were smaller with information than without information for

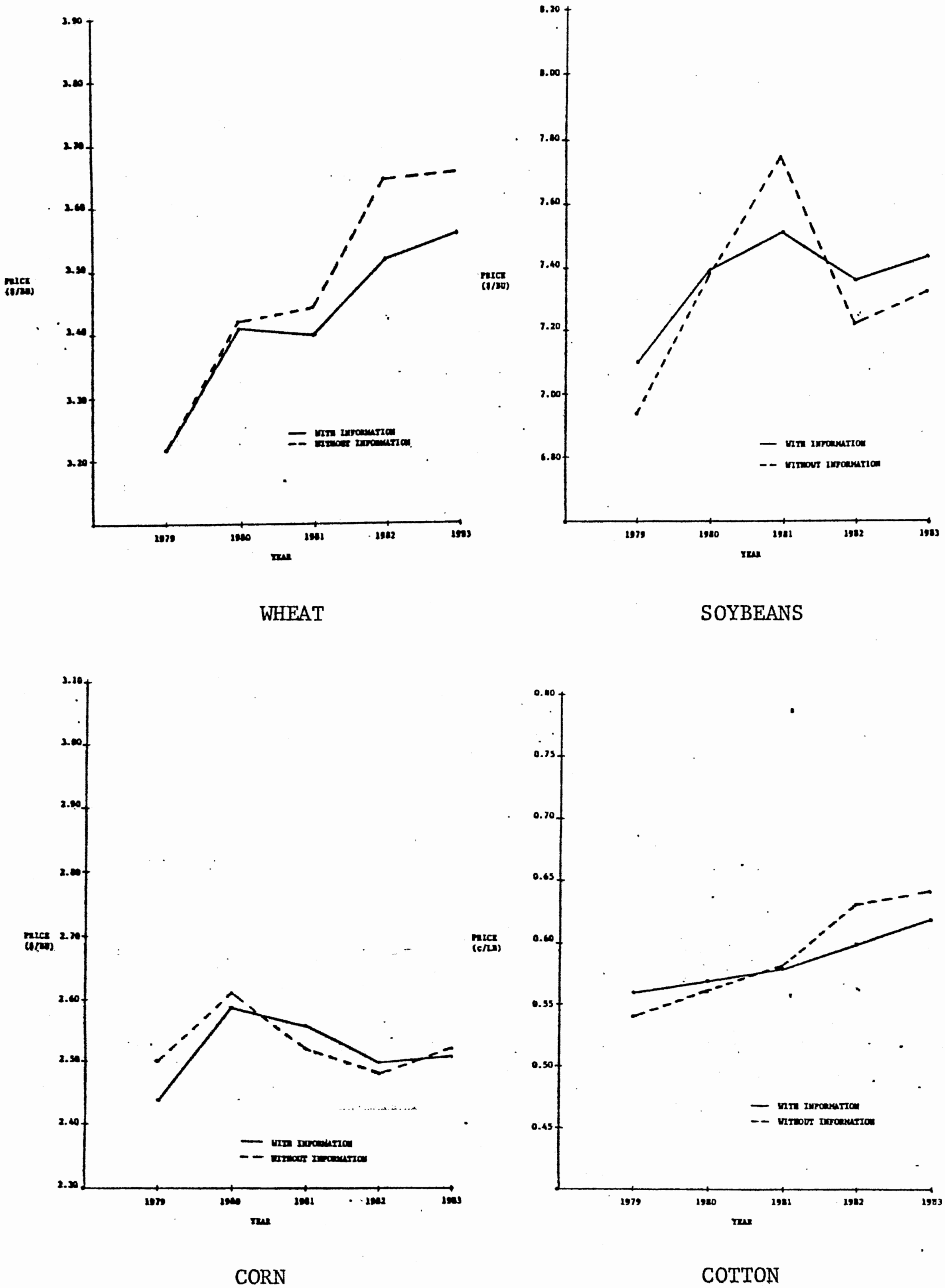


Figure 15. Comparison of Price, by Crop, With and Without Information, High Accuracy, High Price Weight

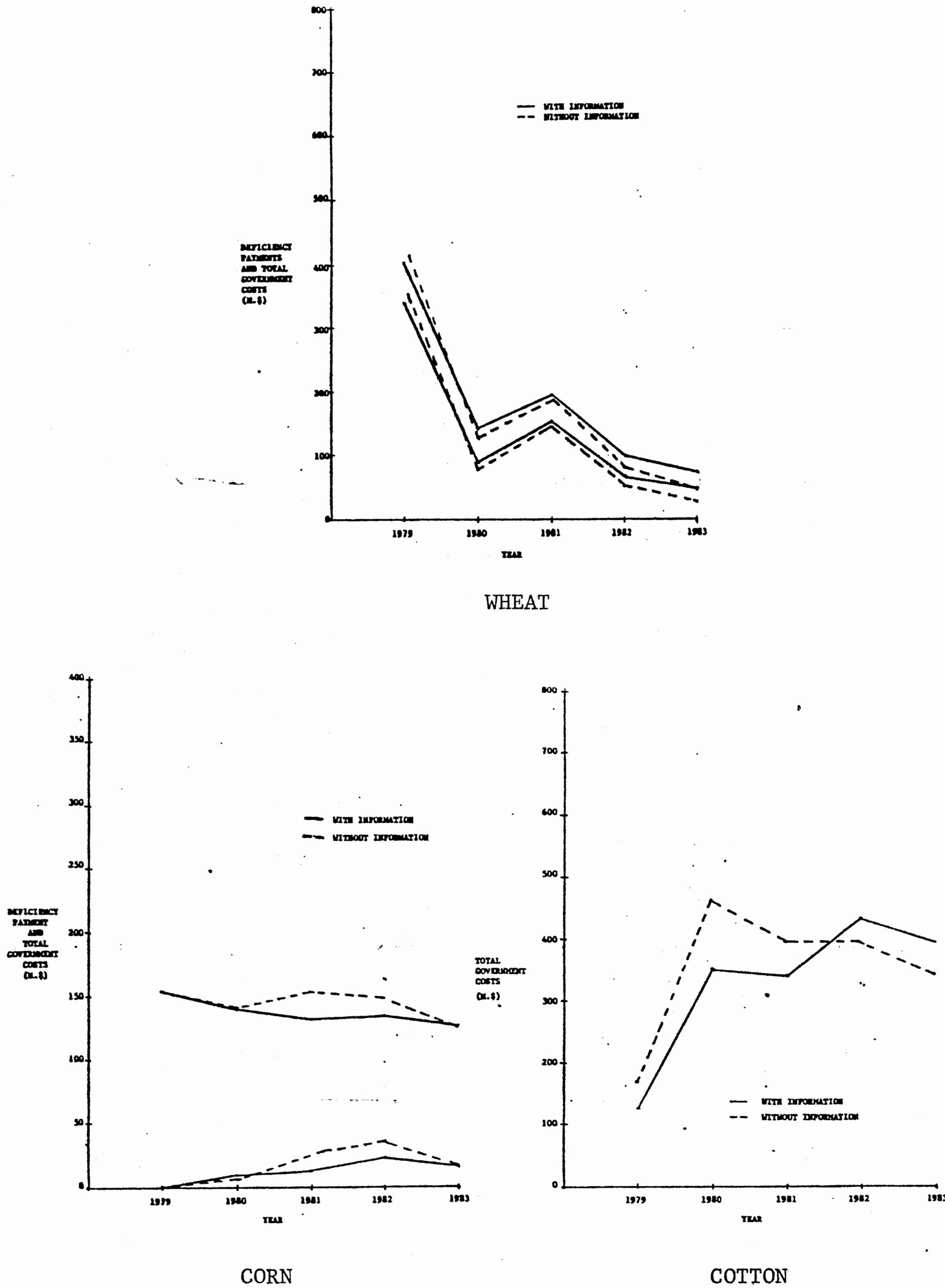


Figure 16. Comparison of Deficiency Payments and Total Government Costs, by Crop, With and Without Information, High Accuracy, High Price Weight

the first three years, again, reflecting the price differences. Both corn and cotton deficiency payments were significantly different from the no information level. The average net farm income with information was $61.74 million below the no information level, not a statistically significant difference. The with information net farm income was less variable than the without information result (Table IV).

Small Surplus Weight. The average consumer, producer, and net domestic surpluses for the four crops are shown in Table V. Assuming the POLYSIM baseline represents an equilibrium situation, the numbers represent differences from the POLYSIM baseline values due to the method of calculation in the model. Consumer surplus is a function of both crop price and total domestic utilization. Consumer surplus, when prices were low and demand was high, was necessarily greater than consumer surplus when prices were high and demand was low. The results were consistent with the above statement. For example, the consumer surplus for soybeans in 1979, when information was assumed, was less than the consumer surplus when no information was assumed. Looking back at the domestic demands (Figure 12) and the prices (Figure 15), the soybean demand in 1979 with information was less than the soybean demand without information and, conversely, the soybean price in 1979 with information was higher than the soybean price without information. Higher price and lower quantity equates to lower consumer surplus. Similar descriptions apply to the consumer surpluses for wheat, corn, and cotton. The five year average consumer surplus for both wheat and corn were statistically different from the no information average (Table VI). Only 1980 was not significantly different for wheat, 1980 and 1982 for soybeans, 1981 and 1983 for

TABLE V

COMPARISON OF CONSUMER, PRODUCER, AND NET DOMESTIC SURPLUSES FOR THE WITH AND WITHOUT INFORMATION ASSUMPTIONS, RELATIVE TO THE POLYSIM BASELINE LEVEL, BY CROP AND YEAR, WITH THE FIVE YEAR AVERAGE, HIGH ACCURACY, HIGH CURRENT YEAR PRICE WEIGHT, SMALL SURPLUS WEIGHT SIMULATION

Crop	Information Level	Surplus	1979	1980	1981	1982	1983	Five Year Average
WHEAT:	WITH	Consumer	-16.13	-15.58	-80.74	-131.38	-187.58	-86.28
		Producer	-57.46	-164.15	181.96	183.64	217.42	72.28
		Net Domestic	-73.59	-179.73	101.22	52.26	29.84	-14.00
	WITHOUT	Consumer	7.10	-7.43	-131.02	-258.54	-326.00	-143.18
		Producer	-64.25	-174.02	249.52	379.98	395.44	157.34
		Net Domestic	-57.14	-181.44	118.51	121.44	69.44	14.16
SOYBEANS:	WITH	Consumer	-385.61	-472.63	-182.87	-450.66	-574.81	-413.32
		Producer	462.80	259.34	-264.38	289.15	499.15	249.21
		Net Domestic	77.19	-213.29	-447.25	-161.51	-75.66	-164.10
	WITHOUT	Consumer	-232.61	-418.88	-439.90	-395.89	-451.45	-387.74
		Producer	270.57	208.47	37.35	140.72	286.18	188.66
		Net Domestic	37.96	-210.41	-402.54	-255.18	-165.27	-199.09
CORN:	WITH	Consumer	152.60	147.08	-409.88	-425.07	-352.15	-177.60
		Producer	-167.97	-193.31	643.36	286.78	140.37	141.85
		Net Domestic	-15.37	-46.22	233.48	-138.89	-211.78	-35.76
	WITHOUT	Consumer	-98.34	-132.24	-363.31	-322.80	-358.90	-255.12
		Producer	97.24	-61.89	413.54	115.47	197.16	152.30
		Net Domestic	-1.10	-194.14	50.22	-207.32	-161.75	-102.82
COTTON:	WITH	Consumer	-122.56	-96.28	0.15	94.64	51.09	-14.59
		Producer	187.01	96.93	-77.44	-177.45	-90.48	-12.29
		Net Domestic	64.45	0.65	-77.30	-82.81	-39.39	-26.88
	WITHOUT	Consumer	-76.29	-37.86	15.97	16.27	-37.19	-23.82
		Producer	125.07	12.69	-101.06	-76.52	-11.76	-10.32
		Net Domestic	48.77	-25.17	-85.09	-60.25	-48.96	-34.14

TABLE VI

RESULTS OF STATISTICAL TEST FOR EQUAL MEANS, INFORMATION VERSUS NO INFORMATION ASSUMPTIONS, HIGH ACCURACY LEVEL, HIGH PRICE WEIGHT, SMALL SURPLUS WEIGHT

	1979	1980	1981	1982	1983	5 Year Average
CONSUMER SURPLUS						
Wheat	-1.18	-0.45	2.24	3.65	3.87	4.46
Soybeans	-2.27	-0.67	3.21	-0.89	-1.83	-0.80
Corn	5.77	5.11	-0.86	-1.74	0.13	3.11
Cotton	-3.44	-3.49	-0.97	3.21	3.86	1.04
7 Crops	0.40	1.53	2.48	0.61	1.13	2.72
PRODUCER SURPLUS						
Wheat	0.18	0.27	-1.50	-2.88	-2.60	-3.42
Soybeans	2.77	0.71	-3.84	2.00	2.86	1.80
Corn	-2.58	-2.41	3.65	3.67	-1.11	-0.41
Cotton	2.95	3.45	1.01	-2.78	-2.10	-0.14
7 Crops	-0.19	0.03	-0.90	0.29	-0.68	-0.64
NET DOMESTIC SURPLUS						
Wheat	-0.62	0.06	-0.53	-1.70	-0.90	-1.74
Soybeans	1.32	-0.07	-0.94	1.99	2.20	1.78
Corn	-0.63	3.31	3.80	1.59	-1.07	3.46
Cotton	1.20	1.93	0.52	-1.26	0.47	0.97
7 Crops	0.25	1.73	1.49	0.98	0.35	2.20

A t-statistic of $\pm$ 1.28 is significant at a 20 percent level, $\pm$ 1.64 is significant at a 10 percent level, and $\pm$ 1.96 is significant at a 5 percent level.

corn, 1981 for cotton and 1979, 1982 and 1983 for the seven crops combined.

Producer surplus, on the other hand, results from crop prices, production, and variable costs of production. The direction of movement of the crop price appears to have a greater influence on the direction of the producer surplus, when comparing the with and without information results. For corn in 1979, the price, assuming information, was below the price without information (Figure 15) and production (Figure 11) was above. In 1979, the average producer surplus (Table V) for corn was lower, with information, than without it. In 1980, corn price and production were both below the without information base, and producer surplus again was below the no information result. Both soybeans and corn exhibit wide swings from one year to the next as a result of price and production shifts. Only the five year averages for wheat and soybeans were statistically different from the no information level (Table VI). For the individual years, three of the five years were significantly different for wheat and four of five years for the other three crops. None of the years for the seven crops were significantly different.

Net domestic surplus (Table V) is the sum of domestic consumer surplus and producer surplus for each crop. Again, the numbers indicate average differences from the POLYSIM baseline. As long as the "with information" level was above the "without information" level, the information has a positive value for a particular crop. The value of the satellite-based information does vary by crop and by year simulated.

Of the four crops, corn stands out as the one which receives the most benefit from the satellite-based information system. The five year average surplus was $35.76 million below the POLYSIM baseline, compared to over $102 million below without information. Wheat appears, in this case,to receive the least benefit from the information. In only 1980 was the net surplus greater with information than without information. Only the five year average net domestic surplus for cotton was not statistically different from the no information result (Table VI). In 1979 only the soybean net domestic surplus was different statistically. In 1980, corn, cotton, and the seven crop total were different. In 1981, corn and the seven crop total were different. In 1982, wheat, soybeans, and corn were different and in 1983 only soybeans were different.

Large Surplus Weight. The results for the situation of high accuracy (90/99), high current year price weight (90/10), and larger surplus weights (10/20) were the same as the previous discussion for all variables except the three surplus values which used a different preliminary surplus weighting value as discussed in Chapter III (Table XXXII, Appendix A).

Table VII shows the average over the 300 iterations for consumer surplus, producer surplus, and net domestic surplus. The same general pattern exists as described above except at a somewhat different level. None of the differences in surplus values proved for the two surplus weighting schemes to be statistically different from each other.

The five year average consumer surplus for wheat, corn, and the seven crop total was significantly different from the no information result (Table VIII). At least three years of the five years simulated

TABLE VII

COMPARISON OF CONSUMER, PRODUCER, AND NET DOMESTIC SURPLUSES FOR THE WITH AND WITHOUT INFORMATION ASSUMPTIONS, RELATIVE TO THE POLYSIM BASELINE LEVEL, BY CROP AND YEAR, WITH THE FIVE YEAR AVERAGE, HIGH ACCURACY, HIGH CURRENT YEAR PRICE WEIGHT, LARGE SURPLUS WEIGHT SIMULATION

Crop	Information Level	Surplus	1979	1980	1981	1982	1983	Five Year Average
WHEAT:	WITH	Consumer	-13.19	-15.90	-83.05	-135.64	-189.29	-87.41
		Producer	-57.44	-163.13	182.57	186.88	220.24	73.83
		Net Domestic	-70.62	-179.03	99.52	51.24	30.96	-13.59
	WITHOUT	Consumer	7.10	-7.43	-131.02	-258.54	-326.00	-143.18
		Producer	-64.25	-174.02	249.52	379.98	395.44	157.34
		Net Domestic	-57.14	-181.44	118.51	121.44	69.44	14.16
SOYBEANS:	WITH	Consumer	-353.65	-451.39	-195.38	-441.88	-543.64	-397.19
		Producer	447.90	253.59	-250.40	286.91	484.50	244.50
		Net Domestic	94.24	-197.80	-445.78	-154.97	-59.14	-152.69
	WITHOUT	Consumer	-232.61	-418.88	-439.90	-395.89	-451.45	-387.74
		Producer	270.57	208.47	37.35	140.72	286.18	188.66
		Net Domestic	37.96	-210.41	-402.54	-255.18	-165.27	-199.09
CORN:	WITH	Consumer	139.67	142.74	-410.06	-407.81	-345.67	-176.23
		Producer	-154.94	-189.93	644.09	279.48	139.16	143.57
		Net Domestic	-15.27	-47.19	234.03	-128.33	-206.50	-32.65
	WITHOUT	Consumer	-98.34	-132.24	-363.31	-322.80	-358.90	-255.12
		Producer	97.24	-61.89	413.54	115.47	197.16	152.30
		Net Domestic	-1.10	-194.14	50.22	-207.32	-161.75	-102.82
COTTON:	WITH	Consumer	-114.62	-93.25	0.31	88.89	46.03	-14.53
		Producer	182.37	96.34	-76.59	-171.99	-86.03	-11.18
		Net Domestic	67.76	3.09	-76.28	-83.10	-40.00	-25.71
	WITHOUT	Consumer	-76.29	-37.86	15.97	16.27	-37.19	-23.82
		Producer	125.07	12.69	-101.06	-76.52	-11.76	-10.32
		Net Domestic	48.77	-25.17	-85.09	-60.25	-48.96	-34.14

TABLE VIII

RESULTS OF STATISTICAL TEST FOR EQUAL MEANS, INFORMATION VERSUS NO INFORMATION ASSUMPTIONS, HIGH ACCURACY LEVEL, HIGH PRICE WEIGHT, LARGE SURPLUS WEIGHT

	1979	1980	1981	1982	1983	5 Year Average
CONSUMER SURPLUS						
Wheat	-1.05	-0.47	2.14	3.54	3.83	4.38
Soybeans	-1.91	-0.43	3.19	-0.80	-1.46	-0.32
Corn	5.62	5.13	-0.87	-1.49	0.25	3.24
Cotton	-2.95	-3.39	-0.98	2.99	3.65	1.06
7 Crops	0.87	1.78	2.41	0.82	1.47	3.23
PRODUCER SURPLUS						
Wheat	0.18	0.30	-1.48	-2.83	-2.56	-3.36
Soybeans	2.62	0.64	-3.70	2.00	2.72	1.69
Corn	-5.49	-2.35	3.63	3.53	-1.13	-0.35
Cotton	2.75	3.44	1.05	-2.63	-1.98	-0.06
7 Crops	-0.25	0.03	-0.75	0.29	-0.74	-0.64
NET DOMESTIC SURPLUS						
Wheat	-0.51	0.09	-0.59	-1.74	-0.88	-1.73
Soybeans	1.94	0.31	-0.93	2.16	2.66	2.40
Corn	-0.63	3.36	3.90	1.87	-0.97	3.69
Cotton	1.47	2.14	0.60	-1.29	0.44	1.14
7 Crops	0.71	1.98	1.56	1.19	0.63	2.72

A t-statistic of $\pm$ 1.28 is significant at a 20 percent level, $\pm$ 1.64 is significant at a 10 percent level, and $\pm$ 1.96 is significant at a 5 percent level.

were statistically different for all four crops and the seven crop total.

For the producer surplus, at least three years of the five years simulated were significantly different for the four crops. None of the seven crop totals were significantly different and only the five year average for wheat and soybeans were different. Only the five year average net domestic surplus for cotton was not significantly different. For wheat only 1982 was different with three years different for the other three crops and two years different for the seven crop total.

Low Current Year Price Weight (Less Timely)

Under the assumption of less timely data (i.e., 0.25 current year price weight) producer response to satellite-based information was slightly less than that occurring under the same accuracy level assumption with the high current year price weight (Table XXXIII, Appendix A). The acres harvested and production of wheat averaged over the five years simulated were 65.23 million acres and 2101.02 million bushels respectively, under the low price weight compared to 65.38 million acres and 2105.89 million bushels for the high price weight. Comparison of the "with information" line in Figure 17, with the "with information" line in Figure 11, the crop production under the more timely information assumption, shows the differences between the two timeliness assumptions. Wheat follows closely the same response exhibited by the no information assumption. The production level does not increase from 1979 to 1980 as occurred previously. Soybeans production (acres harvested) begin above the no information

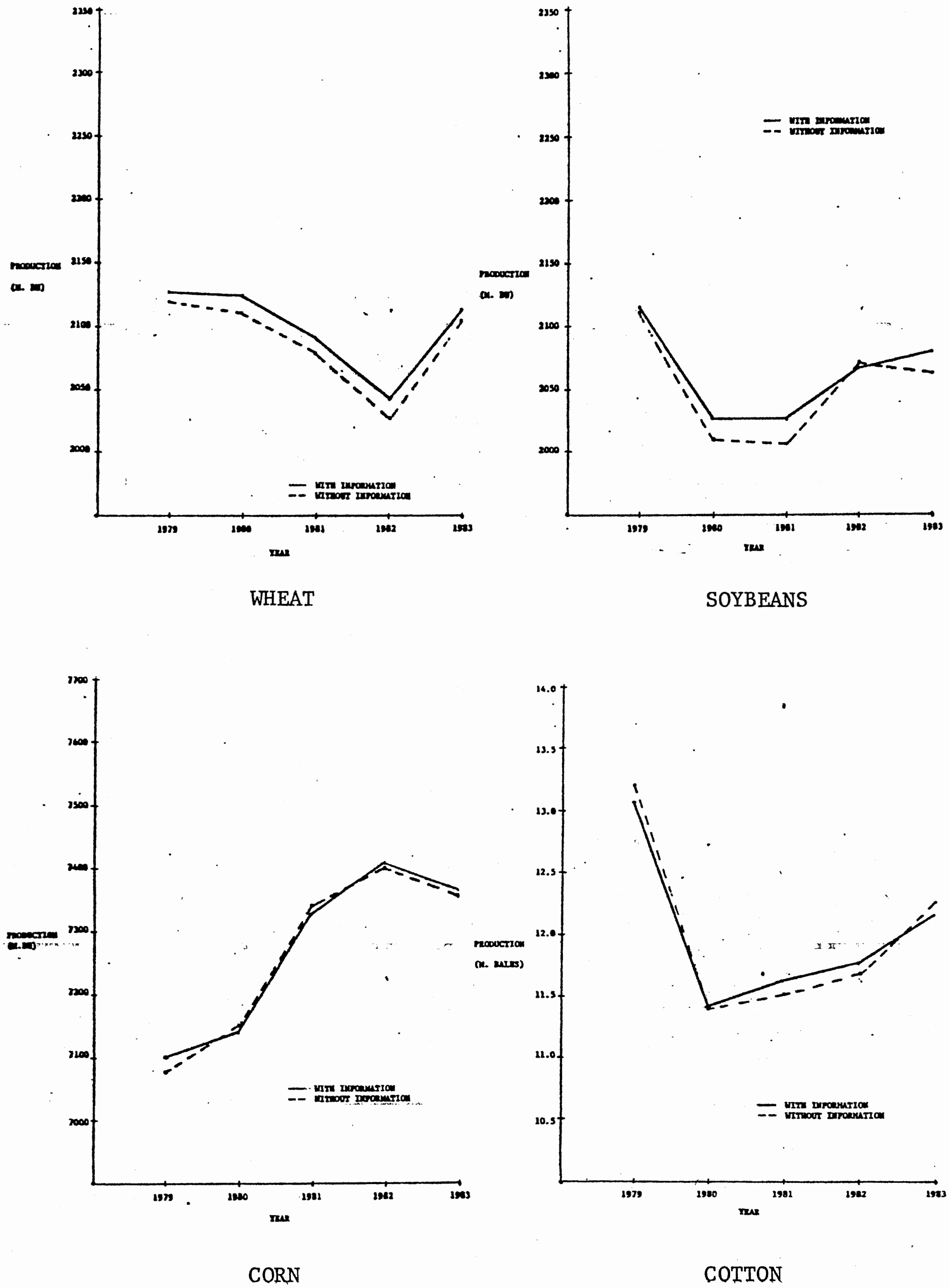


Figure 17. Comparison of Production, by Crop, With and Without Information, High Accuracy, Low Price Weight

base under the less timely information assumption. Neither the area harvested nor production five year averages were statistically different from the five year average without information.

The variability of the production of wheat, corn, and cotton is higher than under the more timely information assumption but is still below the level exhibited by the without information result (Table IV). The variability of soybean production is slightly less for the less timely assumption.

The domestic demands for the four crops also follow the no information result very closely (Table XXX, Appendix A). Statistical analysis of the five year average indicates no statistical difference between the domestic demand with information and the domestic demand without information. The domestic demand for wheat and corn are more variable than the more timely information result but still less variable than the without information results (Table IV). The domestic demands for soybeans and cotton are less variable than the more timely information results and the without information results due to less substitution of the crops.

As with the other variables thus far, the ending year inventory approaches the no information result as the current year price weight approaches zero. Similarly for reserve levels, prices and total government costs, the with information result approaches the no information result as the current year price weight approaches zero. Net farm income, compared to the high current year price weight, was higher in 1980 and 1983. The other years are nearly the same. Ending year inventory for the four crops and price for wheat, corn, and cotton are more variable than the more timely results but less variable than the without information result.

The only variable which proved to be statistically different was the average deficiency payment for corn which was $15.78 million with information and $17.99 million without information.

Table IX shows the average consumer surplus for the five years simulated for the four crops. Comparison with Table VII allows a visual interpretation of the differences between the more timely and less timely information. As with other variables the less timely information resulted in the surplus values being closer to the no information result. This brought the with information up to and, occasionally, above the no information result.

For wheat, the first two years (1979 and 1980) now are essentially the same while the last three years remain above the no information result. Consumer surplus for soybeans now has only two year less than the no information base, whereas, in the more timely information case, only one year was above the base result. The major effect on corn and cotton is to move the result closer to the base result. None of the five year averages and only one year for wheat, soybeans, corn and the seven crops total were significantly different from the no information result (Table X).

Table IX shows the average producer surplus results for the less timely assumption. Again, the result moves closer to the no information base. The most significant change occurs for corn and soybeans.

The net domestic surplus results are shown in Table IX. The same basic changes occurred here as with the other variables. The net surplus moved closer to the no information result. For soybeans, the net surplus in 1981 was now above the base result. Only the results

TABLE IX

COMPARISON OF CONSUMER, PRODUCER, AND NET DOMESTIC SURPLUSES FOR THE WITH AND WITHOUT INFORMATION ASSUMPTIONS, RELATIVE TO THE POLYSIM BASELINE LEVEL, BY CROP AND YEAR, WITH THE FIVE YEAR AVERAGE, HIGH ACCURACY, LOW CURRENT YEAR PRICE WEIGHT SIMULATION

Crop	Information Level	Surplus	1979	1980	1981	1982	1983	Five Year Average
WHEAT:	WITH	Consumer	3.59	-9.01	-116.61	-210.52	-275.22	-121.56
		Producer	-60.73	-163.61	229.97	307.66	342.53	131.16
		Net Domestic	-57.15	-172.62	113.36	97.13	67.31	9.61
	WITHOUT	Consumer	7.10	-7.43	-131.02	-258.54	-326.00	-143.18
		Producer	-64.25	-174.02	249.52	379.98	395.44	157.34
		Net Domestic	-57.14	-181.44	118.51	121.44	69.44	14.16
SOYBEANS:	WITH	Consumer	-239.20	-355.62	-322.46	-405.40	-426.08	-349.75
		Producer	309.29	157.72	-46.87	238.90	325.77	196.96
		Net Domestic	70.10	-197.90	-369.33	-166.50	-100.31	-152.79
	WITHOUT	Consumer	-232.61	-418.88	-439.90	-395.89	-451.45	-387.74
		Producer	270.57	208.47	37.35	140.72	286.18	188.66
		Net Domestic	37.96	-210.41	-402.54	-255.18	-165.27	-199.09
CORN:	WITH	Consumer	-23.12	-71.68	-400.64	-325.55	-328.23	-229.84
		Producer	27.74	-77.29	491.03	136.22	166.30	148.80
		Net Domestic	4.63	-148.98	90.39	-189.33	-161.93	-81.05
	WITHOUT	Consumer	-98.34	-132.24	-363.31	-322.80	-358.90	-255.12
		Producer	97.24	-61.89	413.54	115.47	197.16	152.30
		Net Domestic	-1.10	-194.14	50.22	-207.32	-161.75	-102.82
COTTON:	WITH	Consumer	-80.14	-48.48	17.26	46.15	-15.26	-16.09
		Producer	134.62	33.02	-96.00	-107.88	-17.32	-10.71
		Net Domestic	54.47	-15.46	-78.74	-61.72	-32.58	-26.81
	WITHOUT	Consumer	-76.29	-37.86	15.97	16.27	-37.19	-23.82
		Producer	125.07	12.69	-101.06	-76.52	-11.76	-10.32
		Net Domestic	48.77	-25.17	-85.09	-60.25	-48.96	-34.14

TABLE X

RESULTS OF STATISTICAL TEST FOR EQUAL MEANS, INFORMATION VERSUS NO INFORMATION ASSUMPTIONS, HIGH ACCURACY LEVEL, LOW PRICE WEIGHT, LARGE SURPLUS WEIGHT

	1979	1980	1981	1982	1983	5 Year Average
CONSUMER SURPLUS						
Wheat	-0.18	-0.09	0.06	1.26	1.30	1.16
Soybeans	-0.11	0.94	1.53	-0.19	0.44	0.17
Corn	1.74	1.22	-0.69	-0.05	0.61	0.02
Cotton	-0.30	-0.64	0.09	1.11	0.86	0.51
7 Crops	0.96	1.18	1.03	0.76	1.28	0.95
PRODUCER SURPLUS						
Wheat	0.09	0.28	-0.41	-0.95	-0.71	-0.95
Soybeans	0.57	-0.74	-1.00	1.30	0.54	0.46
Corn	-1.46	-0.31	1.20	0.44	-0.55	-0.01
Cotton	0.46	0.80	0.20	-0.77	-0.12	0.09
7 Crops	-0.24	-0.32	-0.15	0.16	-0.34	-0.14
NET DOMESTIC SURPLUS						
Wheat	0.00	0.31	-0.15	-0.55	-0.05	-0.57
Soybeans	1.07	0.31	0.71	1.75	1.57	1.02
Corn	0.25	1.04	0.91	0.43	-0.00	0.54
Cotton	0.44	0.70	0.41	-0.07	0.71	0.76
7 Crops	0.78	0.82	0.89	0.96	0.95	0.85

A t-statistic of $\pm$ 1.28 is significant at a 20 percent level, $\pm$ 1.64 is significant at a 10 percent level, and $\pm$ 1.96 is significant at a 5 percent level.

in 1982 and 1983 for soybeans were significantly different from the no information result (Table X).

Middle Accuracy Satellite-Based Information

High Current Year Price Weight (More Timely)

With the middle accuracy level (75/99) and the high current year price weight (90/10) the acreage harvested and production for the four crops are nearly the same as with the high accuracy, high price weight results (Table XXXIV, Appendix A). Wheat and corn production are lower and soybean production is higher. Cotton production is slightly higher. Domestic demand and ending year inventories follow the same pattern, not much change from the higher accuracy results. The variability of production domestic demand, and ending year inventory is greater for the middle accuracy results than for the high accuracy results (Table IV). The variability of soybean domestic demand and ending inventory is greater than the no information result.

As compared to the without information results, the acres harvested, total supply, domestic demand, and ending year inventory results proved to be statistically different (Table XXXIV, Appendix A). For soybeans, only the ending year inventory was statistically different. Total supply and ending inventory were significantly different for cotton.

Only set aside acres were different for corn. For the other crops set aside acres were not significantly different.

The reserve levels for wheat and corn were lower than the levels obtained under the high accuracy assumption. The average yearly action for wheat was 37.34 million bushel released, compared to 35.63

million bushels for the high accuracy level (Table XXXII, Appendix A) and 39.93 million bushels for the no information result. For corn, the average yearly action was a 20.41 million bushel released, compared to 21.40 million bushels for the high accuracy level, and 22.92 million bushels for the no information case.

Crop prices for wheat and corn, averaged over the five years simulated, were $0.01 per bushel higher than the high accuracy result, significantly lower than the no information result of $3.47 per bushel average for wheat, and the same as the no information result for corn. The five year average soybean price was $7.30 per bushel, compared to $7.36 per bushel for the high accuracy level and $7.32 per bushel with no information available. The cotton price, averaged over the five years, was $0.59 per pound in all three instances. Wheat, corn, soybeans and cotton prices are more variable with the middle accuracy information than with the high accuracy information (Table IV). The soybean price is more variable than the no information result, again, due to crop substitution.

The deficiency payments for wheat and corn were somewhat lower than those occurring under the high accuracy assumption, averaging $135.81 million and $11.44 million, respectively. Total government costs followed the same pattern, averaging $177.98 million for wheat and $136.42 million for corn. The deficiency payments for cotton were higher in each of the five years than the high accuracy results. The deficiency payments for all three crops were significantly different from the without information results (Table XXX, Appendix A). Net farm income did not appear to be significantly different from no information result although the variability appears significantly smaller (Table IV). The five year average was $45.03 million below that obtained under the no information assumption of $33815.04 million (Table XXX, Appendix A).

Table XI shows the consumer surplus results for the four crops for the middle accuracy, high current year price weight simulation, compared to the result obtained assuming no information was available. The five year average consumer surplus for wheat was $99.72 million below that computed for the POLYSIM baseline, while the average for the no information simulation was $143.18 million below that calculated for the POLYSIM baseline. This difference was statistically significant (Table XII). The consumer surplus for wheat was below the no inforamtion result for 1979 and 1980 and above for the remaining three years. The difference in 1980 was not statistically significant (Table XII).

The consumer surplus calculated for soybeans was below that calculated for the no information case in all years except 1981. The five year averages are $388.82 million below the POLYSIM baseline with information and $387.74 million below the POLYSIM baseline without information result. The five year averages were not different statistically. The difference in 1979 and in 1981 the were significant (Table XII).

The five year average consumer surplus for corn was $246.34 million below the POLYSIM baseline value compared to $255.12 million below, assuming no information, not a statistically significant difference. However, each year taken separately was significantly different at least at the 2 percent level except 1983 which was significant at the 20 percent level (Table XII).

TABLE XI

COMPARISON OF CONSUMER, PRODUCER, AND NET DOMESTIC SURPLUSES FOR THE WITH AND WITHOUT INFORMATION ASSUMPTIONS, RELATIVE TO THE POLYSIM BASELINE LEVEL, BY CROP AND YEAR, WITH THE FIVE YEAR AVERAGE, MIDDLE ACCURACY, HIGH CURRENT YEAR PRICE WEIGHT SIMULATION

Crop	Information Level	Surplus	1979	1980	1981	1982	1983	Five Year Average
WHEAT:	WITH	Consumer	-19.10	-26.63	-97.16	-149.85	-205.85	-99.72
		Producer	-51.17	-154.74	202.71	199.55	247.34	88.74
		Net Domestic	-70.27	-181.38	105.55	49.70	41.49	-10.98
	WITHOUT	Consumer	7.10	-7.43	-131.02	-258.54	-326.00	-143.18
		Producer	-64.25	-174.02	249.52	379.98	395.44	157.34
		Net Domestic	-57.14	-181.44	118.51	121.44	69.44	14.16
SOYBEANS:	WITH	Consumer	-367.72	-436.47	-179.01	-429.40	-531.52	-388.82
		Producer	426.98	170.58	-338.76	224.70	436.38	183.98
		Net Domestic	59.26	-265.88	-517.77	-204.69	-95.14	-204.85
	WITHOUT	Consumer	-232.61	-418.88	-439.90	-395.89	-451.45	-387.74
		Producer	270.57	208.47	37.35	140.72	286.18	188.66
		Net Domestic	37.96	-210.41	-402.54	-255.18	-165.27	-199.09
CORN:	WITH	Consumer	101.13	87.73	-495.94	-495.06	-429.54	-246.34
		Producer	-124.07	-161.89	690.45	305.33	169.22	175.81
		Net Domestic	-22.95	-74.16	194.51	-189.74	-260.33	-70.53
	WITHOUT	Consumer	-98.34	-132.24	-363.31	-322.80	-358.90	-255.12
		Producer	97.24	-61.89	413.54	115.47	197.16	152.30
		Net Domestic	-1.10	-194.14	50.22	-207.32	-161.75	-102.82
COTTON:	WITH	Consumer	-116.55	-95.64	-5.04	83.17	45.57	-17.70
		Producer	182.36	99.48	-73.52	-166.72	-92.42	-10.16
		Net Domestic	65.81	-3.85	-78.56	-83.55	-46.85	-27.86
	WITHOUT	Consumer	-76.29	-37.86	15.97	16.27	-37.19	-23.82
		Producer	125.07	12.69	-101.06	-76.52	-11.76	-10.32
		Net Domestic	48.77	-25.17	-85.09	-60.25	-48.96	-34.14

TABLE XII

RESULTS OF STATISTICAL TEST OF EQUAL MEANS, INFORMATION VERSUS NO INFORMATION ASSUMPTIONS, MIDDLE ACCURACY, HIGH PRICE WEIGHT SITUATION

	1979	1980	1981	1982	1983	5 Year Average
CONSUMER SURPLUS						
Wheat	-1.35	-1.04	1.51	3.10	3.31	3.38
Soybeans	-2.13	-0.23	3.44	-0.58	-1.23	0.04
Corn	4.66	4.08	-2.43	-2.98	-1.33	0.35
Cotton	-3.08	-3.50	-1.29	2.70	3.56	0.69
7 Crops	0.09	1.26	1.51	-0.18	0.61	1.48
PRODUCER SURPLUS						
Wheat	0.34	0.53	-1.03	-2.64	-2.13	-2.74
Soybeans	2.28	-0.57	4.81	1.12	1.99	-0.14
Corn	-4.77	-1.85	4.34	4.07	-0.54	0.93
Cotton	2.74	3.53	1.17	-2.43	-2.12	0.01
7 Crops	-0.05	-0.34	-0.91	0.16	-0.69	-0.84
NET DOMESTIC SURPLUS						
Wheat	-0.50	-0.03	-0.40	-1.76	-0.63	-1.55
Soybeans	0.73	-1.34	-2.46	1.08	1.73	-0.30
Corn	-0.98	2.73	3.06	0.41	2.92	1.68
Cotton	1.32	2.18	0.44	-1.29	0.10	0.84
7 Crops	0.03	0.96	0.45	0.02	-0.27	0.54

A t-statistic of $\pm$ 1.28 is significant at a 20 percent level, $\pm$ 1.64 is significant at a 10 percent level, and $\pm$ 1.96 is significant at a 5 percent level.

The consumer surplus for cotton, averaged over the five years simulated, was \$17.70 million below the POLYSIM baseline. The no information value was \$23.82 below the POLYSIM baseline. The difference was not statistically significant. Each of the five years taken individually were significantly different from the no information result (Table XII). The first three years were below the no information result.

The producer surplus for wheat was \$88.74 million above the original POLYSIM baseline values compared to \$157.34 million above for the without information result (Table XXX, Appendix A). The difference was significant at the 1 percent level. Each of the first three years were not significantly different from the no information result, but the last two years were significantly different (Table XII).

For soybeans, the five year average was \$183.98 million above the POLYSIM baseline compared to \$188.66 million above for the without information situation (Table XXX, Appendix A). The results for the years 1979, 1981, and 1983 were significantly different from the results obtained without information available (Table XII).

The difference between the producer surplus obtained with information and that obtained without information was not significant for the five year average for corn. However, only in 1983 was the difference not significant at least at the 10 percent level (Table XII).

For cotton, no significant difference occurred for the five year averages, but all years except 1981 were significantly different at least at the 5 percent level (Table XII).

Only the net domestic surplus for wheat in 1982 was significantly different from the result obtained without information (Tables XI and XII). However, the average over the five years simulated, \$10.98 million below the POLYSIM baseline, was significantly different at the 85 percent level from the average without information value, \$14.16 million above the POLYSIM baseline (Table XXXIV, Appendix A).

For soybeans, the five year averages were not significantly different but 1980, 1981, and 1983 were significantly different from the no information base. The five year average and the 1980, 1981, and 1983 values for corn net domestic surplus all were significantly different from the no information result. In the case of cotton, the 1979, 1980, and 1982 net domestic surplus values were significantly different at the 20 percent level.

<u>Low Current Year Price Weight (Less Timely)</u>

As was the situation when the high and low current year price weight results were compared for the high accuracy situation, the middle accuracy, low current year price weight results moved toward the results obtained under the no information assumption. Again, this would be the expected result since the previous year price (which was used alone in the no information case) has a heavier weight (0.75 versus 0.10) in the low current year weighting scheme.

The variability of production, domestic demand, ending inventory, and price for wheat is greater with the less timely information (Table IV). All of these variables are more stable for soybeans with less timely information. Domestic demand for cotton is more stable with less timely information.

None of the five year averages for the variables (Table XXXV, Appendix A) are significantly different from the no information results (Table XXX, Appendix A) except the consumer surplus five year averages for wheat and soybeans and net domestic surplus for soybeans. Table XIII shows the consumer surplus results for the four crops under the information and no information assumptions. For wheat no result for an individual year was significantly different from the no information result (Table XIV).

Few of the surplus variables showed a statistically significant difference between the with information and without information results (Table XIV). As mentioned previously, the five year average consumer surplus for wheat and soybeans was different at an 20 percent level of significance. Note also the five year average consumer surplus for all seven crops combined proved to be significantly different at a 5 percent level.

For the producer surpluses (Table XIII), only the 1981 corn surplus and 1982 soybean surplus proved to be significantly different from the no information results (Table XIV) at the 20 percent level of significance. Net domestic surplus, was significantly different for soybeans in 1982 and for the five year averages for soybeans and the total for all seven crops.

TABLE XIII

COMPARISON OF CONSUMER, PRODUCER, AND NET DOMESTIC SURPLUSES FOR THE WITH AND WITHOUT INFORMATION ASSUMPTIONS, RELATIVE TO THE POLYSIM BASELINE LEVEL, BY CROP AND YEAR, WITH THE FIVE YEAR AVERAGE, MIDDLE ACCURACY, LOW CURRENT YEAR PRICE WEIGHT SIMULATION

Crop	Information Level	Surplus	1979	1980	1981	1982	1983	Five Year Average
WHEAT:	WITH	Consumer	0.74	-13.62	-122.83	-217.90	-282.15	-127.15
		Producer	-61.54	-166.68	231.45	312.42	342.44	131.62
		Net Domestic	-60.80	-180.30	108.62	94.52	60.29	4.47
	WITHOUT	Consumer	7.10	-7.43	-131.02	-258.54	-326.00	-143.18
		Producer	-64.25	-174.02	249.52	379.98	395.44	157.34
		Net Domestic	-57.14	-181.44	118.51	121.44	69.44	14.16
SOYBEANS:	WITH	Consumer	-274.75	-387.77	-370.01	-431.05	-450.33	-382.79
		Producer	317.75	153.82	-36.99	248.74	335.34	203.73
		Net Domestic	42.99	-233.95	-407.00	-182.31	-115.00	-179.05
	WITHOUT	Consumer	-232.61	-418.88	-439.90	-395.89	-451.45	-387.74
		Producer	270.57	208.47	37.35	140.72	286.18	188.66
		Net Domestic	37.96	-210.41	-402.54	-255.18	-165.27	-199.09
CORN:	WITH	Consumer	-43.89	-80.18	-421.23	-336.66	-342.81	-244.95
		Producer	39.04	-82.40	500.14	129.96	173.66	152.08
		Net Domestic	-4.85	-162.58	78.91	-206.69	-169.15	-92.87
	WITHOUT	Consumer	-98.34	-132.24	-363.31	-322.80	-358.90	-255.12
		Producer	97.24	-61.89	413.54	115.47	197.16	152.30
		Net Domestic	-1.10	-194.14	50.22	-207.32	-161.75	-102.82
COTTON:	WITH	Consumer	-84.06	-49.85	12.84	42.73	-17.35	-19.14
		Producer	138.58	33.13	-91.89	-105.13	-19.67	-9.00
		Net Domestic	54.52	-16.72	-79.05	-62.40	-37.02	-28.13
	WITHOUT	Consumer	-76.29	-37.86	15.97	16.27	-37.19	-23.82
		Producer	125.07	12.69	-101.06	-76.52	-11.76	-10.32
		Net Domestic	48.77	-25.17	-85.09	-60.25	-48.96	-34.14

TABLE XIV

RESULTS OF STATISTICAL TEST OF EQUAL MEANS, INFORMATION VERSUS NO INFORMATION ASSUMPTIONS, MIDDLE ACCURACY, LOW PRICE WEIGHT SITUATION

	1979	1980	1981	1982	1983	5 Year Average
CONSUMER SURPLUS						
Wheat	-0.32	-0.33	0.34	1.06	1.12	1.56
Soybeans	-0.69	0.46	0.90	-0.66	0.02	1.32
Corn	1.26	1.05	-1.07	-0.25	0.32	1.09
Cotton	-0.61	-0.72	-0.18	0.98	0.77	0.84
7 Crops	0.10	0.69	0.22	0.26	0.83	2.26
PRODUCER SURPLUS						
Wheat	0.07	0.19	-0.38	-0.88	-0.72	-0.97
Soybeans	0.69	-0.80	-0.88	1.43	0.67	0.25
Corn	-1.23	-0.40	1.34	0.31	-0.42	-0.14
Cotton	0.65	0.81	0.36	-0.70	-0.18	-0.03
7 Crops	0.03	-0.44	0.07	0.26	-0.23	-0.37
NET DOMESTIC SURPLUS						
Wheat	-0.14	0.04	-0.30	-0.61	-0.20	-0.27
Soybeans	0.17	-0.58	-0.10	1.44	1.22	2.35
Corn	-0.16	0.73	0.65	0.02	-0.16	1.18
Cotton	0.44	0.61	0.39	-0.11	0.52	0.92
7 Crops	0.16	0.20	0.32	0.59	0.60	1.93

A t-statistic of $\pm$ 1.28 is significant at a 20 percent level, $\pm$ 1.64 is significant at a 10 percent level, and $\pm$ 1.96 is significant at a 5 percent level.

Low Accuracy Satellite-Based Information

Under the assumption of an accuracy level of plus or minus 50 percent in 99 of 100 years (50/99), the five year average for acres harvested for wheat, corn and cotton were significantly different from the no information results (Table XXXVI, Appendix A). Production was significantly different for corn. Total supply for corn and soybeans were also different. Domestic demand and price for wheat, domestic demand, ending inventory, and price for soybeans, price and total government costs for cotton, and domestic demand, ending inventory, price, and deficiency payments for corn were all significantly different than the five year average result for the no information scenario. Net farm income, averaged over the five years, was slightly above the no information average (Table XXX, Appendix A). This was not a significant increase.

Wheat and soybean production under the low accuracy assumption are more variable than without the improved information (Table IV). soybean domestic demand, ending inventory, and price are more variable as is cotton domestic demand. Net farm income variability remains significantly lower than the without information level.

Consumer surpluses for the four crops are in Table XV along with the results for the no information situation. The five year averages for wheat, soybeans, corn, and cotton were \$130.63 million below, \$436.70 million below, \$397.12 million below, and \$17.25 million below the POLYSIM baseline, respectively. This compares to the no information results of \$143.18 million below, \$387.74 below, \$255.12 million below, and \$23.82 million below the POLYSIM baseline for the same four crops, respectively. Again, when the with information result is above

TABLE XV

COMPARISON OF CONSUMER, PRODUCER, AND NET DOMESTIC SURPLUSES FOR THE WITH AND WITHOUT INFORMATION ASSUMPTIONS, RELATIVE TO THE POLYSIM BASELINE LEVEL, BY CROP AND YEAR, WITH THE FIVE YEAR AVERAGE, LOW ACCURACY SIMULATION

Crop	Information Level	Surplus	1979	1980	1981	1982	1983	Five Year Average
WHEAT:	WITH	Consumer	-33.49	-49.33	-132.39	-193.60	-244.34	-130.63
		Producer	-44.31	-152.20	249.94	257.22	299.84	122.10
		Net Domestic	-77.80	-201.53	117.56	63.63	55.50	-8.53
	WITHOUT	Consumer	7.10	-7.43	-131.02	-258.54	-326.00	-143.18
		Producer	-64.25	-174.02	249.52	379.98	395.44	157.34
		Net Domestic	-57.14	-181.44	118.51	121.44	69.44	14.16
SOYBEANS:	WITH	Consumer	-439.25	-457.50	-215.81	-481.49	-589.46	-436.70
		Producer	409.99	45.91	-471.37	145.95	386.95	103.49
		Net Domestic	-29.27	-411.58	-687.18	-335.54	-202.50	-333.21
	WITHOUT	Consumer	-232.61	-418.88	-439.90	-395.89	-451.45	-387.74
		Producer	270.57	208.47	37.35	140.72	286.18	188.66
		Net Domestic	37.96	-210.41	-402.54	-255.18	-165.27	-199.09
CORN:	WITH	Consumer	18.62	-43.23	-667.23	-685.32	-608.43	-397.12
		Producer	-62.49	-91.33	770.88	388.43	223.64	245.82
		Net Domestic	-43.88	-134.56	103.65	-269.89	-384.79	-151.29
	WITHOUT	Consumer	-98.34	-132.24	-363.31	-322.80	-358.90	-255.12
		Producer	97.24	-61.89	413.54	115.47	197.16	152.30
		Net Domestic	-1.10	-194.14	50.22	-207.32	-161.75	-102.82
COTTON:	WITH	Consumer	-123.33	-99.01	-6.67	85.51	57.24	-17.25
		Producer	186.37	97.84	-80.26	-183.76	-124.62	-20.89
		Net Domestic	63.04	-1.17	-86.93	-98.25	-67.39	-38.14
	WITHOUT	Consumer	-76.29	-37.86	15.97	16.27	-37.19	-23.82
		Producer	125.07	12.69	-101.06	-76.52	-11.76	-10.32
		Net Domestic	48.77	-25.17	-85.09	-60.25	-48.96	-34.14

the without information result, the information has a positive value to consumers regardless of whether the values are less than zero.

The five year average consumer surplus for corn, soybeans and the seven crop total were significantly different from the no information average (Table XVI), at 20 percent for soybeans and under 0.5 percent for corn and the seven crops. In addition, the differences were significant in four of the five years simulated for wheat and soybeans and in all five years for corn and cotton. Consumer surplus for the seven crops combined was significantly different in 1979, 1982, and 1983.

Producer surplus, (Table XV), on the other hand, was significantly different from the no information result for two years for wheat, three years for soybeans, and four years for corn and cotton (Table XVI). The five year averages for wheat, soybeans, and corn were significantly different. None of the seven crop total producer surplus values proved significantly different from the no information result.

Net domestic surplus for the four crops (Table XV) was significantly different for wheat in one year, soybeans in four years, corn in four years, cotton in two years, and the seven crop total in all five years (Table XVI). Only the cotton five year average was not significantly different. The five year average net surplus for wheat was \$8.53 million below the POLYSIM baseline, compared to \$14.16 million above for the no information result. Similar surplus values for soybeans were \$333.21 million below versus \$199.09 million below, for corn \$151.29 million below versus \$102.82 million below, and \$38.14 million below versus \$34.14 million below for cotton.

TABLE XVI

RESULTS OF STATISTICAL TEST FOR EQUAL MEANS, INFORMATION VERSUS NO INFORMATION ASSUMPTIONS, LOW ACCURACY SITUATION

	1979	1980	1981	1982	1983	5 Year Average
CONSUMER SURPLUS						
Wheat	-2.05	-2.16	-0.06	1.77	2.14	0.93
Soybeans	-3.19	-0.49	2.88	-1.38	-1.98	-1.52
Corn	2.58	1.61	-5.16	-6.01	-4.40	-5.40
Cotton	-3.55	-3.50	-1.33	2.67	3.80	0.70
7 Crops	-2.14	-0.52	-1.03	-3.08	-1.85	-3.66
PRODUCER SURPLUS						
Wheat	1.12	0.58	0.01	-1.72	-1.34	-1.37
Soybeans	1.96	-2.07	-6.24	0.06	1.24	-2.36
Corn	-3.32	-0.56	5.48	5.68	0.49	3.63
Cotton	2.89	3.31	0.87	-2.81	-2.89	-0.74
7 Crops	0.61	-0.77	-0.97	0.55	-0.45	-0.50
NET DOMESTIC SURPLUS						
Wheat	-0.78	-0.70	-0.03	-1.33	-0.31	-1.37
Soybeans	-2.13	-4.64	-5.76	-1.63	-0.87	-6.48
Corn	-2.01	1.32	1.12	-2.02	-4.63	-2.30
Cotton	1.09	1.76	-0.12	-2.03	-0.87	-0.52
7 Crops	-1.79	-1.44	-2.23	-2.38	-2.74	-4.63

A t-statistic of $\pm$ 1.28 is significant at a 20 percent level, $\pm$ 1.64 is significant at a 10 percent level, and $\pm$ 1.96 is significant at a 5 percent level.

Alternative Supply-Demand Scenarios

Three supply-demand scenarios are developed by adjusting the POLYSIM baseline values for yields and final exports as specified in Table III. The preliminary export forecast is drawn at random using the predetermined final export as the mean of the distribution. These values are then used in the model to represent the three supply-demand scenarios: 1) excess supply (increasing commodity stocks), 2) tight supply (decreasing commodity stocks), and 3) fluctuating supply and demand. The results of the 300 iterations are discussed in that order.

Excess Supply

Production levels of wheat drop from near 2.2 billion bushels in 1979 to 1.9 billion bushel in 1982 before climbing 33 million bushels in 1983 (Table XXXVII, Appendix A and Figure 18). This reduction resulted in spite of the larger than baseline yields and was due to increased amounts of set aside acres. For wheat, set aside increased from 10.61 million acres in 1979 to 18.62 million acres in 1983. The five year average acreage harvested was 59.87 million acres, with 14.95 million acres of set aside, and 2006.34 million bushels of production. The harvested area, set aside area, and production averages were significantly different from the no information result (Table XXXVIII, Appendix A). The variability of wheat production with information is less than the variability without the information (Table XVII).

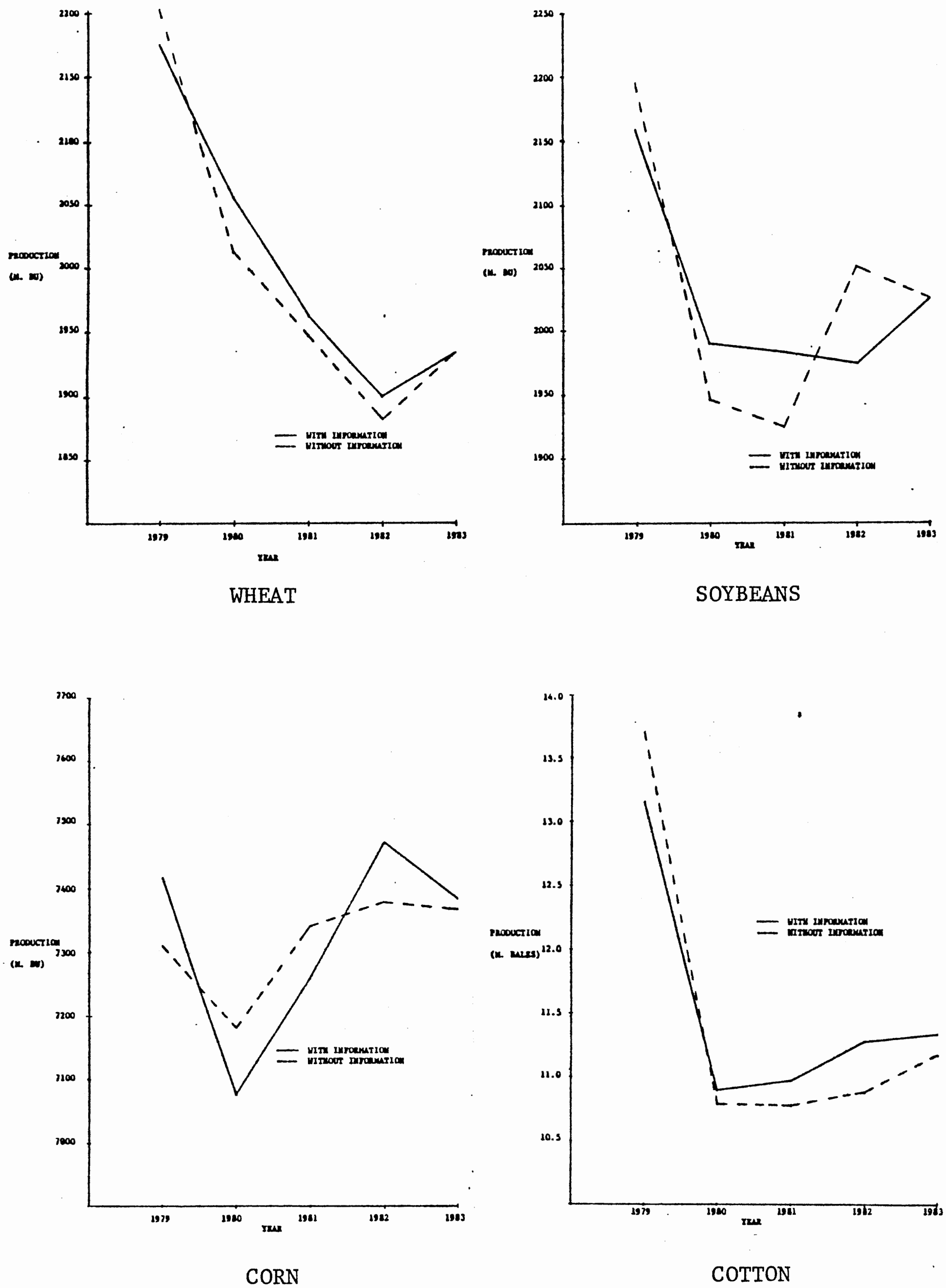


Figure 18. Comparison of Production, by Crop, With and Without Information, Excess Supply-Demand Scenario

TABLE XVII

COEFFICIENT OF VARIATION FOR THE FIVE YEAR AVERAGES FOR SELECTED VARIABLES BY CROP FOR THE WITH AND WITHOUT INFORMATION ASSUMPTIONS, ALTERNATIVE SUPPLY-DEMAND SCENARIOS

Crop	Variable	Excess Supply		Tight Supply		Fluctuating Supply	
		Without Information	With Information	Without Information	With Information	Without Information	With Information
WHEAT:	Production	5.62	4.97	6.08	3.24	9.49	5.19
	Domestic Demand	0.99	0.88	6.82	6.08	4.47	2.64
	Ending Year Inventory	3.33	3.91	31.11	29.74	37.72	29.56
	Price	3.36	2.27	22.91	20.92	31.74	18.08
SOYBEANS:	Production	4.70	3.43	0.50	2.81	6.91	4.26
	Domestic Demand	3.85	3.66	0.86	3.99	9.52	9.03
	Ending Year Inventory	13.23	4.76	0.00	0.41	47.84	48.92
	Price	4.72	3.16	3.42	7.05	21.28	21.90
CORN:	Production	0.99	1.93	1.10	1.41	6.31	7.31
	Domestic Demand	3.31	3.19	2.68	2.09	5.83	5.93
	Ending Year Inventory	6.74	6.65	22.24	21.31	46.96	48.43
	Price	2.19	2.28	4.94	4.18	16.69	16.36
COTTON:	Production	9.84	7.25	3.94	0.21	13.26	10.71
	Domestic Demand	1.94	2.16	1.18	1.95	2.71	2.80
	Ending Year Inventory	8.44	3.85	14.51	6.06	31.36	28.17
	Price	5.40	3.18	9.49	3.94	16.15	15.11
NET FARM INCOME:		4.67	4.96	14.35	11.99	23.81	22.70

Soybean production, like wheat production, drops from 2.16 billion bushels in 1979 to under 1.97 billion bushels in 1982 before increasing to over 2.0 billion bushels in 1983 (Table XXXVII, Appendix A and Figure 18).

The acres harvested in 1979 was 72.23 million acres before declining to 61.12 million acres in 1982. Neither of the five year averages for acres harvested or production were statistically significant differences from the no information result. Note in Figure 18 that both the production declines for wheat and soybeans are more gradual when information is available. The variability of soybean production is less eith the improved information than without the information (Table XVII).

However, corn production falls more rapidly than occurred without information and, then, rose more rapidly between 1980 and 1982 (Table XXXVII, Appendix A). The coefficient of variation is nearly twice that of the no information level (Table XVII). Harvested acreage dropped from 70.66 million acres in 1979 to 68.32 million acres in 1980, while set aside increased from 2.90 million acres in 1979 to 6.37 million acres in 1980 with satellite information available. Under the no information assumption harvested acreage was 69.63 million acres in 1979 and 69.33 million acres in 1980, a much smaller reduction (0.3 million acres) than that which occurred with information (2.34 million acres). Set aside, without information, also increased from 2.9 million acres in 1979 to 4.82 million acres in 1980. The difference in set aside acreages in 1980 was a result of the difference in the ending year inventory for 1979, with or without information. The influence of the satellite information on the 1979 crop area harvested and resulting production comes solely through the price differences. The five year average area harvested, set aside and production results are different from the no information result at the 20 percent level of significance only.

Cotton area harvested and production also dropped sharply from 1979 to 1980, but the drop was more gradual than that occurred without information. The variability of the production with information is smaller than that with information (Table XVII). Again, the area harvested, set aside and production results were significantly different from those obtained under the assumption of no information availability.

For wheat, corn, and cotton, the total supply, total domestic demand (Figure 19), ending inventories (Figure 20), prices (Figure 21), and deficiency payments (Figure 22) were significantly different from the result obtained assuming no information. Only price was different for soybeans. The reserve level for corn was also significantly different (Figure 23). The five year average for net farm income with information was $31287.49 million compared to just over $31,000 million for the no information result, no statistically significant.

The coefficient of variation for production, domestic demand, ending inventory, and price for the four crops is shown in Table XVII. All of the items for soybeans have smaller coefficients of variation with information. The variability of production and price of corn with information is greater than occurs without the information. Only domestic demand for cotton exhibits more variability with information. Net farm income also shows greater variability when information is available

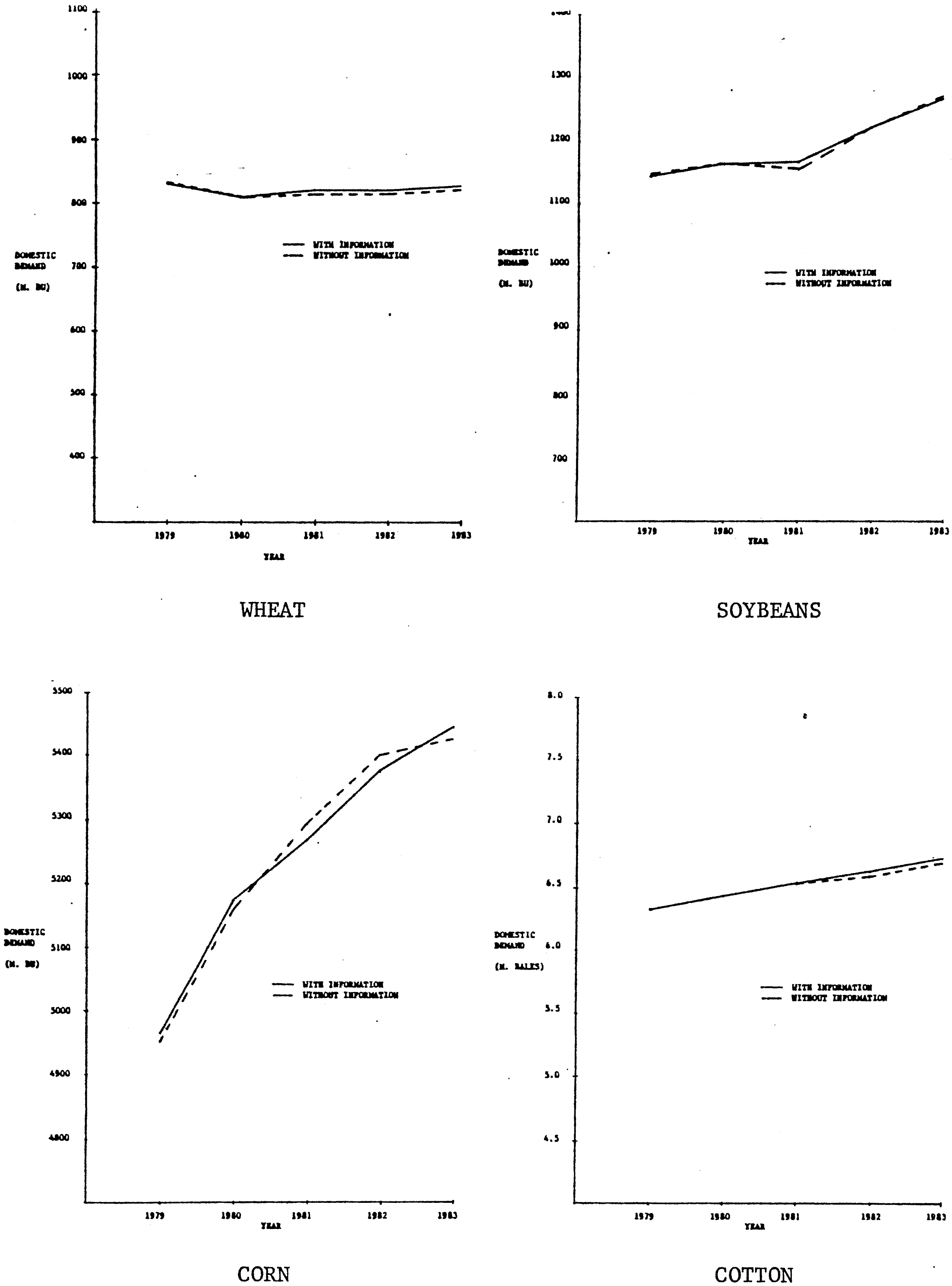


Figure 19. Comparison of Domestic Demand, by Crop, With and Without Information, Excess Supply-Demand Scenario

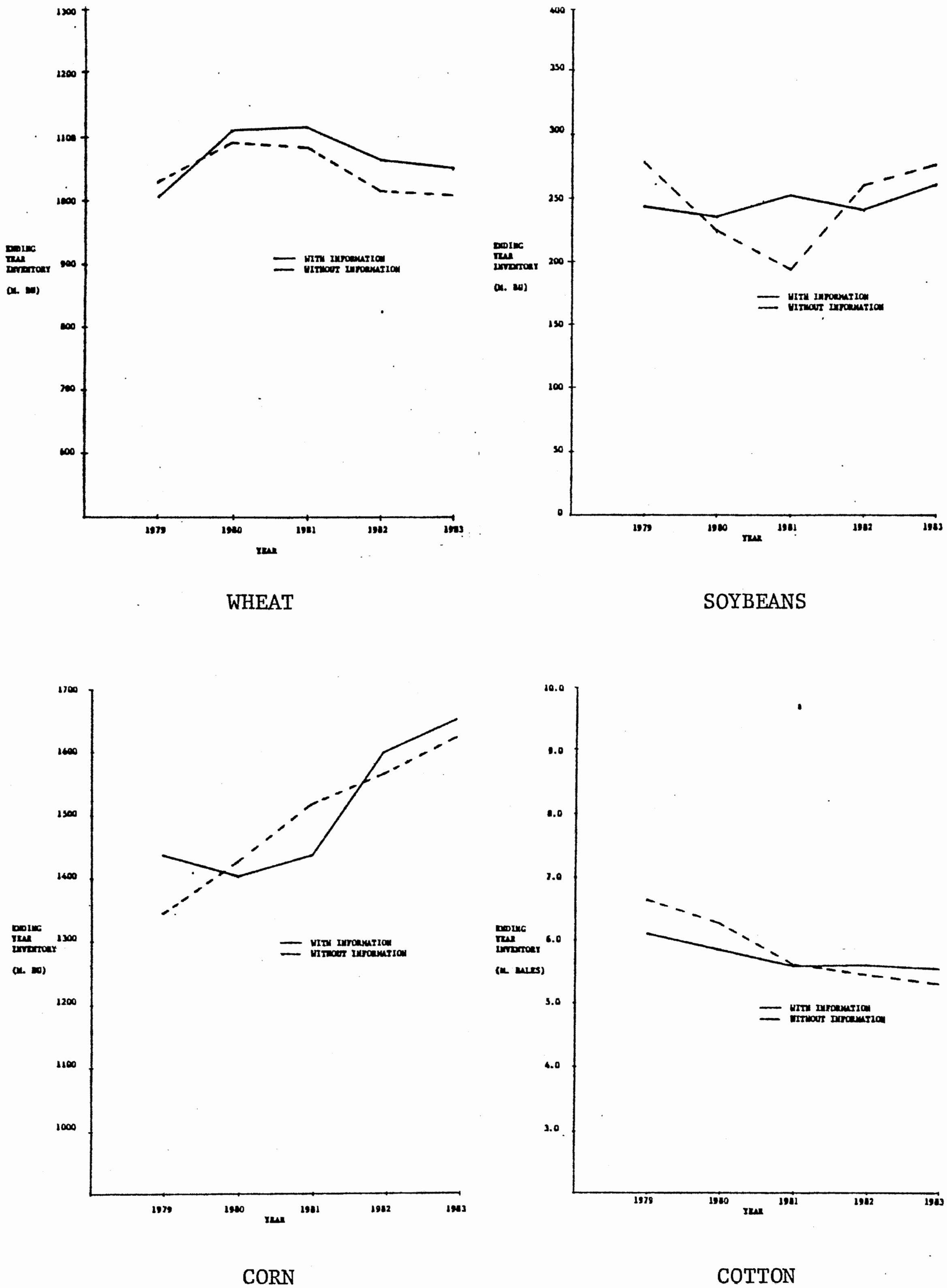


Figure 20. Comparison of Ending Year Inventory, by Crop, With and Without Information, Excess Supply-Demand Scenario

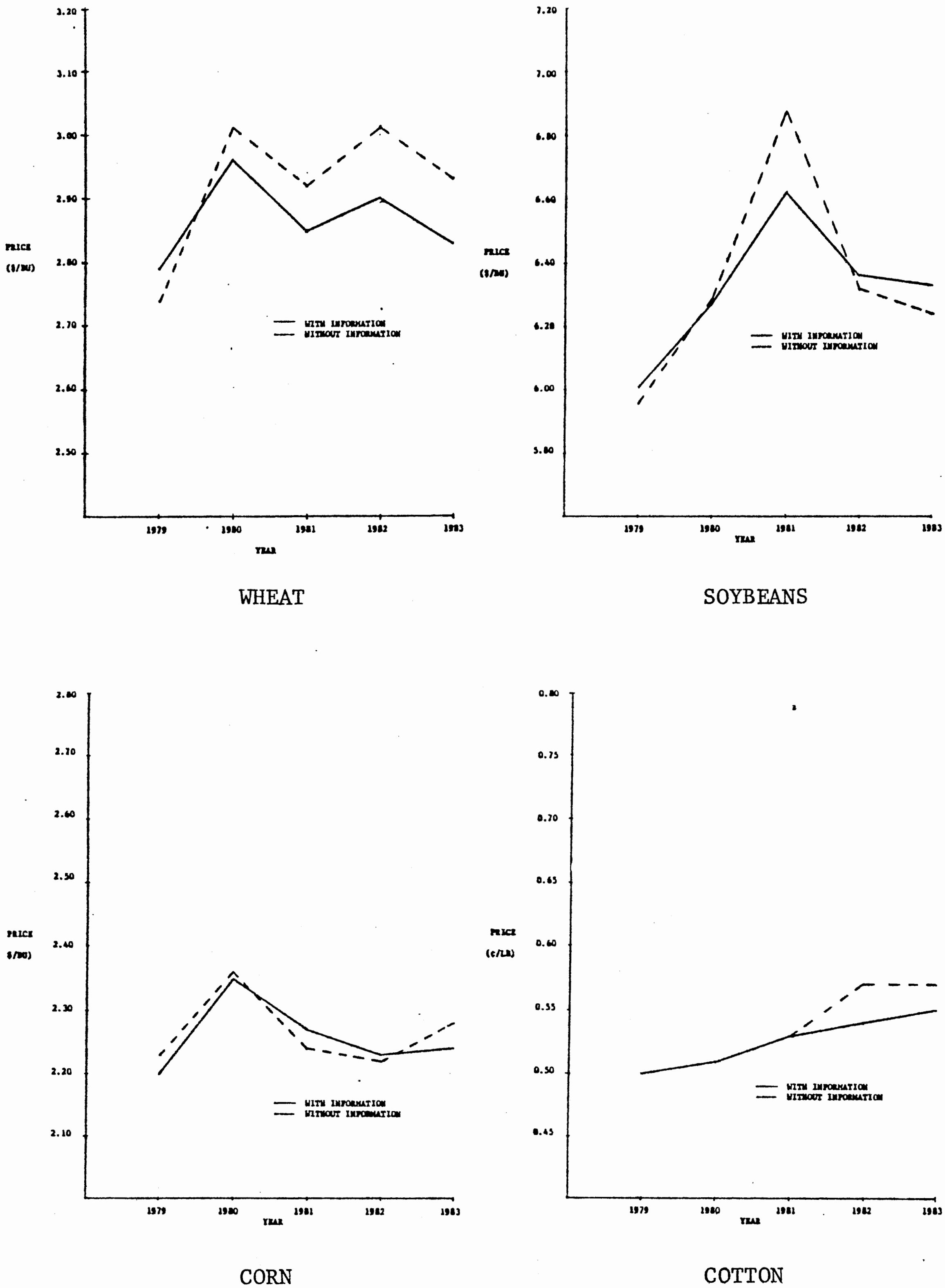


Figure 21. Comparison of Price, by Crop, With and Without Information, Excess Supply-Demand Scenario

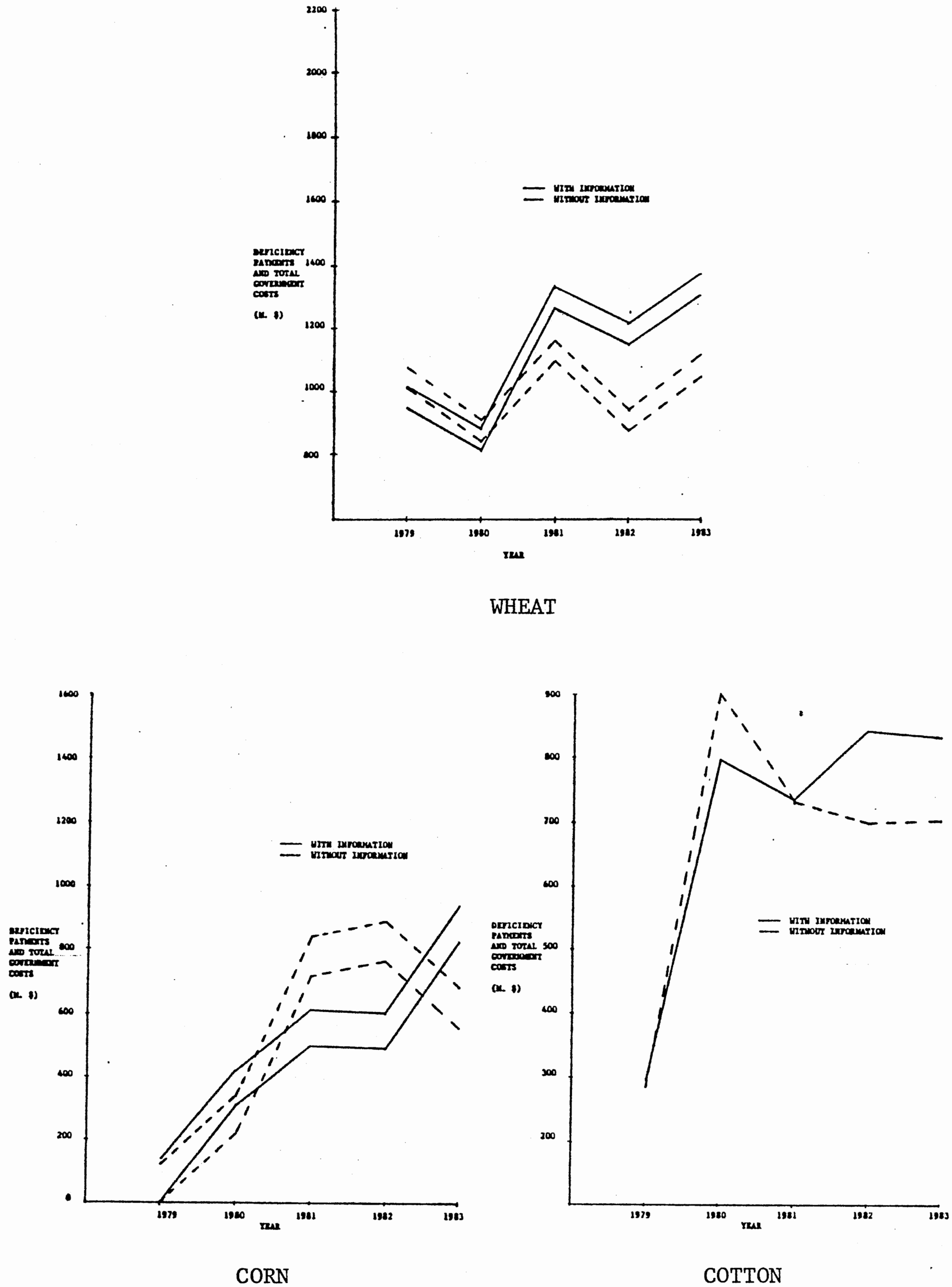
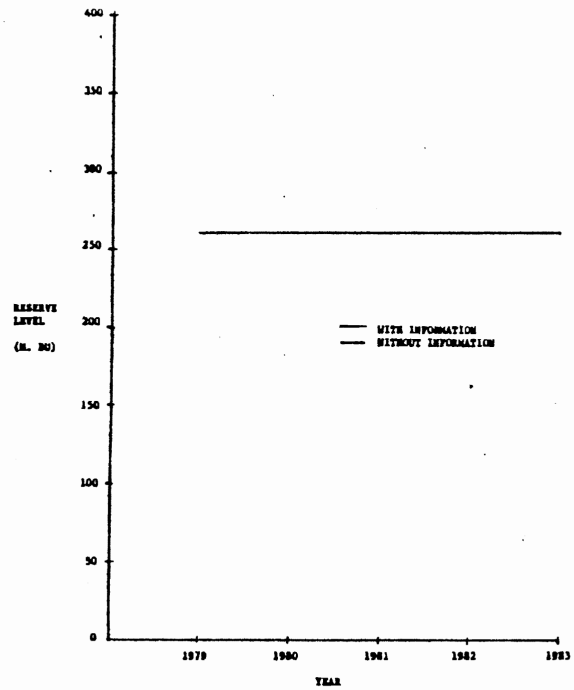
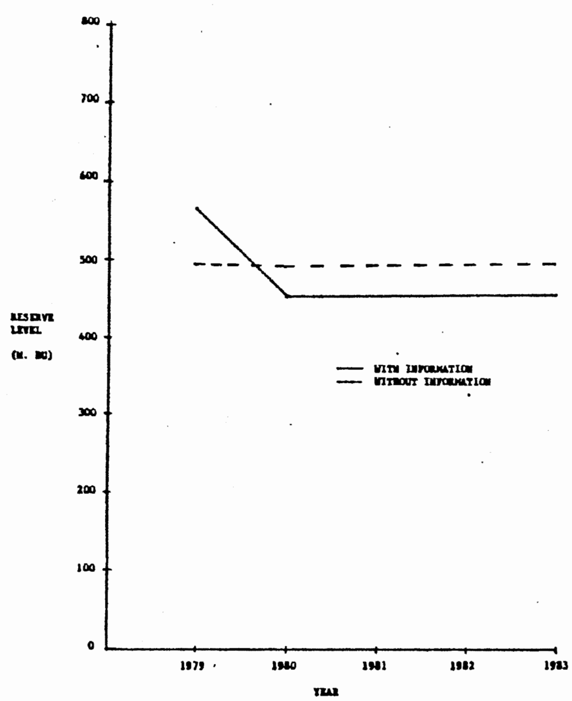


Figure 22. Comparison of Deficiency Payments and Total Government Costs, by Crop, With and Without Information, Excess Supply-Demand Scenario



WHEAT



CORN

Figure 23. Comparison of Reserve Level, by Crop, With and Without Imformation, Excess Supply-Demand Scenario

Table XVIII shows the consumer surplus, producer surplus, and net domestic surplus results, obtained under the assumption of increasing commodity supplies (stocks). Only the producer surplus for wheat in 1980, the net domestic surplus for corn in 1982 and the soybean five year averages for consumer surplus and producer surplus were not highly different from the no information results obtained (Table XIX).

The five year average consumer surplus for wheat was \$398.27 million above the POLYSIM baseline, compared to \$351.50 million above for the no information case. For soybeans, the results were \$1007.24 million above and \$1014.82 million above for the with and without information results, respectively.

Similarly, the consumer surpluses for corn were \$1537.87 million above and \$1566.12 million above, respectively, and for cotton, \$237.90 million above and \$202.02 million above.

By comparison the producer surplus was \$1060.31 million below for wheat, \$1729.90 million below for soybeans, \$1237.71 million below for corn, and \$259.68 million below for cotton when information was available. All four of the net domestic surpluses are lower than the nor information result.

Tight Supply

Under the assumption of decreasing commodity supplies relative to their demands, wheat production, assuming information was available, increased from the 1979 level due to both area and yield increases, although yield did decline from the baseline values (Figure 24). The difference between the five year average wheat area and production values under alternative information and no information assumptions

TABLE XVIII

COMPARISON OF CONSUMER, PRODUCER, AND NET DOMESTIC SURPLUSES FOR THE WITH AND WITHOUT INFORMATION ASSUMPTIONS, RELATIVE TO THE POLYSIM BASELINE LEVEL, BY CROP AND YEAR, WITH THE FIVE YEAR AVERAGE, HIGH ACCURACY, HIGH CURRENT YEAR PRICE WEIGHT, EXCESS SUPPLY-DEMAND SCENARIO

Crop	Information Level	Surplus	1979	1980	1981	1982	1983	Five Year Average
WHEAT:	WITH	Consumer	205.24	337.46	390.07	480.29	578.27	398.27
		Producer	-783.08	-1112.06	-993.75	-1106.44	-1306.23	-1060.31
		Net Domestic	-577.84	-774.59	-603.67	-626.15	-727.96	-662.04
	WITHOUT	Consumer	251.30	347.47	326.73	367.80	464.19	351.50
		Producer	-842.59	-1111.49	-890.06	-947.28	-1133.06	-984.90
		Net Domestic	-591.28	-764.02	-563.33	-579.48	-668.88	-633.40
SOYBEANS:	WITH	Consumer	672.09	1072.09	1258.24	993.39	1040.37	1007.24
		Producer	-1327.62	-1881.88	-2048.27	-1765.02	-1626.71	-1729.90
		Net Domestic	-655.54	-809.79	-790.03	-771.63	-586.34	-722.66
	WITHOUT	Consumer	735.11	1107.18	1068.80	1006.94	1156.07	1014.82
		Producer	-1292.32	-2083.77	-1873.70	-1545.73	-1820.94	-1723.29
		Net Domestic	-557.21	-976.59	-804.90	-538.79	-664.86	-708.47
CORN:	WITH	Consumer	1019.67	1694.23	1451.85	1686.13	1837.47	1537.87
		Producer	-1306.32	-1657.60	-999.85	-1010.34	-1214.43	-1237.71
		Net Domestic	-286.65	36.64	452.00	675.79	623.04	300.16
	WITHOUT	Consumer	982.84	1590.02	1642.84	1864.24	1750.65	1566.12
		Producer	-1299.56	-1447.85	-1196.95	-1185.43	-935.48	-1213.05
		Net Domestic	-316.72	142.17	445.89	678.82	815.17	353.07
COTTON:	WITH	Consumer	47.49	147.63	248.39	379.66	366.31	237.90
		Producer	-53.98	-171.83	-273.61	-414.19	-384.80	-259.68
		Net Domestic	-6.49	-24.20	-25.22	-34.53	-18.49	-21.78
	WITHOUT	Consumer	45.96	167.47	240.81	286.10	269.74	202.02
		Producer	-5.61	-205.45	-251.89	-284.86	-295.58	-208.68
		Net Domestic	40.36	-37.98	-11.08	1.24	-25.85	-6.66

TABLE XIX

RESULTS OF STATISTICAL TEST FOR EQUAL MEANS, INFORMATION VERSUS NO INFORMATION ASSUMPTIONS, EXCESS SUPPLY-DEMAND SCENARIO

	1979	1980	1981	1982	1983	5 Year Average
CONSUMER SURPLUS						
Wheat	-49.05	-6.63	28.53	44.44	43.98	12.20
Soybeans	-40.65	-10.76	55.37	-4.44	-59.14	-1.19
Corn	25.46	55.83	-63.68	-57.28	26.30	-2.59
Cotton	14.44	-55.44	9.34	80.16	71.93	8.93
7 Crops	-35.43	10.69	13.36	6.18	43.71	2.12
PRODUCER SURPLUS						
Wheat	20.81	-0.24	-29.64	-47.42	-51.89	-13.62
Soybeans	-18.17	30.93	-32.86	-41.52	63.04	-0.68
Corn	-2.56	-49.24	65.52	33.73	-62.38	-3.16
Cotton	-150.01	74.18	-23.36	-102.10	-66.90	-11.49
7 Crops	-6.72	1.33	-10.46	-37.58	-52.96	-9.30
NET DOMESTIC SURPLUS						
Wheat	6.81	-7.56	-28.83	-46.66	-50.22	-10.14
Soybeans	-120.72	41.59	4.10	-77.18	31.35	-2.85
Corn	24.34	-41.66	3.56	-0.81	-56.62	-3.72
Cotton	-197.41	87.25	-107.31	-198.86	35.17	-20.40
7 Crops	-40.51	5.65	-6.00	-60.52	-36.80	-6.98

A t-statistic of $\pm$ 1.28 is significant at a 20 percent level, $\pm$ 1.64 is significant at a 10 percent level and $\pm$ 1.96 is significant at a 5 percent level.

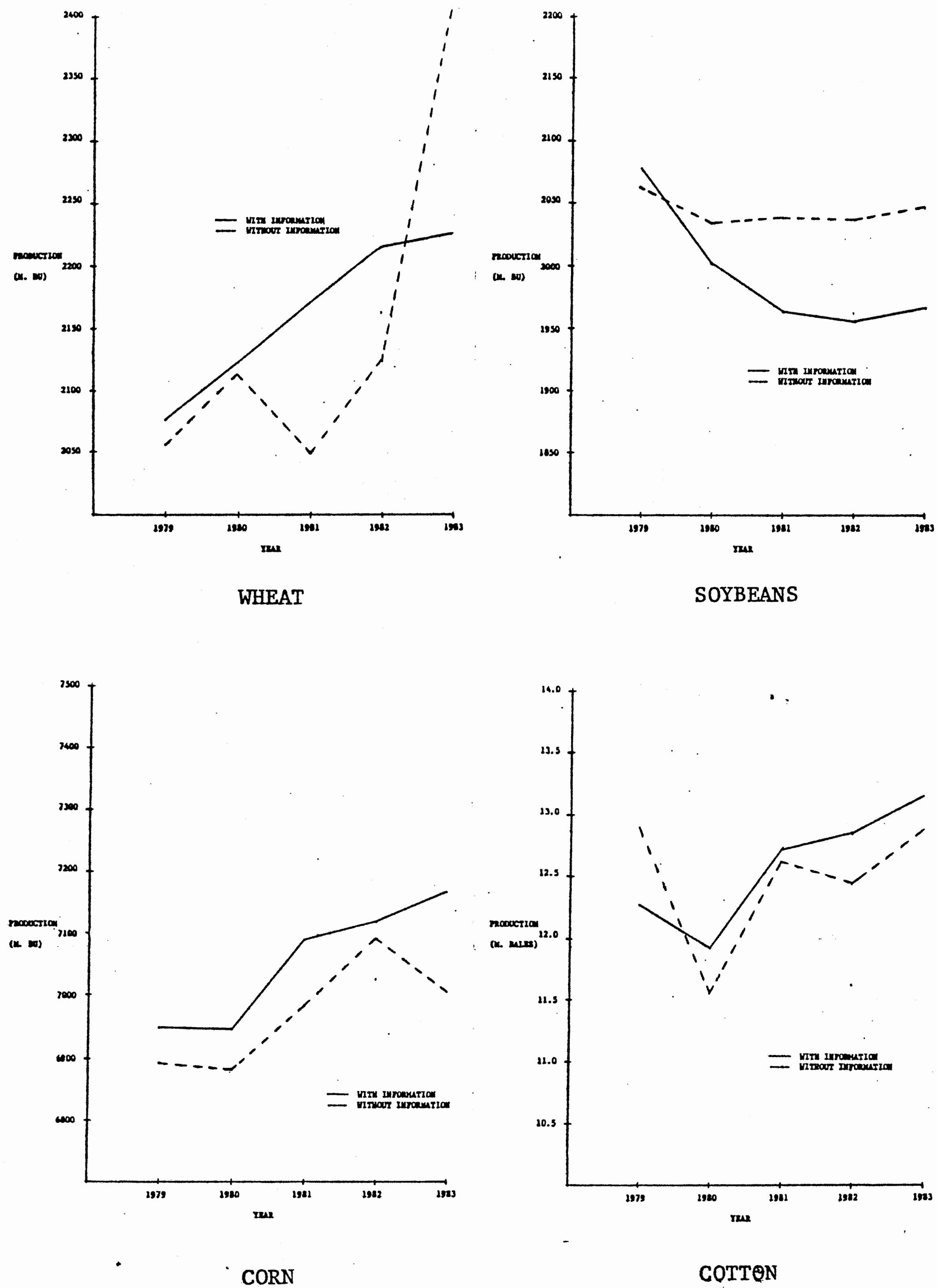


Figure 24. Comparison of Production, by Crop, With and Without Information, Tight Supply-Demand Scenario

was highly significant (Table XXXIX, Appendix A). The wheat area and production increased dramatically in 1982 and 1983 (over 13 million acres and 350 million bushels) assuming no information was available while the result, when information was available, continued to increase from 1979 to 1983.

With information, soybean production declined from the 1979 level in 1980, 1981, and 1982 (nearly 125 million bushels total) before increasing in 1983. Without information, production decreased some 30 million bushels (1.4 percent) before increasing slightly (Table XL, Appendix A). The difference in five year averages for both area and production between information and no information was significant.

Corn production, with information, increased throughout the five years simulated (from 6.95 billion bushels to 7.17 billion bushels). Without information, production increased from 6.89 billion bushels in 1979 to 7.09 billion bushels in 1982, before declining to 7.0 billion bushels in 1983. The difference between the information and no information results in the five year averages for corn area harvested and production were significant.

The five year averages for cotton area harvested and production with information were significantly different from the no information results. Cotton production did decline some three percent between 1979 and 1980 with information but the increased over 10 percent by 1983. Without information, cotton production declined nearly nine percent between 1979 and 1980 and increased to a level two percent below the 1983 with information level.

The five year averages for the domestic demands for wheat, soybeans and corn (shown in Figure 25) were significantly different from the no information results. The difference for wheat results from the 1981 through 1983 consumption levels. Soybean domestic demand with information was continually below the demand without information for 1980 through 1983, by as much as seven percent in 1982. Again this reflected directly the different production levels for soybeans under the alternative with or without information assumptions.

The domestic demand for corn with information was continually above the no information level, from less than 0.5 percent in 1979 but increasing to 5.3 percent in 1983. This difference again was reflected in the production levels.

Only small differences in cotton domestic demand occurred between the information and no information simulations. In both situations domestic demand increased slightly throughout the five years simulated.

Ending year inventories for the three of the four crops declined throughout the five years (Figure 26). Wheat ending inventory declined from 646 million bushels in 1979 to near the "pipeline" value2 of 300 million bushels in 1982 and 1983. Soybean ending inventory reached the pipeline value in 1979 and remained at that level throught the five years. Corn ending inventory declined from

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[2]Pipeline value refers to that quantity of a commodity which is in commercial channels such as, in transit and awaiting transport to final destination. The assumed values in POLYSIM are 300 million bushels for wheat, 400 million bushels for corn, 90 million bushels for soybeans and 1.0 million bales for cotton.

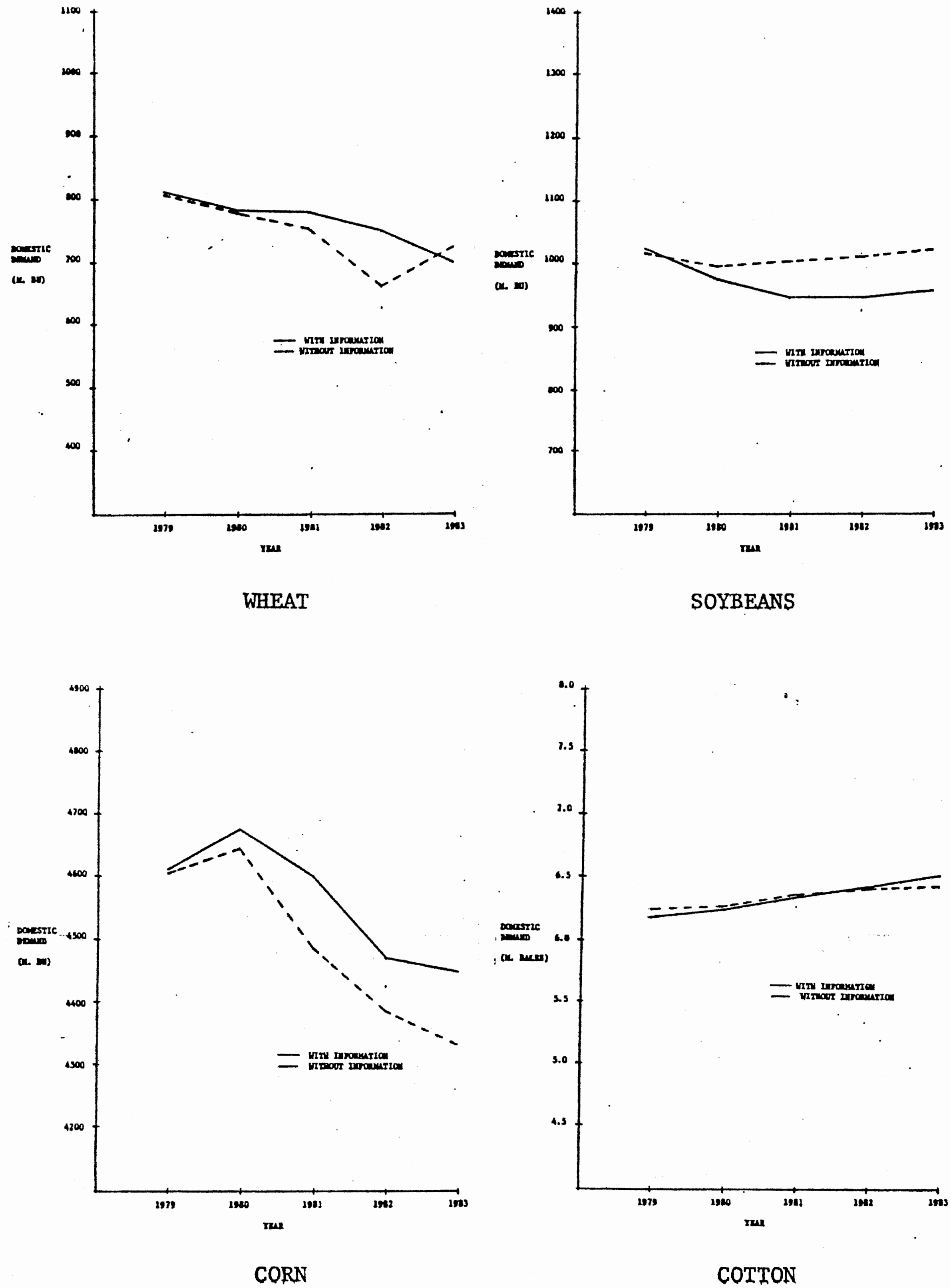


Figure 25. Comparison of Domestic Demand, by Crop, With and Without Information, Tight Supply-Demand Scenario

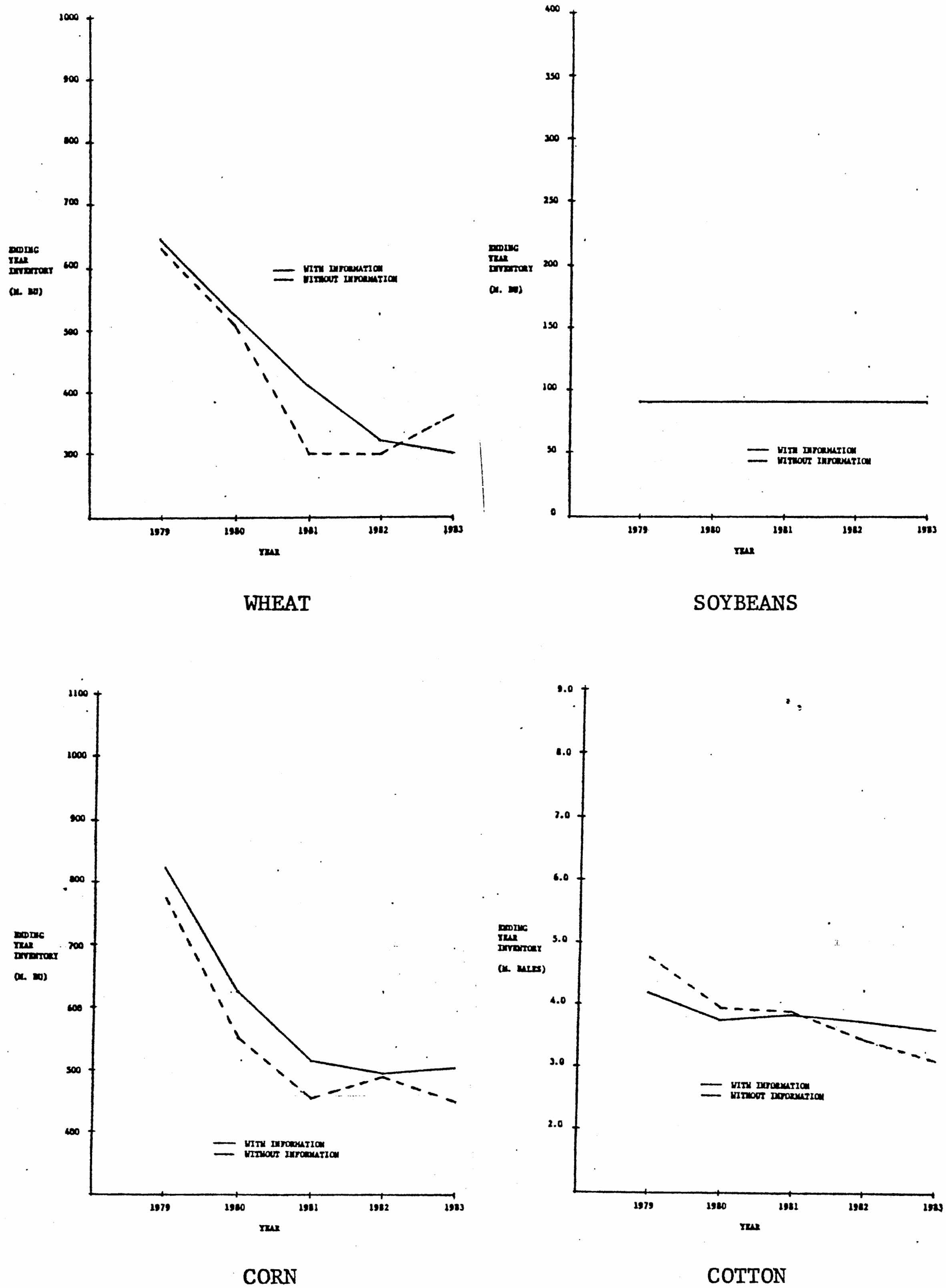


Figure 26. Comparison of Ending Year Inventory, by Crop, With and Without Information, Tight Supply-Demand Scenario

near 824 million bushels in 1979 to 496 million bushels in 1982, still above the 400 million bushel pipeline value. Cotton ending inventory declined from 4.2 million bales in 1979 to 3.6 million bales in 1983. The five year averages for wheat, corn, and soybeans were significantly different from the no information result (Table XXXIX, Appendix A).

The reserve levels for wheat and corn are completely depleted by 1981 for wheat, corn, one year later than the no information result. However, in 1980 only 5.7 million bushels of wheat and 57.7 million bushels of corn remained in reserve.

Crop prices reflect the ending inventory levels (Figure 27). As demands increases, ending inventories decrease and the prices increase. The five year averages for the four crops with information were significantly different from the averages without information (Table XXXIX, Appendix A).

The wheat price in 1979 was $3.54 per bushel with information and $3.56 per bushel without information. Both prices increased through 1982 to $4.88 per bushel with information and to $6.35 per bushel without information. Reflecting the continued strong demand in 1983 the price of wheat, with information, continued to increase to $5.70 per bushel while the without information price dropped to $4.17 per bushel due to the large production increase.

The soybean price in 1979, with information, was $8.26 per bushel and increased steadily to $9.83 per bushel in 1983. The without information price increased each year from $8.41 per bushel in 1979 to $9.26 per bushel in 1983. The corn price, with information, exhibited a steady increase, whereas the without information price showed

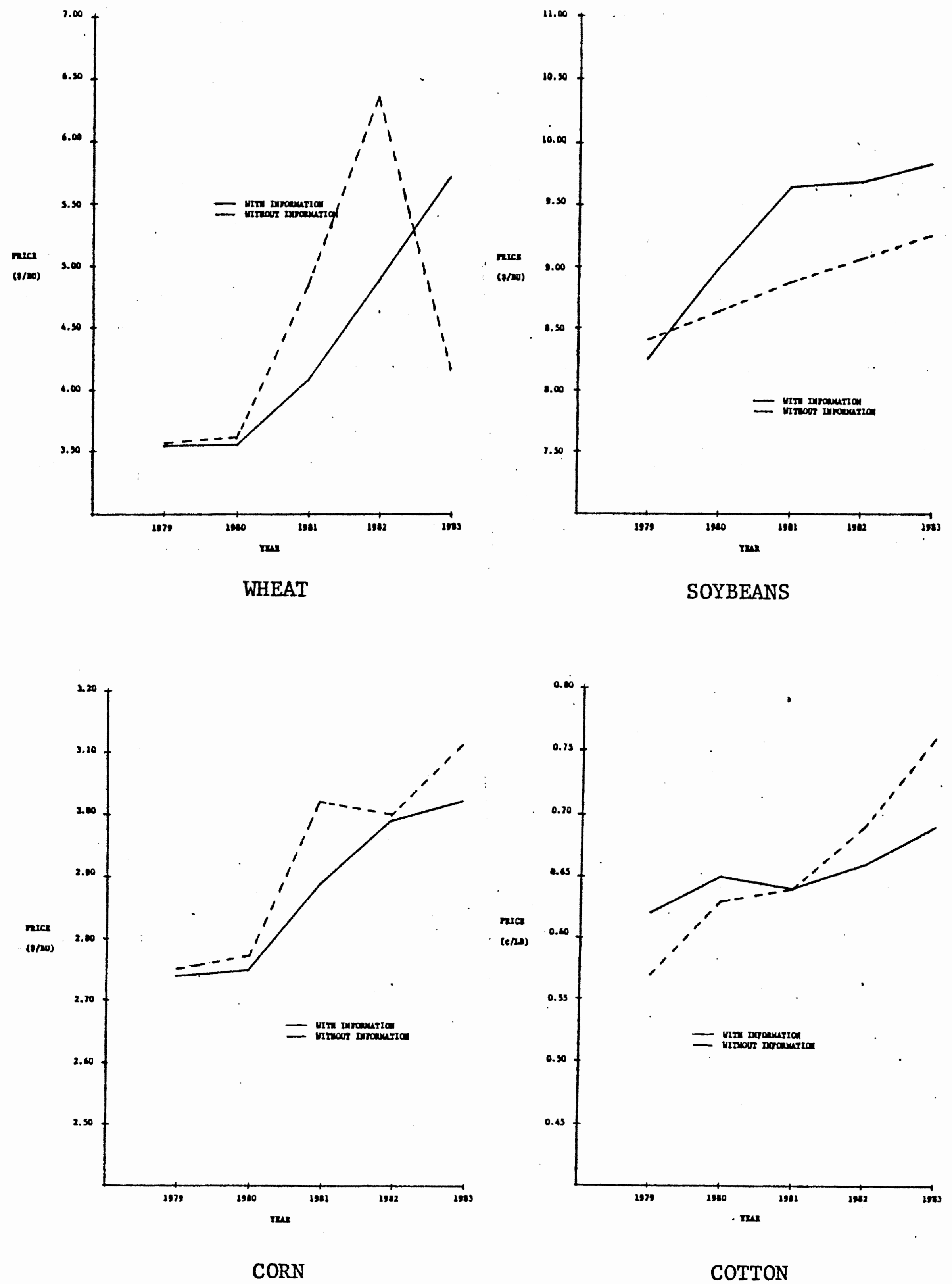


Figure 27. Comparison of Price, by Crop, With and Without Information, Tight Supply-Demand Scneario

sharper increases and decreases. Cotton prices showed an upward trend for both with and without information assumptions, although the with information trend was lower.

No deficiency payments were paid in any of the five years for corn or wheat reflecting the high price levels. The total government costs, therefore, shadow the storage costs of the grain reserves. Deficiency payments (and, therefore, total government costs) for cotton are higher with information than without information in 1982 and 1983 reflecting the fact that the price was below the target price in those years. The without information deficiency payment was highest in 1980 at $78.52 million, with no payments made in 1983.

The net farm income with information began at $32.3 billion in 1979 and increased to $46.1 billion in 1982 before declining to $42.2 billion in 1983 (Table XXXIX, Appendix A). The average of $39.3 billion was different from the no information average of $39.6 billion at an 80 percent level of significance.

Table XVII also shows the variability of production, domestic demand, ending inventory, and price for the four crops with and without information available under the tight supply-demand scenario. With information available, the variability of each item above is smaller for wheat and larger for soybeans than the variability without the improved information. For corn the production variability was larger with information than without information. Domestic demand for cotton also shows more variability. Net farm income is less variable with information than without information.

Table XX shows the consumer surpluses for the four crops under the tight supply demand scenario. Consumer surplus was directly

TABLE XX

COMPARISON OF CONSUMER, PRODUCER, AND NET DOMESTIC SURPLUSES FOR THE WITH AND WITHOUT INFORMATION ASSUMPTIONS, RELATIVE TO THE POLYSIM BASELINE LEVEL, BY CROP AND YEAR, WITH THE FIVE YEAR AVERAGE, HIGH ACCURACY, HIGH CURRENT YEAR PRICE WEIGHT, TIGHT SUPPLY-DEMAND SCENARIO

Crop	Information Level	Surplus	1979	1980	1981	1982	1983	Five Year Average
WHEAT:	WITH	Consumer	-187.09	-329.45	-638.98	-1253.33	-2235.93	-928.95
		Producer	463.85	-3.45	1757.17	3310.36	4563.94	2018.37
		Net Domestic	276.77	-332.90	1118.19	2057.03	2328.01	1089.42
	WITHOUT	Consumer	-314.59	-451.55	-1139.02	-3212.49	-1939.60	-1411.45
		Producer	440.84	74.52	2915.03	6024.16	1670.56	2225.02
		Net Domestic	126.26	-377.03	1776.00	2811.68	-269.05	813.57
SOYBEANS:	WITH	Consumer	-1458.85	-2386.58	-2785.01	-3483.79	-3990.45	-2820.94
		Producer	2693.14	3082.23	2985.85	3739.43	3988.33	3297.79
		Net Domestic	1234.28	695.65	200.84	255.64	-2.13	476.86
	WITHOUT	Consumer	-1767.67	-2283.34	-2245.99	-3012.49	-3575.88	-2577.07
		Producer	2963.22	2702.55	2285.68	3454.64	3818.39	3044.90
		Net Domestic	1195.55	419.21	39.69	442.15	242.52	467.82
CORN:	WITH	Consumer	-960.03	-1386.67	-2318.80	-3222.18	-3631.08	-2303.75
		Producer	1392.52	299.10	2248.03	2695.25	2674.03	1861.79
		Net Domestic	432.49	-1087.58	-70.77	-526.92	-957.05	-441.96
	WITHOUT	Consumer	-1074.46	-1599.17	-2957.70	-3816.36	-4350.29	-2759.60
		Producer	1347.71	274.81	2961.39	2737.92	3069.71	2078.31
		Net Domestic	273.24	-1324.35	3.70	-1078.44	-1280.58	-681.29
COTTON:	WITH	Consumer	-258.92	-341.79	-238.09	-176.54	-261.01	-255.27
		Producer	420.17	428.14	202.78	92.08	272.09	283.05
		Net Domestic	161.25	86.35	-35.30	-84.46	11.07	27.78
	WITHOUT	Consumer	-146.07	-285.24	-238.41	-258.45	-492.51	-284.14
		Producer	203.02	363.07	212.80	228.35	644.23	330.29
		Net Domestic	56.95	77.83	-25.61	-30.10	151.72	46.16

related to crop price and domestic demand which was reflected in the changes in the consumer surpluses. For wheat falling domestic demand and rising price resulted in a decreasing consumer surplus. The upward shift, under the no information assumption, reflected the lower price and higher consumption afforded by the production increase in 1983 (Table XL, Appendix A).

Similarly for soybeans, corn, and cotton the consumer surpluses moved as expected relative to prices and demands. For corn the increasing price appeared to offset the increased levels of domestic demand in 1980 since the consumer surplus continued to decline. The consumer surplus for all four crops in all five years simulated plus the five year averages showed a significant difference compared to the no information result except 1981 cotton (Table XXI).

Producer surpluses for the four crops are shown in Table XX. Since producer surplus was essentially returns over variable costs, the year to year changes in production and price were reflected directly in the producer surplus changes. A test for a significant difference between the with information results and the without information showed highly significant differences for the four crops in all years plus the five year averages, the exception being the seven crop total in 1979 (Table XXI).

The net domestic surpluses for the four crops (Table XX) were significantly different from the no information result for each year except the five year average for soybeans (Table XXI). The wheat surplus was below the without information level in 1981 and 1982. The soybean surplus was above in 1979, 1980, and 1981 while corn was above in each year except 1981 and cotton was above in 1979 and 1980.

TABLE XXI

RESULTS OF STATISTICAL TEST FOR EQUAL MEANS, INFORMATION VERSUS NO INFORMATION ASSUMPTIONS, TIGHT SUPPLY-DEMAND SCENARIO

	1979	1980	1981	1982	1983	5 Year Average
CONSUMER SURPLUS						
Wheat	137.19	75.03	103.73	81.79	-6.90	13.73
Soybeans	35.07	-6.30	-30.68	-28.00	78.83	-8.44
Corn	26.91	48.13	53.84	50.41	62.00	10.84
Cotton	-153.65	-34.29	0.17	45.79	78.37	8.57
7 Crops	68.99	16.75	84.61	105.59	8.36	7.11
PRODUCER SURPLUS						
Wheat	22.16	-48.75	-74.58	-52.82	65.16	-2.86
Soybeans	-22.04	22.42	59.39	29.56	17.85	12.91
Corn	11.69	8.60	-45.46	-6.82	-67.76	-5.85
Cotton	215.04	27.42	-3.65	-52.37	-64.76	-8.36
7 Crops	0.81	21.76	-64.81	-55.83	57.38	-2.00
NET DOMESTIC SURPLUS						
Wheat	106.64	36.16	-60.56	-25.88	148.56	6.50
Soybeans	10.75	41.39	15.86	-19.56	-24.18	0.58
Corn	54.44	34.85	-15.53	72.58	37.86	10.41
Cotton	341.33	10.69	-10.46	-44.84	-46.62	-6.24
7 Crops	71.51	54.46	-31.65	-14.35	139.51	10.64

A t-statistic of $\pm$ 1.28 is significant at a 20 percent level, $\pm$ 1.64 is significant at a 10 percent level, and $\pm$ 1.96 is significant at a 5 percent level.

Fluctuating Supply

Under the assumption that commodity supplies and demands fluctuate, the availability of information allowed more moderate adjustments in acres harvested and production (Figure 28). Wheat area harvested in started in 1979 at 65.6 million acres with information (Table LVI, Appendix A) and at 66.6 million acres for the without information assumption (Table LVII, Appendix A). In 1980, area harvested declined to 58.8 million acres without information but only to 60.9 million acres with information. In 1981 the areas harvested for both increased. The with information area increased more in 1981 than the no information result and did not increase as much in 1982 before declining again in 1983. The five year average, assuming information, proved to be statistically different from the without information result (Table LVI, Appendix A). The variability of wheat production is significantly small when information is available (Table XVII).

The production of soybeans showed the same characteristic of more moderate adjustment from year to year. Both area harvested and production were significantly different than the result obtained under the no information assumption. Soybean production variability is also smaller with information than without information.

The adjustments in corn production, on the other hand, were more dramatic with information than the without information adjustments. The five year averages were significantly different. The variability of corn production is greater with information than without information due to shifts in production between the other crops and into set aside.

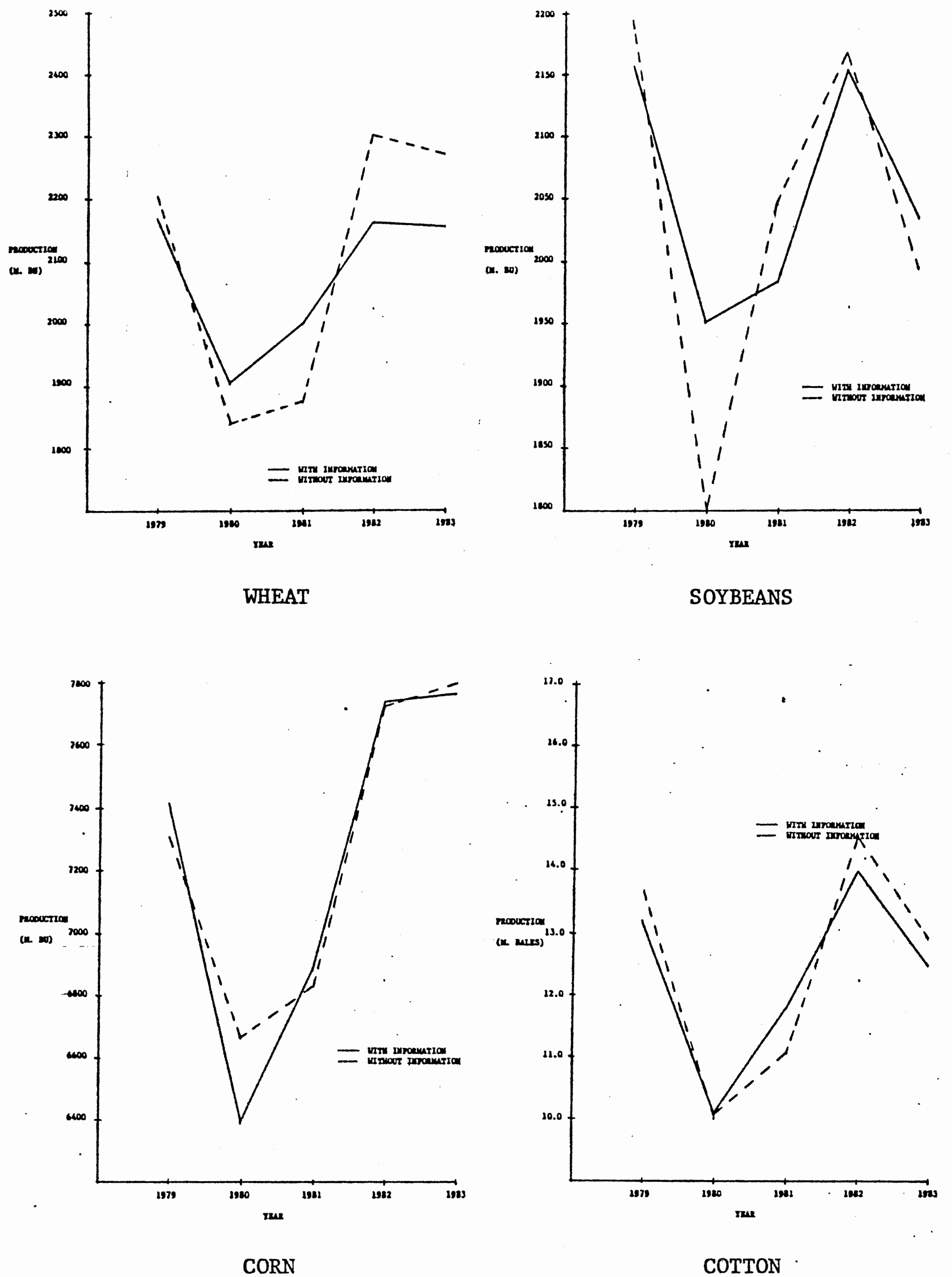


Figure 28. Comparison of Production, by Crop, With and Without Information, Fluctuating Supply-Demand Scenario

Cotton production also exhibited more moderate adjustments with information available. Both the five year average area harvested and production were significantly different with information than without information (Table XLI, Appendix A). Variability of cotton production is smaller with information available.

The domestic demands for the four crops dip during the shortage periods (Figure 29). Note that domestic demand continued to drop even after production began to rise (Figure 28). This was due to smaller ending inventories and higher prices. For wheat the with information result did not drop as far as occurred without information due partly to the higher production level with information (Table XLI, Appendix A). The domestic demand for soybeans with information dropped below that which occurred without information in 1981 and remained below in 1982 and 1983. Corn demand declined in 1980 and 1981 before rising in 1982 and 1983. Again, the demand declined despite an increase in production in 1981. Smaller inventories and higher prices were the reason. The shifting cotton production did little to affect cotton domestic demand. A small dip occurred in 1980 and 1981 but recovered in 1982 and 1983 to levels higher than in 1979. The five year averages for wheat, soybeans, and corn, with information available, were significantly different from the no information result. The variability of the domestic demands for wheat and soybeans is smaller with information available (Table XVII).

The ending year inventories for the four crops declined from 1979 through 1981 before increasing (Figure 30). This occurred in spite of increasing production levels in 1981. The wheat and cotton five year

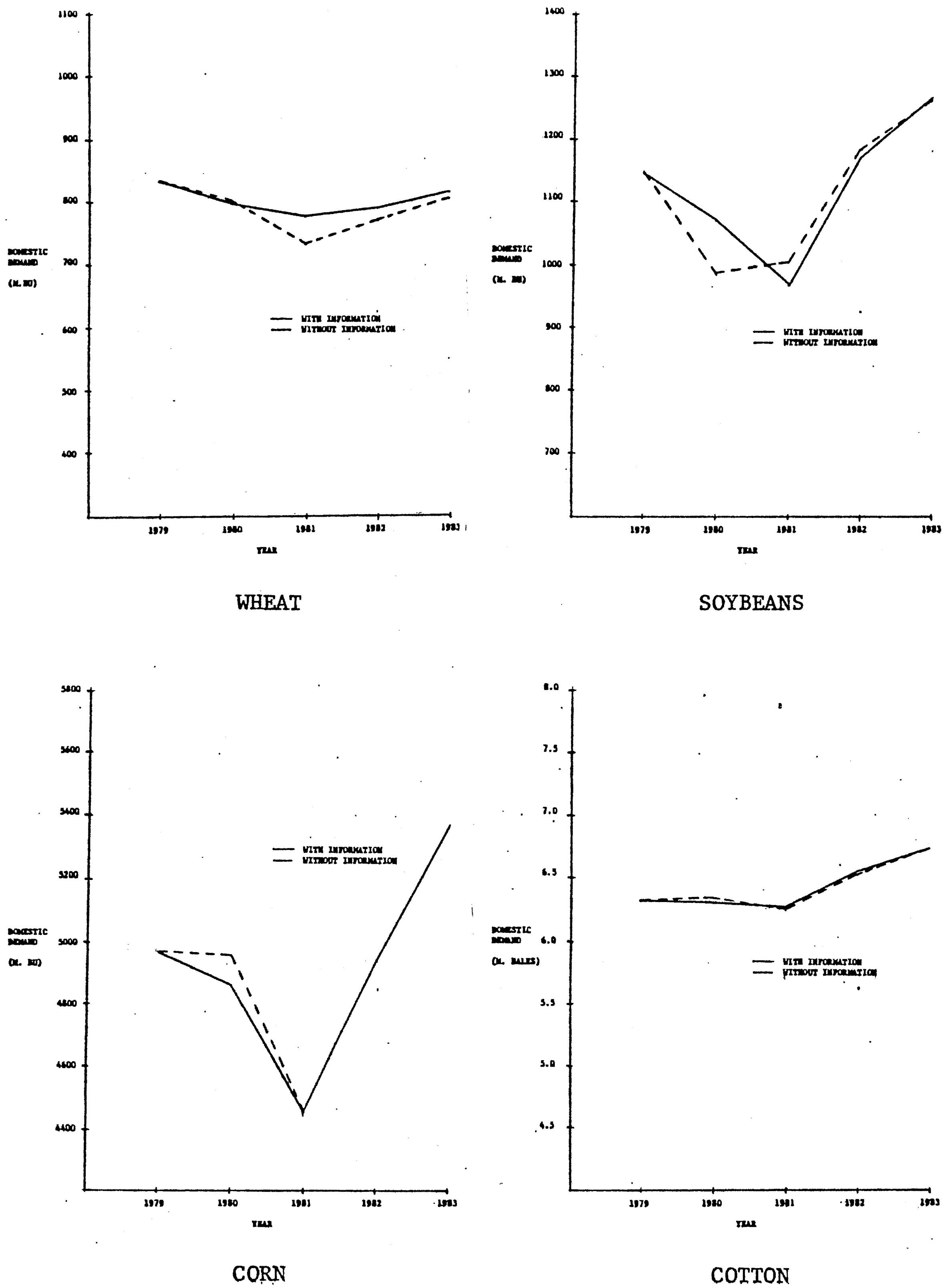


Figure 29. Comparison of Domestic Demand, by Crop, With and Without Information, Fluctuating Supply-Demand Scenario

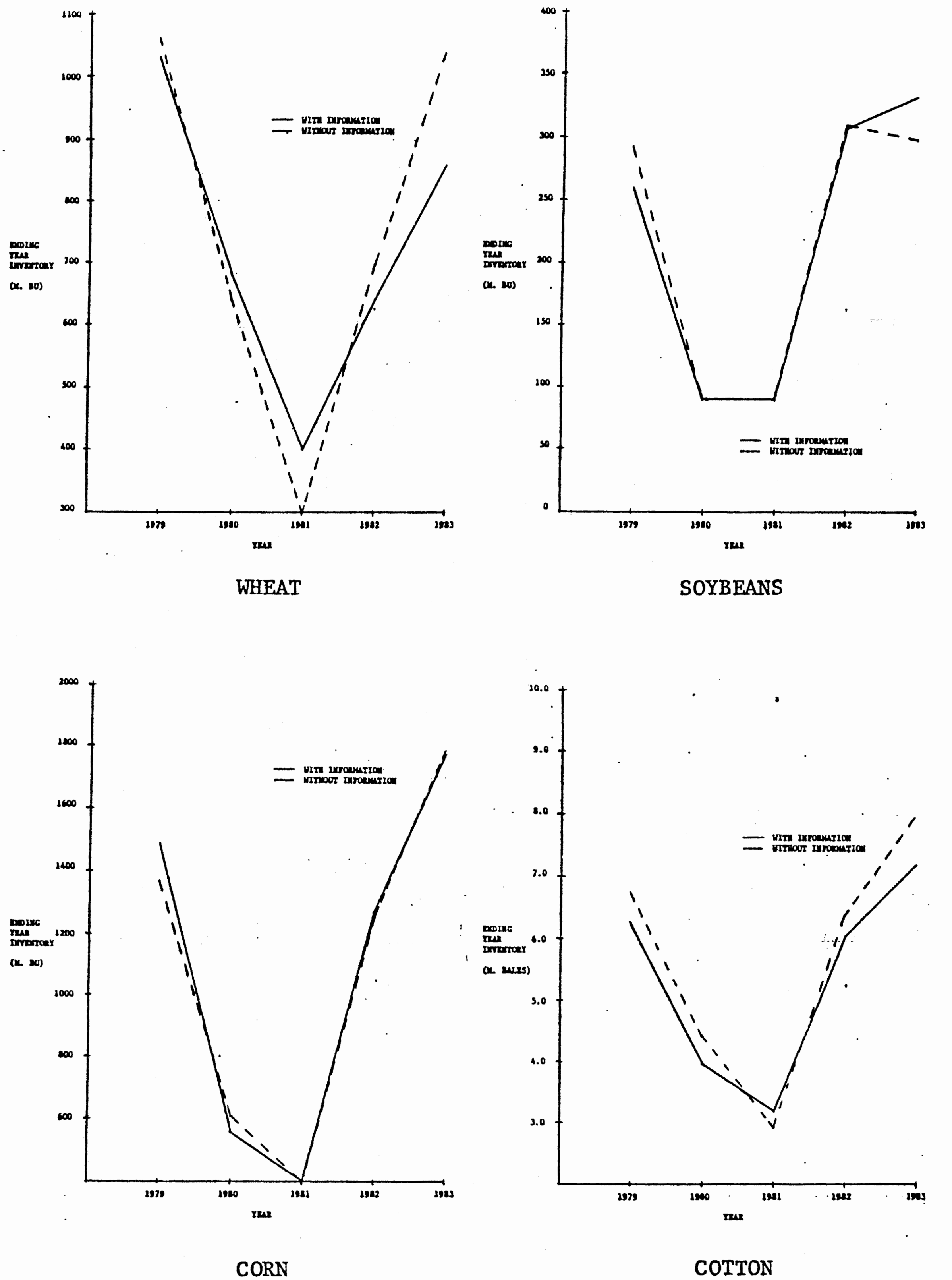


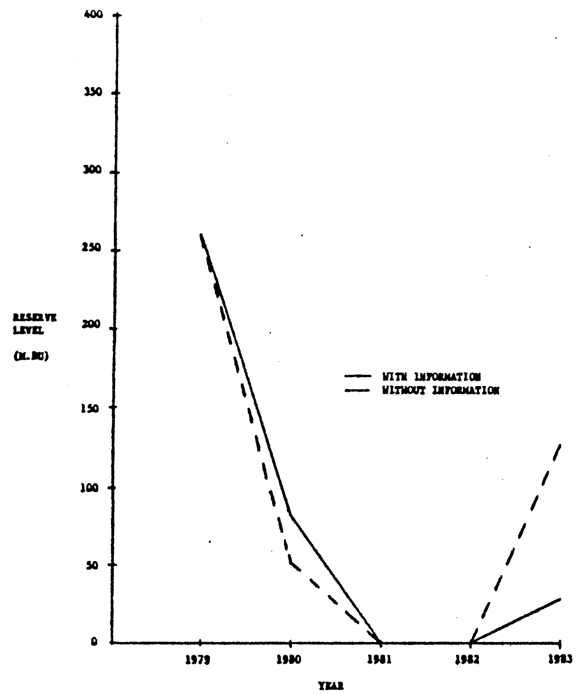
Figure 30. Comparison of Ending Year Inventory, by Crop, With and Without Information, Fluctuating Supply-Demand Scenario

averages were statistically different from the no information result (Table LVI, Appendix A). The ending inventories for corn and soybeans are more variable with information than without information due to piepline levels and more variable production for corn.

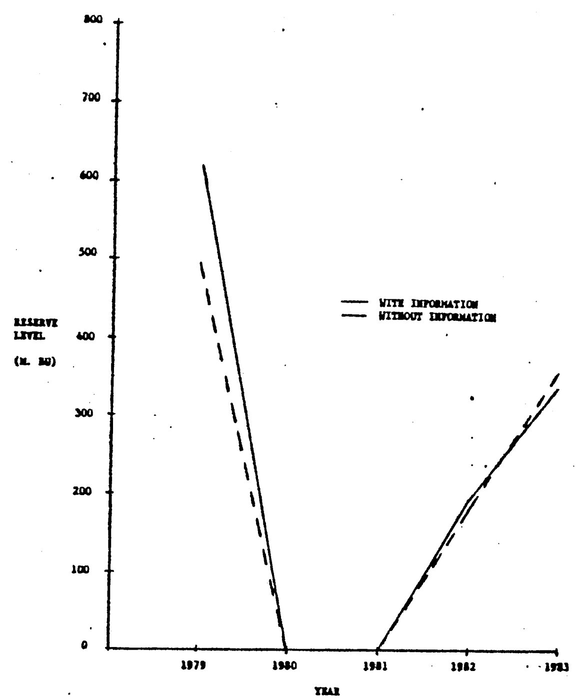
The wheat and corn reserve levels, under the fluctuating supply demand scenario, were completely depleted (in 1981 and 1982 for wheat and in 1980 and 1981 for corn) before building up again in 1982 and 1983 (Figure 31). With information, the wheat reserve in 1979 was 262.7 million bushels, 83.2 million bushels in 1980, 0.0 in 1981, and 1982, and 28.4 million bushels in 1983. Without information, in 1979 the same amount was in the reserve, in 1980 51.9 million bushels were in the reserve, none in either 1981 or 1982, and 126.0 million bushels in 1983.

For corn in 1979, with information, 127.0 million bushels were added to the initial 493.0 million bushels. But in 1980 the entire 620.0 million bushels were released. The reserve was empty at the end of 1980 and 1981. In 1982, 193.7 million bushels of corn were added to the reserve and in 1983, an additional 143.2 million bushels was added to bring the final reserve level to 337.0 million bushels. Without information, the original reserve level was maintained in 1979 and all was released in 1980. In 1982, 179.7 million bushels were added, with another 178.3 million bushels added in 1983 to bring the final level to 358.0 million bushels.

As has occurred previously, the prices of the four crops (Figure 32) reached their peak when ending inventories reached their lowest levels. The price difference for wheat between the five year averages



WHEAT



CORN

Figure 31. Comparison of Reserve Level, by Crop, With and Without Information, Fluctuating Supply-Demand Scenario

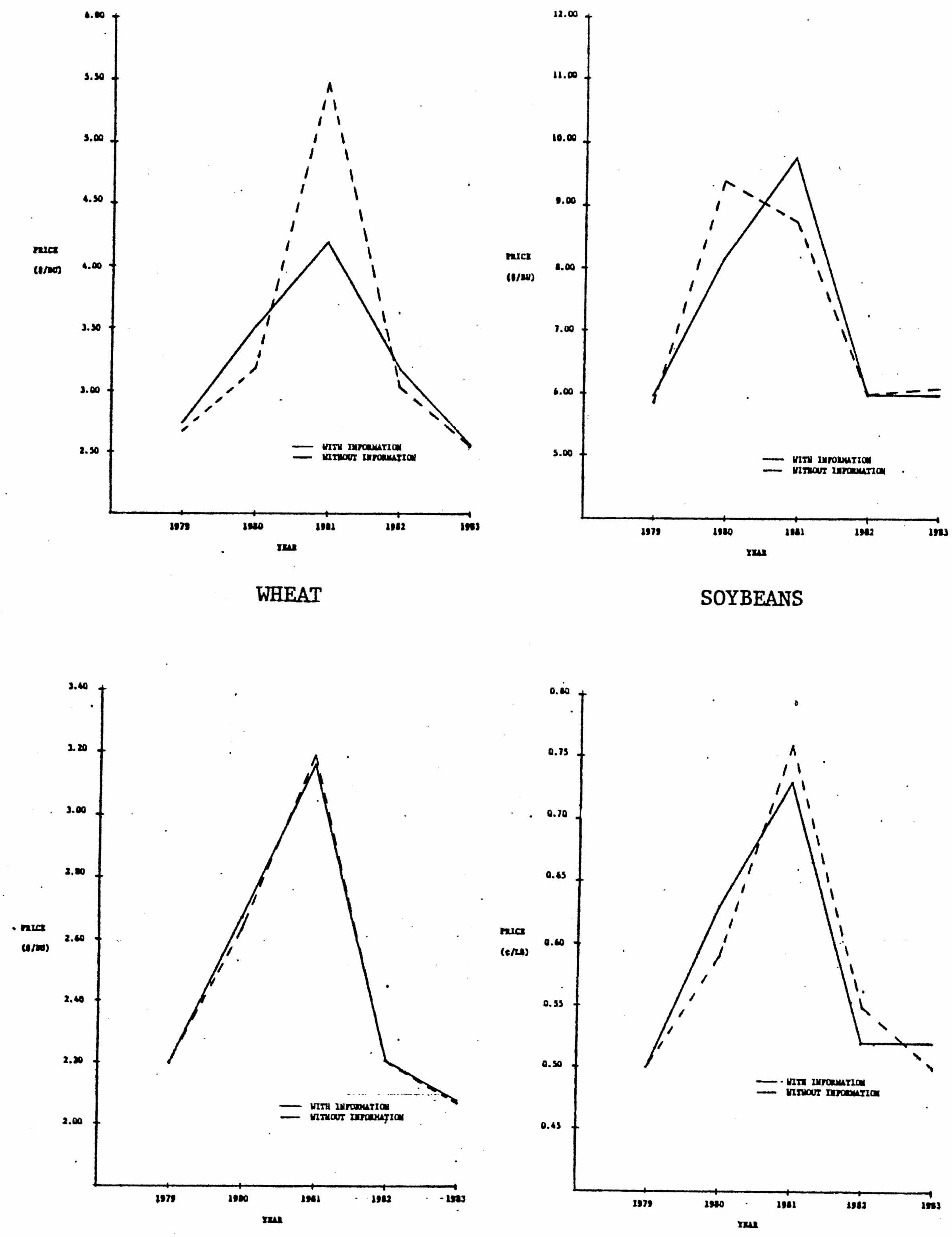


Figure 32. Comparison of Price, by Crop, With and Without Information, Fluctuating Supply-Demand Scenario

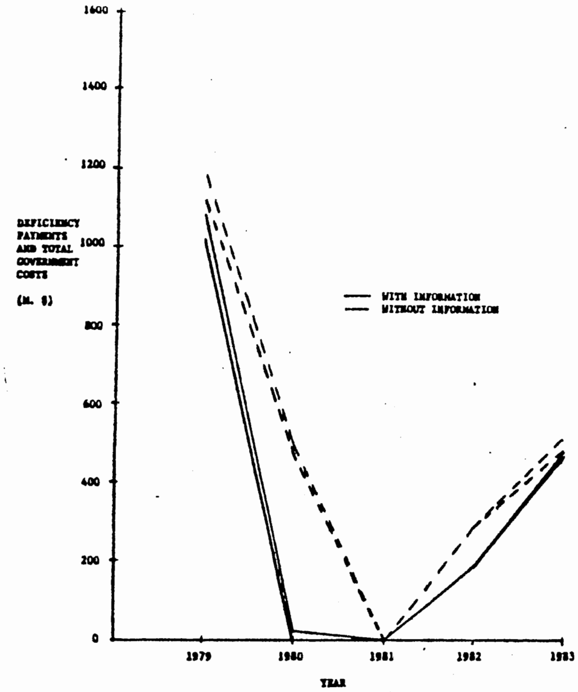
with and without information was statistically significant (Table LVI, Appendix A). The prices for wheat, corn and cotton are less variable with information. The soybean price is more variable due to more variable ending stock levels.

The five year average deficiency payments for wheat and cotton were significantly different from the no information result (Table XLI, Appendix A). Figure 33 shows the levels of both the deficiency payments and the total government costs. Both deficiency payments and government costs were zero for wheat in 1981 and for corn in 1980 and 1981. Cotton deficiency payments were near zero in 1981.

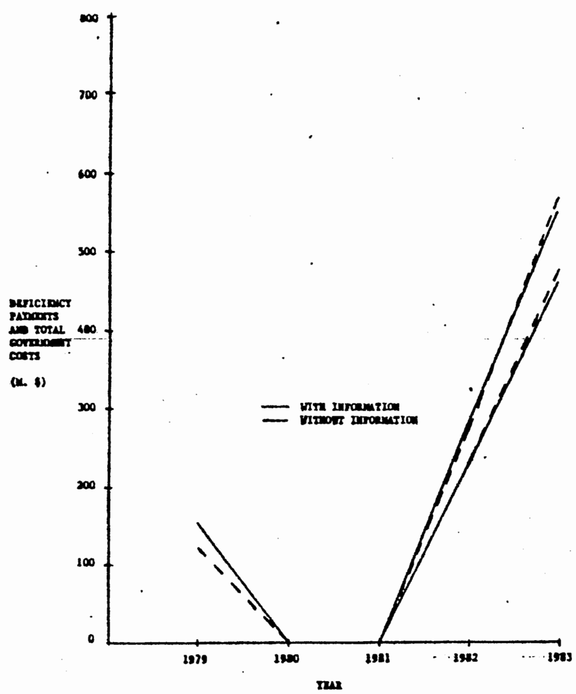
The average net farm income with information over the five years was \$33.4 billion compared to \$33.6 billion without information, not a significant difference (Table XLI, Appendix A). The individual years differences between the information and no information results were significant except 1979. The net farm income is less variable with information than without information (Table XVII).

Table XXII shows the consumer surpluses for the four crops as deviations from the original POLYSIM baseline levels. The individual year and five year average difference between the information result and no information result for the four crops and the seven crop total were significant at least at the 10 percent level except the 1982 corn consumer surplus (Table XXIII).

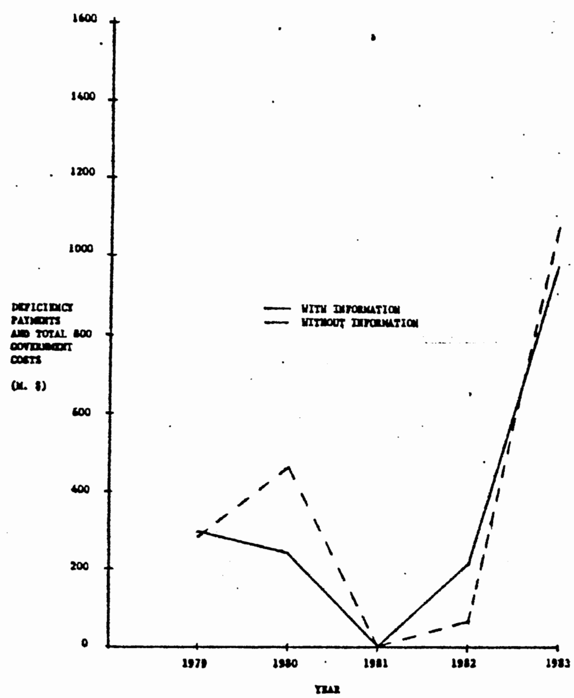
The consumer surplus value for wheat, with information, was above the no information result in each year except 1979 and 1980, with the largest difference occurring in 1981 when both the domestic demand (Figure 29) and price (Figure 32) were most different from the no



WHEAT



CORN



COTTON

Figure 33. Comparison of Deficiency Payments and Total Government Costs, by Crop, With and Without Information, Fluctuating Supply-Demand Scenario

TABLE XXII

COMPARISON OF CONSUMER, PRODUCER, AND NET DOMESTIC SURPLUSES FOR THE WITH AND WITHOUT INFORMATION ASSUMPTIONS, RELATIVE TO THE POLYSIM BASELINE LEVEL, BY CROP AND YEAR, WITH THE FIVE YEAR AVERAGE, HIGH ACCURACY, HIGH CURRENT YEAR PRICE WEIGHT, FLUCTUATING SUPPLY-DEMAND SCENARIO

Crop	Information Level	Surplus	1979	1980	1981	1982	1983	Five Year Average
WHEAT:	WITH	Consumer	237.61	16.40	-683.00	-303.10	300.83	-86.25
		Producer	-885.85	-496.11	1488.39	-266.93	-1685.79	-369.26
		Net Domestic	-648.24	-479.70	805.39	-570.03	-1384.96	-455.51
	WITHOUT	Consumer	290.22	129.50	-1650.90	-719.71	52.70	-379.64
		Producer	-993.71	-1243.53	3588.84	-473.09	-1624.90	-149.28
		Net Domestic	-703.49	-1114.03	1937.94	-1192.80	-1572.2	-528.92
SOYBEANS:	WITH	Consumer	727.32	-1008.44	-2622.53	29.92	1104.83	-353.78
		Producer	-1460.62	1456.71	3641.68	-2033.63	-2448.48	-168.87
		Net Domestic	-733.29	448.27	1019.15	-2003.70	-1343.65	-522.64
	WITHOUT	Consumer	822.58	-2441.64	-2183.44	225.62	1053.78	-504.62
		Producer	-1495.65	2670.27	2167.66	-1896.29	-2319.87	-174.78
		Net Domestic	-673.06	228.63	-15.77	-1670.67	-1266.09	-679.39
CORN:	WITH	Consumer	1019.53	-116.33	-2987.69	-853.14	1424.54	-302.62
		Producer	-1349.16	-1032.54	3862.46	-1444.20	-2299.34	-452.56
		Net Domestic	-329.63	-1148.87	874.77	-2297.35	-874.80	-755.18
	WITHOUT	Consumer	1093.37	320.21	-3039.99	-860.85	1454.10	-206.63
		Producer	-1498.88	-764.53	4021.00	-1433.59	-2269.56	-389.11
		Net Domestic	-405.50	-444.32	981.01	-2294.44	-815.46	-595.74
COTTON:	WITH	Consumer	48.83	-196.40	-427.81	181.96	401.28	1.57
		Producer	-55.32	223.27	627.00	-547.21	-572.02	-64.86
		Net Domestic	-6.49	26.87	199.18	-365.25	-170.74	-63.29
	WITHOUT	Consumer	45.36	-111.49	-535.33	71.26	403.13	-25.41
		Producer	-6.70	26.54	730.50	-321.74	-662.88	-46.86
		Net Domestic	38.65	-84.95	195.18	-250.48	-259.75	-72.27

TABLE XXIII

RESULTS OF STATISTICAL TEST FOR EQUAL MEANS, INFORMATION VERSUS NO INFORMATION ASSUMPTIONS, FLUCTUATING SUPPLY-DEMAND SCENARIO

	1979	1980	1981	1982	1983	5 Year Average
CONSUMER SURPLUS						
Wheat	-122.96	-48.93	100.29	43.27	48.47	13.86
Soybeans	-40.77	142.57	-29.06	-22.45	12.67	2.89
Corn	-57.04	-59.30	4.89	1.15	-8.68	-1.64
Cotton	21.73	-147.39	51.04	36.71	-1.60	2.48
7 Crops	-67.52	61.99	53.42	32.77	40.23	2.78
PRODUCER SURPLUS						
Wheat	154.75	550.18	-161.20	46.74	-33.61	-3.91
Soybeans	5.42	-86.60	103.89	-18.66	-22.12	0.07
Corn	59.87	-51.84	-26.54	-4.23	-15.05	-0.78
Cotton	-199.08	255.10	-27.87	-33.00	37.27	-1.07
7 Crops	29.49	-41.20	-83.85	-13.50	-25.70	-1.34
NET DOMESTIC SURPLUS						
Wheat	147.31	502.88	-200.57	83.67	39.03	1.96
Soybeans	-14.27	40.01	148.06	-24.06	-16.57	4.54
Corn	61.07	-170.01	-20.12	-0.33	-13.19	-4.18
Cotton	-357.00	312.18	2.34	-26.71	39.52	1.33
7 Crops	5.72	26.40	-18.35	17.06	18.63	0.68

A t-statistic of ± 1.28 is significant at a 20 percent level, ± 1.64 is significant at a 10 percent level, and ± 1.96 is significant at a 5 percent level.

information result. Soybean consumer surplus follows the same pattern as the domestic demand and price curves. Consumer surplus for soybeans was above the no information result only in 1981 and 1983. Corn and cotton appear quite similar to the inverted price curves. Consumer surplus for corn was below the no information result in 1979, 1980 and 1983. For cotton the with information result was below the no information result in 1980 and 1983.

Producer surplus, on the other hand, looks like the price curve with modifications due to the level of production. Each of the individual year differences between the with and without information results were highly significant for the four crops (Table XXIII). The five year average differences for corn, cotton and soybeans were not significant.

The producer surplus for wheat was below that for the no information result in 1981 and 1983 (Table XXII). Soybean producer surplus was above in 1981. For corn, only the 1979 producer surplus was higher. In 1980 and 1983 the cotton producer surplus was higher.

Net domestic surplus, relative to the original POLYSIM baseline level, is shown in Table XXII for the four crops. All points for the four crops, with information, were significantly different from the without information result except 1982 corn and the five year average for the seven crop total (Table XXIII). As before, a positive value can be attributed to the information whenever the with information surplus is above the without information surplus, regardless of its location relative to the 0.0 level. Wheat domestic surplus was higher in each year except 1981 plus the five year average was higher. For soybeans, the 1979, 1982, and 1983 domestic surplus levels were lower than the no information result. The five year average was higher. The corn surplus was higher in 1979 only. Cotton was higher in 1980, 1981 and 1983 plus the five year average was higher.

CHAPTER VI

ANALYSIS OF THE VALUE OF INFORMATION

The previous chapter presented the results of the various stochastic simulations. In this chapter the consumer, producer, and net domestic surpluses will be evaluated to determine the value of information under the various accuracy levels, timeliness assumptions, surplus weights, and supply-demand scenarios. The results will be evaluated for the three accuracy levels under the high current year price weight (more timely) followed by the two accuracy levels under the low current year price weight (less timely). The two current year price weights will be evaluated for the two accuracy levels. Then, the two surplus weights will be evaluated for the high accuracy level. Finally, the three alternative supply-demand scenario results will be evaluated.

Accuracy Level

More Timely

Comparison of the value of information for the three accuracy levels, under the more timely information assumption (high current year price weight), is made in Table XXIV.

Each of the three consumer surpluses are distinctly different. The five year average consumer surplus for the seven crops for the high accuracy level was $145.37 million per year above the no

TABLE XXIV

VALUE OF INFORMATION ESTIMATES, RELATIVE TO THE CURRENT INFORMATION SYSTEM, FOR DOMESTIC CONSUMERS, PRODUCERS, AND TOTAL BY TIMELINESS LEVEL AND ACCURACY LEVEL OF THE CROP EXPORT FORECAST

	1979	1980	1981	1982	1983	FIVE YEAR AVERAGE
			(Million Dollars)			
MORE TIMELY:						
High Accuracy - Small Surplus						
Domestic Consumer	36.03	166.06	244.88	61.96	122.99	126.38
Producer	-15.58	-4.05	-98.06	32.28	-88.50	-34.78
Total	20.44	162.00	146.82	94.23	34.49	91.60
High Accuracy - Large Surplus						
Domestic Consumer	70.32	186.90	232.14	80.43	175.07	145.37
Producer	-21.01	-5.00	-81.63	32.18	-96.61	-34.41
Total	49.31	181.90	150.51	112.61	60.46	110.96
Middle Accuracy						
Domestic Consumer	9.25	132.97	142.51	-16.39	66.55	66.98
Producer	-3.54	-45.72	-97.89	16.44	-92.14	-44.57
Total	5.70	87.25	44.62	0.06	-25.59	22.41
Low Accuracy						
Domestic Consumer	-168.58	-48.36	-105.49	-305.71	-200.10	-165.65
Producer	55.03	-93.42	-104.49	66.88	-64.73	-28.14
Total	-113.54	-141.78	-209.98	-238.83	-264.83	-193.79
LESS TIMELY:						
High Accuracy						
Domestic Consumer	73.06	116.34	98.07	74.77	137.35	99.92
Producer	-19.18	-43.01	-13.18	18.42	-44.38	-20.27
Total	53.88	73.32	84.88	93.19	92.97	79.65
Middle Accuracy						
Domestic Consumer	9.09	70.18	18.99	25.74	89.54	42.71
Producer	4.26	-55.70	12.46	30.83	-30.76	-7.78
Total	13.36	14.48	31.45	56.57	58.78	34.93

information level. The four crops accounted for over 92 percent of the seven crop total at the high accuracy level. The three remaining crops increased the level in each year. The average for the middle accuracy level was $66.98 million per year above the no information level. Each year except 1980 plus the five year average was significantly different (Table XXV). The four crops account for 87 percent of the seven crop total on the average. In each year, the three remaining crops had a positive influence on the outcome by increasing the consumer surplus.

The five year average for the low accuracy level was $165.65 million per year below the no information level. Thus, with an accuracy level of plus or minus 50 percent in 99 of 100 years, consumers on the average were worse off, by $165.65 million per year, than consumers were with the current information system. The difference from the high accuracy result was highly significant. Again, the individual years were significantly different from the high accuracy levels (Table XXV).

The four crops account for over 100 percent (100.4 percent to 103.8 percent) of the seven crop total at the low accuracy level for each year. This indicated that the three other crops offset the four crop result. Each consumer surplus level was negative, but the addition of the three crops resulted in a less negative number.

The five year average value of information resulting from the producer sector was $34.41 million per year below the no information level for the high accuracy level, $44.57 million per year below for the middle accuracy level, and $28.14 million per year below for the

TABLE XXV

RESULTS OF STATISTICAL TEST FOR EQUAL MEANS, VALUE OF INFORMATION, SEVEN CROP TOTALS, ALTERNATIVE ACCURACY LEVELS, PRICE WEIGHTS AND SURPLUS WEIGHTS

	1979	1980	1981	1982	1983	5 Year Average
HIGH PRICE WEIGHT						
Middle Versus High Accuracy						
Consumer Surplus	-3.44	-1.06	-1.76	-2.00	-1.83	-3.85
Producer Surplus	0.72	-0.62	-0.25	-0.20	0.06	-0.36
Net Domestic Surplus	-1.95	-2.42	-1.96	-1.95	-1.67	-4.23
Low Versus High Accuracy						
Consumer Surplus	-8.99	-4.33	-5.83	-7.07	-6.37	-13.48
Producer Surplus	2.65	-1.29	-0.33	0.41	0.41	0.20
Net Domestic Surplus	-6.36	-7.30	-6.19	-5.71	-5.89	-13.39
LOW PRICE WEIGHT						
Middle Versus High Accuracy						
Consumer Surplus	-2.99	-1.43	-2.30	-1.55	-1.60	-4.23
Producer Surplus	1.42	-0.38	0.75	0.31	0.36	0.84
Net Domestic Surplus	-2.79	-2.27	-1.55	-1.16	-1.14	-3.55
HIGH ACCURACY						
Low Versus High Price Weight						
Consumer Surplus	0.17	-1.71	-3.30	-0.15	-0.51	-2.78
Producer Surplus	0.10	-0.74	1.34	-0.23	0.97	0.64
Net Domestic Surplus	0.26	-3.38	-1.49	-0.44	0.79	-1.87
MIDDLE ACCURACY						
Low Versus High Price Weight						
Consumer Surplus	-0.01	-1.44	-2.69	0.98	0.54	-1.33
Producer Surplus	0.03	-0.19	2.06	0.22	1.03	1.55
Net Domestic Surplus	0.39	-2.13	-0.28	1.17	1.95	0.70
HIGH ACCURACY - HIGH PRICE WEIGHT						
Small Versus Large Surplus Weight						
Consumer Surplus	-2.33	-0.41	0.27	-0.42	-0.73	-0.99
Producer Surplus	0.21	0.01	-0.25	0.00	0.11	-0.02
Net Domestic Surplus	-1.44	-0.55	-0.07	-0.34	-0.52	-0.98

low accuracy level. This indicated that the information situation was less valuable to producers than the no information situation. The four crops accounted for 110.5 percent of high accuracy result, 113.0 percent of middle accuracy result, and 139.2 percent of the low accuracy result. This again indicated that the three remaining crops had a positive influence on the value of information.

The five year averages for the middle and low accuracy levels were not significantly different from the high accuracy five year average (Table XXV). Only the 1979 and 1980 results for the low accuracy level were significantly different, at the 20 percent level in 1980 and the 1 percent level for 1979. None of the middle accuracy level results were significantly different from the high accuracy result.

Combining the value of the information to the consumer with the value to the producer resulted in the value of the information to the U.S. economy. The five year average value was $110.96 million per year for the high accuracy level, $22.41 million per year for the middle accuracy level, and $193.79 million per year below the no information level for the low accuracy. Each year plus the five year average difference between the high accuracy level and the middle and low accuracy levels were significant at least at the 10 percent level of significance (Table XXV).

<u>Less Timely</u>

Table XXIV also allows the comparison of the value of information results obtained for the high and middle accuracy levels with the low current year price weight (less timely) assumption. The five year average value of information to consumers was $99.92 million per year with the high accuracy level and $42.71 million per year with the middle accuracy level. The difference was statistically significant as were the differences for each of the five years individually (Table XXV). The four crops accounted for 84 to 98 percent of the seven crop totals shown. As occurred before, the three crops remaining had a positive effect on the total.

The value of information to producers averaged over the five years simulated was $20.27 million per year below the no information level for the high accuracy level and $7.78 million per year below for the middle accuracy level. The five year averages were not significantly different with only the 1979 difference significant. The four crops accounted for from 74 to 131 percent of the seven crop total. In 1979, the three remaining crops increased the negative value from $16.48 million to $19.18 million. In all other years, the three crops helped reduce the negative values or increase the positive values.

The value of information to the U.S. economy from the high accuracy level resulted in an average $79.65 million per year over the five years simulated. This compares to $34.93 million under the middle accuracy level assumption. The difference was significant at under the 1 percent level. Only 1982 and 1983 were not significantly different. The four crops accounted for from 84 to 97 percent of the seven crop total shown. The three crops had a positive effect on the totals.

Timeliness

High Accuracy

The effect of timeliness of the information was evaluated using the two current year price weights, 0.90 versus 0.25. The higher weight was indicative of more producer response due to more time with which to study the information and to make the production decision according to the forecast and price expectations. In Table XXIV, the value of information results for consumers, producers, and the U.S. (net domestic) are presented, assuming the high level of accuracy.

The five year average value of information to consumers was \$145.37 million per year with the more timely information versus \$99.92 million per year with the less timely information. The difference was statistically significant at the 1 percent level (Table XXV). The 1980 and 1981 differences were also significantly different. The four crops accounted for from 81 to 98 percent of the seven crop total shown. In every year the three crops remaining had a positive influence on the total.

The value of the information to producers for the more timely information was \$34.41 million per year below the no information level averaged over the five years simulated. The less timely information average was \$20.27 million per year below. The difference did not prove to be statistically significant. Only the 1981 difference was significant at the 20 percent level. The four crops accounted for nearly 110 percent of the seven crop total with the 10 percent reduction (absolute increase) due to the three remaining crops.

The value of the more timely information to the U.S. was $110.96 million per year, averaged over the five years, compared to $79.65 million per year for the less timely information. The difference was statistically significant at under the 10 percent level. The 1980 and 1981 differences were also significant at the 20 percent level. The four crops accounted for nearly 88 percent of the seven crop total.

Middle Accuracy

Under the assumption of the middle level of accuracy (75/99), the results of the two timeliness criteria are shown in Table XXIV. The five year average value of information to consumers was $66.98 million per year for the more timely information, compared to $42.71 million per year for the less timely information. The difference was statistically significant at the 20 percent level (Table XXV). The difference between the more and the less timely information results was statistically significant in 1980 and 1981 also. Nearly 85 percent of the seven crop total was accounted for by the four crops.

The value of the more timely information relative to the no information result for producers was $44.57 million per year below, compared to $7.78 million per year below for the less timely information, a statistically significant difference. The 1981 difference was significant also. The four crops accounted for from 113 to 128 percent of the seven crop total. This indicated that the three crops remaining had a positive effect by reducing the negative value to producers.

The value of the information to the U.S. was larger with the less timely information, $22.41 million per year for the more timely information versus $34.93 million per year for the less timely information. This indicated a trade-off between accuracy and timeliness. The difference was not statistically significant, however. The 1980 and 1983 differences were significant at the 5 percent level. The four crops accounted for only 34.4 percent of the seven crop total with the more timely information and 74.9 percent of the seven crop total with the less timely information.

Preliminary Surplus Weighting

Table XXIV shows the results when the surplus weight for the preliminary export forecast under the high accuracy, more timely information assumption was reduced from 0.10 and 0.20 to 0.05 and 0.10.

The five year average value of information to consumers changed from $145.37 million per year to $126.38 million per year, not a statistically significant difference. Only the 1979 difference was significant (Table XXV). The four crops accounted for nearly 93 percent of the seven crop total.

The five year average value of information to producers was $34.41 million per year below the no information level with the larger surplus weight. This compares to $34.78 million per year below with the smaller weight, again, not a significant difference. None of the differences were significant. The four crops accounted for over 110 percent of the seven crop total. The three crops remaining reduced the negative value.

The value of information to the U.S. economy was $110.96 million per year with the large surplus weight and $91.6 million per year with the small surplus weight. Only the 1979 difference was signficant at the 20 percent level. The four crops accounted for over 87 percent of the seven crop total.

Alternative Supply-Demand Scenarios

Table XXVI shows the value of information accruing to consumers, producers, and the U.S. economy, in general, (net domestic) under the three alternative supply-demand scenarios.

The value of information to the consumer was statistically different in all five years between the three scenarios (Table XXVII). The five year averages were $49.75 million above the no information value for the excess supply scenario, $373.11 million above for the fluctuating supply scenario, and $740.90 million above for the tight supply scenario. (Tables XXXVII, XXXIX, and XLI, Appendix A).

In 1979, for both the excess and fluctuating supply demand scenarios, the value of the satellite-based information was negative to consumers. In each of the other years and for all five years of the tight supply scenario the information had a positive value to consumers. The negative value to the consumer results from higher prices for wheat and soybeans when information is available for the excess supply scenario. This is due to smaller production levels. For the fluctuating scenario, corn also contributes to this negative value to consumers.

The value of information to producers, averaged over the five years, under the tight supply situation was $228.09 million below the

TABLE XXVI

VALUE OF INFORMATION ESTIMATES, RELATIVE TO THE CURRENT INFORMATION SYSTEM, FOR DOMESTIC CONSUMERS, PRODUCERS, AND TOTAL FOR THREE SUPPLY-DEMAND SCENARIOS

	1979	1980	1981	1982	1983	FIVE YEAR AVERAGE
			(Million Dollars)			
EXCESS SUPPLY:						
Domestic Consumer	-73.81	33.40	69.87	31.61	187.67	49.75
Producer	-29.83	7.72	-101.63	-345.74	-348.73	-163.64
Total	-103.64	41.12	-31.76	-314.13	-161.06	-113.89
FLUCTUATING SUPPLY:						
Domestic Consumer	-215.59	794.32	670.26	331.86	284.69	373.11
Producer	245.76	-550.59	-889.96	-145.72	-160.05	-300.11
Total	30.17	243.73	-219.70	186.14	124.64	72.99
TIGHT SUPPLY:						
Domestic Consumer	448.03	179.11	580.94	2187.47	308.94	740.90
Producer	9.21	401.17	-1200.21	-2617.36	2266.72	-228.09
Total	457.24	580.28	-619.27	-429.89	2575.67	512.80

TABLE XXVII

RESULTS OF STATISTICAL TEST FOR EQUAL MEANS, VALUE OF INFORMATIONS, SEVEN CROP TOTAL, THREE SUPPLY-DEMAND SCENARIOS

	1979	1980	1981	1982	1983	5 Year Average
EXCESS VERSUS TIGHT SUPPLY						
Consumer Surplus	-76.61	-13.07	-59.16	-101.85	-3.31	-32.69
Producer Surplus	-3.08	-20.37	52.86	47.89	-65.30	1.45
Net Domestic Surplus	-81.47	-46.88	29.24	3.84	-145.16	-20.42
FLUCTUATING VERSUS TIGHT SUPPLY						
Consumer Surplus	-91.81	36.84	6.24	-81.22	-0.65	-15.81
Producer Surplus	16.31	-41.99	14.66	51.79	-60.68	-1.58
Net Domestic Surplus	-51.64	-24.01	17.59	19.47	-125.73	-14.18
EXCESS VERSUS FLUCTUATING SUPPLY						
Consumer Surplus	37.21	-57.71	-44.15	-26.66	-11.74	-30.78
Producer Surplus	-29.27	37.95	54.87	-14.24	-20.83	11.23
Net Domestic Surplus	-22.93	-19.78	14.44	-41.38	-36.10	-26.97

A t-statistic of $\pm$ 1.28 is significant at a 20 percent level, $\pm$ 1.64 is significant at a 10 percent level, and $\pm$ 1.96 is significant at a 5 percent level.

no information level, compared to $300.11 million below for the fluctuating supply-demand situation and $163.64 million below for the excess supply scenario. The five year averages and the individual years were all significantly different for each scenario (Table XXVII).

For the excess supply scenario producer value is positive only in 1980 due to positive values to soybean and cotton producers. This is due to the higher product price. For the fluctuating scenario, only the producer value in 1979 is positive. Again, product price for wheat, corn and soybeans is the reason. With the tight supply scenario, positive values of information to producers occurred, in three of the five years simulated. In 1979, 1980, and 1983 both consumers and producers received a positive value from the improved information.

The net result of the consumer and producer value of information was that over the five years the value of information to the U.S. economy was $512.80 million per year above the no information level under the tight supply-demand scenario. This compared to $72.99 million per year above the no information result for the fluctuating supply scenario and $113.89 million per year below for the excess supply scenario. Again, all points were significantly different (Table XXVII).

For the excess supply scenario, the value of information to consumers and producers combined was negative in all years except 1980 when both consumers and producers received a positive value from the information. In 1979, both consumers and producers received less from the information than the level attained without the information. In the other three years the negative value to producers outweighed the positive value to consumers, resulting in a negative value when combined.

For the fluctuating supply scenario, the value of information to consumers and producers combined is positive in every year except 1981. In 1981 the negative value to producers was greater than the positive value to consumers. In all other years the positive value was always greater than the negative value. For the tight supply scenario, both consumers and producers received a positive value from the information in 1979, 1980, and 1983. In 1981 and 1982, the negative value to producers outweighed the positive value to consumers. Higher wheat prices without information results in large negative values of information to wheat producers in these two years.

CHAPTER VII

FURTHER ANALYSIS WITH THE MODEL

This chapter presents the results of some "what if" types of situations. The model was run for one iteration only in each case. The first section of this chapter analyzes the results obtained at four different accuracy levels for the high current year price weight and large surplus weight. The second section compares the results obtained under various types of satellite forecasting capabilities (i.e., all crops, wheat only, wheat and corn only) with an assumed level of a future USDA forecasting ability.

Accuracy Levels

Four different accuracy levels were assumed with one iteration of the model using random yields and preliminary and final exports. For the four simulations only the preliminary export value changes based on the alternative forecast accuracy level used. The results represent the correct relationship between the simulation results although the exact level does not coincide with the level expected from a 300 iteration simulation. It is valid to compare these results for differences in results due to accuracy level assumptions as long as the relative levels are kept in mind. The same three accuracy levels (90/99, 75/99, and 50/99) were evaluated plus a higher accuracy level of plus or minus 5 percent in 99 out of 100 years (95/99). Table XVIII presents the value of information to consumers, producers, and the U.S. (net domestic) for the five years for the four simulations with a five year average.

The average value of information at the highest accuracy level (95/99) is $16.77 million per year, compared $6.82 million per year below the no information level for the 90/99 accuracy level, $246.81 million per year below for the 75/99 accuracy level, and $667.06 million per year below for the 50/99 accuracy level. By comparison to the stochastic results obtained earlier, the 90/99 accuracy level was $110.96 million per year above the no information result, the 75/99 accuracy level was $22.41 million per year above, and the 50/99 accuracy level was $193.79 million per year below.

A simple linear regression for the three stochastic results with their corresponding deterministic result allows the estimation of what the 95/99 accuracy level result may have been using the stochastic simulator. With the deterministic average of $16.77 million per year, the estimated stochastic result would be $131.19 million per year above the no information result.

Figure 34 shows the relationship of value of information per year to the level of accuracy. From Figure 34 some accuracy level near 72.5 percent in 99 out of 100 years would be required for the value of information from the satellite-based information system to be greater than the value of information under the current information systems. The numbers in the chart are not discounted thus some adjustment would need to be made for its use in a cost benefit analysis.

TABLE XXVIII

VALUE OF INFORMATION UNDER FOUR ALTERNATIVE ACCURACY ASSUMPTIONS

Accuracy Level		1979	1980	1981	1982	1983	5 Year Average
95/99	Consumer	149.83	644.63	2080.04	807.08	1762.27	1088.77
	Producer	-176.89	367.94	-4217.83	1360.12	-2693.31	-1072.00
	U.S.	- 27.06	1012.57	-2137.79	2167.20	- 931.04	16.77
90/99	Consumer	167.98	654.43	2071.30	756.30	1699.76	1069.95
	Producer	-210.31	285.75	-4175.31	1367.31	-2651.29	-1076.77
	U.S.	- 42.33	940.18	-2104.01	2123.61	- 951.53	- 6.82
75/99	Consumer	189.86	670.72	1432.02	1318.91	1740.41	1070.38
	Producer	-273.61	35.33	-2704.16	-1566.48	-2077.04	-1317.19
	U.S.	- 83.75	706.05	-1272.14	- 247.57	- 336.67	- 246.81
50/99	Consumer	199.86	608.29	1422.39	858.28	1645.94	946.95
	Producer	-339.13	-236.21	-2924.27	-1914.84	-2655.61	-1614.01
	U.S.	-139.27	372.08	-1501.88	-1056.56	-1009.67	- 667.06

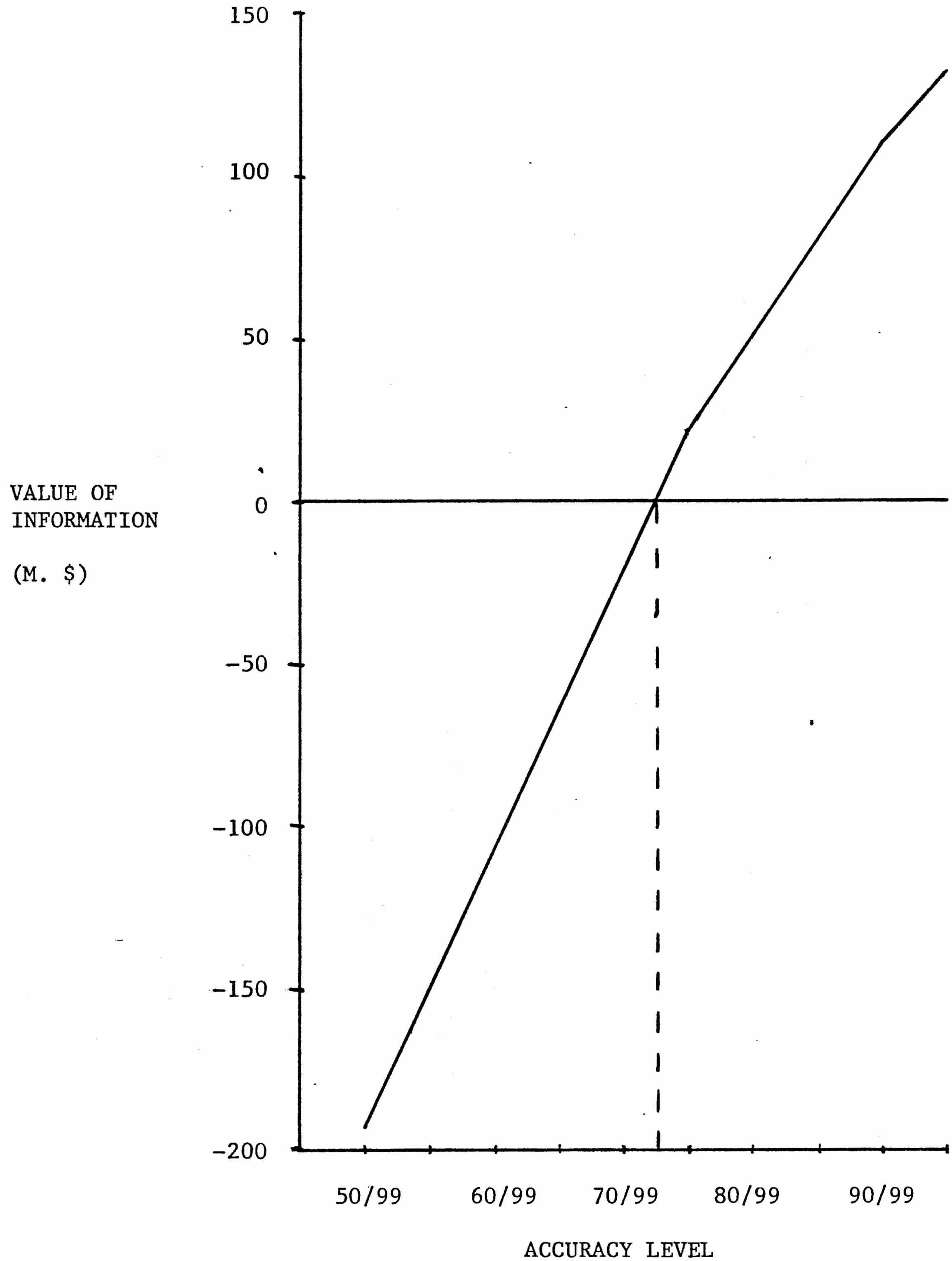


Figure 34. Comparison of the Value of Information for Alternative Accuracy Levels

Types of Information Coverage

The three alternative supply demand scenarios were used along with alternative assumptions regarding future USDA forecasting error levels and associated satellite information forecasting error levels. The first USDA forecast of crop exports for the seven crops was compared to the final export for each crop to determine the error associated with the first forecast. This was done for the years 1975 through 1979. The level of forecast errors were then applied, in reverse order, to the POLYSIM baseline exports to get the assumed USDA forecast errors for the years 1979 through 1983.

A simple "rule of thumb" schedule was devised to associate a forecast error under the satellite information system to a forecast error under the assumed USDA system. The procedure was two step. First, the sign of the error by the USDA forecast was assumed. Second, an error level for the satellite-based information was associated with an error level for the USDA system as shown below:

If the USDA error is:	Then the satellite error is:
0 - 5 %	5%
5 - 10%	6%
10 - 15%	8%
15%	10%

Thus for a given USDA forecast error, the corresponding satellite information system forecast error was determined. This preliminary export forecast error was used in the simulation model along with the predetermined final export values.

Three types of information coverage were assumed: 1) all seven crops were included in the satellite-base information system, 2) only wheat and corn were included in the satellite information system, and 3) only wheat included in the satellite based system.

For each of the three supply-demand scenarios, the value of the information from the satellite-based information system was higher when all seven crops were included (Table XXIX). When only the wheat and corn forecasting was included, the value of the information was at least 75 percent of the seven crop value. The value of information when only wheat forecasts were included ranged from \$3.84 million per year below the no information level for the excess supply situation to \$552.40 million per year above for the tight supply situation. The tight supply result with only wheat forecasting represents over 80 percent of the seven crop forecasting result. For the fluctuating supply situation, the wheat only system's value was near 45 percent of the seven crop system's value.

The value of information results were obtained from only one iteration of the simulation model and, as such, the results do not show the same relationship between the three supply-demand scenarios that was exhibited by the stochastic simulation of 300 iterations. The relationship of the results within each scenario (e.g., all crops versus wheat and corn versus wheat) was the expected relationship (all crops should be most valuable, followed by the wheat and corn value, and the wheat only value).

TABLE XXIX

VALUE OF INFORMATION UNDER ALTERNATIVE TYPES OF SATELLITE-BASED INFORMATION

	1979	1980	1981	1982	1983	5 Year Average
			(MILLION DOLLARS)			
EXCESS SUPPLY						
All Crops	8.43	11.37	- 5.91	90.60	129.78	46.85
Wheat and Corn	13.73	64.73	-36.36	88.11	46.34	35.31
Wheat	0.90	1.44	- 6.78	- 1.47	-13.31	- 3.84
TIGHT SUPPLY						
All Crops	463.26	-872.94	493.04	926.04	2432.99	688.48
Wheat and Corn	388.49	-681.72	322.44	871.22	2136.05	607.30
Wheat	47.40	- 97.05	-10.23	878.49	1943.37	552.40
FLUCTUATING SUPPLY						
All Crops	-162.76	- 89.52	185.87	96.28	108.59	27.67
Wheat and Corn	7.03	10.50	-72.22	217.60	-32.52	26.08
Wheat	- 2.99	12.04	-84.08	116.71	20.38	12.41

CHAPTER VIII

SUMMARY, CONCLUSIONS, AND RECOMMENDED USES

Summary

Even before the launch of the first Earth Resources Technology Satellite (ERTS), now called Landsat, in 1972, questions had been asked regarding the benefits to be obtained by using satellite data. Research projects, such as the Large Area Crop Inventory Experiment (LACIE), have developed some analytical tools capable of being used for crop condition assessment and early warning of crop production potentials. With the incorporation of these tools into an operational role within the U.S. Department of Agriculture, the value of the information provided by a satellite-based information system, again, has become important.

The apparent advantages of a satellite-based system are through improved accuracy and improved timeliness. Both advantages allow producers and consumers to make decisions earlier in the production and consumption cycles with less fear of the forecast information resulting in an incorrect decision. Government policymakers will be able to use the more current, more accurate information in their decisions.

Several studies have been conducted in order to estimate the value of information provided by a satellite-based system. Each study has had some shortcoming in terms of model specifications, implementation errors, lack of real world applicability, etc. This study has taken a simulation model of the U.S. agricultural economy and added sections to measure the value of the information in terms of consumer and producer surpluses.

The approach taken was to evaluate the consumer and producer surpluses resulting from varying levels of U.S. exports and the preliminary export forecast using a satellite-based information system. Various accuracy and timeliness levels of the preliminary export forecast were simulated. In addition, increasing, decreasing, and fluctuating commodity supply-demand levels were evaluated.

Although the discussion refers to a satellite-based information system no satellite data is used in the anlaysis. The link to the satellite-based information system is through various assumptions regarding information accuracy and timeliness. Alternative assumptions can relate the results to any improved information regardless of the source.

Conclusions

On the basis of the results of this study the conclusion was that the satellite-based information, under the assumptions underlying the model, has a positive value when the new system was of a higher accuracy level than the current information system. Both more accurate and more timely information showed more value than less accurate and less timely information. More timely information proved less valuable as the accuracy level decreased.

Under alternative supply-demand scenarios, the value of the satellite-based information was significantly higher for the continually tightening supply situation (commodity shortage). The fluctuating supply scenario also proved to receive a positive value from the satellite information. The nondiscounted average value of information under the tight supply situation is $512.80 million per year greater than the current information system, compared to nearly $73 million per year for the fluctuating supply scenario. For the excess supply scenario, the no information value was greater than the with information result.

With less than a seven crop information system, a wheat and corn information system resulted in more than 75 percent of the value of the full seven crop system under all three supply-demand scenarios. Also, a wheat only system proved to account for one quarter of the value of a full seven crop system.

Other conclusions are:

1) Production, consumption, and prices tended to be stabilized. Generally, the increases and decreases were at a more moderate rate and reached lower highs and higher lows.

2) Farm prices were lower on the average.

3) Livestock production tended to be larger although not statistically significant.

4) Net farm incomes were slightly different. Again, the difference was not statistically significant.

5) Farmer reserve levels were higher.

6) Deficiency payments were somewhat higher on the average due to the generally lower price levels.

Limitations

The most severe limitation of this study is the exact relationship of the satellite-based information accuracy (with regard to foreign crop production) and the level of the U.S. export forecast accuracy. Is a satellite system accuracy of ±5 percent required just to reach an export forecast accuracy of ±25 percent? Or can a ±10 percent export forecast accuracy be attained with a ±10 percent satellite-based production accuracy level?

A second limitation of the study may be the annual timeframe of some decisions and processes. From the consumption viewpoint, a monthly timeframe may be more appropriate with regard to purchase, storage, and marketing decisions. For crop production, an annual timeframe may be sufficient since little can be done ,short of destroying planted fields to reduce output once the crop is planted. Output increases are similarly difficult to achieve once the crop is planted. Producer marketing decisions may be better modeled on a monthly level.

The assumption of linear supply and demand curves also prove to be a limitation of this study. Under the alternative assumption of non-linear curves, the values of consumer and producer surpluses will change by an amount directly related to the amount of the curve. With small changes away from the equilibrium level, the assumption of linear curves should not be significant. The assumption of parallel shifts in the curves should be recognized also. Anything less than a parallel shift would tend to decrease the surpluses and, therefore, the value of the information. Again, with small shifts around the equilibrium, this assumption should not prove significant.

With reference to the work of Bullock (7), any errors in actions taken, relative to the stock holdings, from the availability of satellite-based information may alter the results of this study somewhat. This study is more dynamic than that of Bullock or Hayami and Peterson thus the implications of their two period models are not readily apparent over the longer term. What is the value or cost in five years of stock actions taken this year?

Affects on the livestock sector of the changes in crop production, prices, etc., are not evaluated in this study. Inclusion of these surpluses would affect the results. From the lower price and high production levels, one would expect the livestock producers to expand production. The expanded production would lower prices. The expanded production and lower price would result in a positive surplus to consumers. The change in surplus to livestock producers is unknown. Lower prices should mean lower surpluses, but production increases and lower feed costs may offset the lower surplus resulting in an overall gain to livestock producers also.

A second need of the model, in order to use the results directly in a cost/benefit analysis, would be to add a discounting mechanism to obtain an estimate of the present value of these anticipated future values of information. Again, this would appear to be a minor modification to the model.

Recommended Uses

By comparison to previous value of information studies by ECON, Inc. and Earthsat, this study uses a more relastic model of the U.S. agricultural economy applied under alternative accuracy level, timeliness, and supply-demand scenarios. Producers use the futures price, generated by using the POLYSIM model and the preliminary export forecast, to temper their production decisions. Consumers and producers are allowed to use the futures price as the basis for a small portion of their sales and purchases of the grains.

The ECON, Inc. study using the integrated model estimated the benefits derived from improved estimates of global wheat production to be near $235 million per year. Earlier ECON, Inc. studies placed the value of wheat information at between $108 million per year, and $212 million per year. The Earthsat Corporation study evaluated domestic production forecast improvements and, therefore, is not comparable. The high accuracy level information value is estimated at $111 million per year (nondiscounted) for the seven crops analyzed.

Based on the results presented here an assessment of the value of the satellite-based information system could be made once appropriate discounting procedures are used. Alternative accuracy levels and timeliness criteria could be analyzed relative to the costs of attaining each level of accuracy or timeliness. This could be done under alternative supply-demand assumptions.

If alternative satellite capabilities (specifications) could be tied to some level of accuracy, then an evaluation of benefits of these capabilities could be made and associated with the appropriate cost estimates.

Further Research Needs

The most critical need for further research is to associate various foreign crop production forecasts (errors) by countries or regions and by crops with various U.S. export forecasts (errors). What are the typical relationships among a foreign country's production shortfalls, its imports, and U.S. exports? Such an analysis would provide direct input to any cost/benefit anlaysis of future satellite capabilities as well as information accuracy and timeliness criteria.

Additionally, the questions of who benefits, who loses, and by how much need to be investigated more thoroughly. Future decisions may hinge on which element of society benefits the most, and if they could compensate other elements of society.

Other areas of research involve the effects of forecasts (information) on commodity cash and futures markets, U.S. government policy decisions, livestock production, etc. Analysis of alternative trade restriction policies, world grain reserve policies, long term sales agreements, and other less than free market conditions appear to be fruitfull areas of consideration.

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APPENDIXES

APPENDIX A

RESULTS OF THE STOCHASTIC SIMULATIONS

TABLE XXX

AVERAGES FOR SELECTED VARIABLES FOR THE FIVE YEARS SIMULATED AND THE FIVE YEAR AVERAGE, BY CROP, GENERAL "NO INFORMATION" CASE

VARIABLE [1]	1979	1980	1981	1982	1983	5 YEAR AVERAGE
WHEAT:						
Acres Harvested	66.60	65.45	63.92	63.60	66.25	65.17
Acres Set Aside	10.61	2.72	3.81	2.98	2.53	4.53
Production	2128.29	2120.70	2089.54	2038.99	2117.37	2098.98
Total Supply	3052.29	2963.52	2959.59	2877.54	2858.62	2942.31
Domestic Demand	824.00	796.94	798.34	790.30	789.59	799.83
Ending Inventory	840.82	868.05	836.55	739.26	695.34	796.00
Reserve Actions [3]	14.83	54.02	35.72	47.46	47.59	39.93
Price	3.22	3.42	3.44	3.64	3.65	3.47
Deficiency Payments	356.10	85.95	154.16	67.24	44.36	141.56
Total Government Costs	418.26	135.04	194.87	96.73	63.26	181.63
Consumer Surplus	-7.10	-7.43	-131.02	-258.54	-326.00	-143.18
Producer Surplus	-64.25	-174.02	249.52	379.98	395.44	157.34
Domestic Surplus	-57.14	-181.44	118.51	121.44	69.44	14.16
SOYBEANS:						
Acres Harvested	73.42	68.29	66.73	67.31	66.65	68.48
Acres Set Aside	0.00	0.85	0.78	0.88	0.82	0.67
Production	2120.52	2020.59	2018.40	2081.77	2072.92	2062.84
Total Supply	2270.52	2170.73	2145.80	2209.97	2225.75	2204.55
Domestic Demand	1096.74	1091.13	1087.42	1149.42	1189.03	1122.75
Ending Inventory	150.14	127.40	128.20	152.83	141.77	140.07
Price	6.94	7.37	7.74	7.22	7.32	7.32
Consumer Surplus	-232.61	-418.88	-439.90	-395.89	-451.45	-387.74
Producer Surplus	270.57	208.47	37.35	140.72	286.18	188.66
Domestic Surplus	37.96	-210.41	-402.54	-255.18	-165.27	-199.09

TABLE XXX (Continued)

VARIABLE [1]	1979	1980	1981	1982	1983	5 YEAR AVERAGE
COTTON:						
Acres Harvested	13.16	11.17	11.18	11.14	11.55	11.64
Acres Set Aside	0.00	1.74	2.19	2.27	2.30	1.70
Production	13.22	11.40	11.52	11.69	12.26	12.02
Total Supply	17.42	17.20	16.95	16.69	16.90	17.03
Domestic Demand	6.27	6.36	6.45	6.50	6.59	6.43
Ending Inventory	5.61	5.23	4.80	4.44	4.42	4.90
Reserve Actions [4]	-0.24	-0.06	0.04	0.10	0.04	-0.02
Price	0.54	0.56	0.58	0.63	0.64	0.59
Deficiency Payments	171.10	461.75	392.14	393.89	341.02	351.98
Consumer Surplus	-76.29	-37.86	15.97	16.27	-37.19	-23.82
Producer Surplus	125.07	12.69	-101.06	-76.52	-11.76	-10.32
Domestic Surplus	48.77	-25.17	-85.09	-60.25	-48.96	-34.14
CORN:						
Acres Harvested	69.63	71.65	73.69	74.83	75.07	72.97
Acres Set Aside	2.90	0.54	0.61	0.56	0.82	1.09
Production	7078.65	7149.08	7339.39	7398.52	7356.70	7264.46
Total Supply	8316.65	8194.32	8443.56	8596.58	8617.62	8433.74
Domestic Demand	4772.30	4887.56	4955.86	5032.75	5072.30	4944.15
Ending Inventory	1044.24	1103.16	1197.06	1259.92	1245.44	1169.96
Reserve Actions [3]	6.21	58.26	11.73	19.59	18.80	22.92
Price	2.50	2.61	2.52	2.48	2.52	2.53
Deficiency Payments	0.00	6.49	29.17	36.28	18.02	17.99
Total Government Costs	153.92	140.77	153.02	148.32	125.44	144.29
Consumer Surplus	-98.34	-132.24	-363.31	-322.80	-358.90	-255.12
Producer Surplus	97.24	-61.89	413.54	115.47	197.16	152.30
Domestic Surplus	-1.10	-194.14	50.22	-207.32	-161.75	-102.82

TABLE XXX (Continued)

VARIABLE [1]	1979	1980	1981	1982	1983	5 YEAR AVERAGE
GRAIN SORGHUM:						
Acres Harvested	12.96	14.11	14.61	14.11	14.26	14.01
Acres Set Aside	0.90	0.25	0.62	0.62	0.79	0.64
Production	762.67	787.40	806.50	779.19	785.08	784.17
Total Supply	949.67	925.92	947.61	932.41	934.70	938.06
Domestic Demand	531.07	526.09	533.67	521.23	525.26	527.46
Ending Inventory	138.52	141.11	153.22	149.63	153.04	147.11
Reserve Actions [3]	0.22	8.55	-8.51	-0.23	5.81	1.17
Price	2.34	2.38	2.30	2.33	2.30	2.33
Deficiency Payments	24.93	79.00	106.89	94.48	118.07	84.67
Total Government Costs	50.62	103.88	132.30	120.15	142.40	109.87
Consumer Surplus	-70.32	-57.40	-78.11	-118.81	-108.28	-86.59
Producer Surplus	13.10	-51.08	15.32	-19.92	-47.64	-18.04
Domestic Surplus	-57.22	-108.48	-62.78	-138.73	-155.92	-104.63
OATS:						
Acres Harvested	10.04	12.15	11.94	12.06	12.13	11.66
Acres Set Aside	0.00	0.12	0.13	0.04	0.03	0.06
Production	527.80	639.94	634.04	642.03	648.22	618.40
Total Supply	836.80	851.44	858.25	865.61	879.91	858.40
Domestic Demand	626.30	628.23	635.67	634.92	639.12	622.76
Ending Inventory	210.50	223.21	222.58	230.69	240.78	225.55
Price	1.29	1.34	1.33	1.35	1.34	1.33
Consumer Surplus	-0.42	-3.61	-7.03	-13.07	-17.12	-8.25
Producer Surplus	-1.77	-0.28	2.51	2.39	1.97	0.96
Domestic Surplus	-2.20	-3.89	-4.53	-10.67	-15.15	-7.29

TABLE XXX (Continued)

VARIABLE [1]	1979	1980	1981	1982	1983	5 YEAR AVERAGE
BARLEY:						
Acres Harvested	7.43	8.11	8.51	8.44	8.49	8.20
Acres Set Aside	0.70	0.26	0.18	0.15	0.12	0.28
Production	355.61	382.34	406.48	403.54	408.32	391.26
Total Supply	602.61	576.14	572.67	564.62	560.06	575.22
Domestic Demand	369.65	367.98	367.25	365.56	365.39	367.17
Ending Inventory	183.79	156.19	151.08	141.74	137.27	154.01
Price	2.04	2.14	2.12	2.16	2.26	2.14
Deficiency Payments	30.67	68.21	82.21	66.82	64.79	62.54
Consumer Surplus	1.39	-3.70	-5.06	-12.16	-16.78	-7.26
Producer Surplus	-1.15	-4.28	6.57	5.63	4.55	2.26
Net Domestic Surplus	0.24	-7.98	1.51	-6.53	-12.22	-5.00
SUMMARY; (TOTALS)						
Net Farm Income	31988.10	33840.60	35029.00	35541.50	32676.10	33815.04
Consumer Surplus	-469.50	-661.13	-1008.45	-1104.99	-1315.72	-911.96
Producer Surplus	438.80	-70.38	623.75	547.75	825.89	473.16
Net Domestic Surplus	-30.70	-731.51	-384.71	-557.24	-489.82	-438.80

See footnotes at the end of Appendix A.

TABLE XXXI

AVERAGES FOR SELECTED VARIABLES FOR THE FIVE YEARS SIMULATED AND THE FIVE YEAR AVERAGE, WITH T-STATISTIC, BY CROP, HIGH ACCURACY LEVEL, HIGH CURRENT YEAR PRICE WEIGHT, SMALL SURPLUS WEIGHT, "WITH INFORMATION" CASE

VARIABLE[1]	1979	1980	1981	1982	1983	5 Year Average	t-Statistic[2]
WHEAT:							
Acres Harvested	66.55	65.99	64.11	64.13	66.12	65.38	2.17
Acres Set Aside	10.61	2.43	4.34	2.79	2.93	4.62	0.42
Production	2126.80	2138.16	2095.71	2055.70	2113.07	2105.89	1.40
Total Supply	3050.80	2980.62	2983.17	2915.60	2886.91	2963.42	3.92
Domestic Demand	822.88	796.63	800.57	795.77	795.33	802.24	3.63
Ending Inventory	840.46	885.46	857.90	771.84	717.89	814.71	3.35
Reserve Actions[3]	11.75	44.11	28.13	46.09	48.08	35.63	-1.95
Price	3.22	3.41	3.40	3.52	3.56	3.42	-4.01
Deficiency Pymts	341.36	91.97	152.31	67.48	51.77	140.98	-0.06
Total Gov't Cost	404.22	143.96	197.58	101.77	74.90	184.49	----
Consumer Surplus	-16.13	-15.58	-80.74	-131.38	-187.58	-86.28	4.46
Producer Surplus	-57.46	-164.15	181.96	183.64	217.42	72.28	-3.42
Domestic Surplus	-73.59	-179.73	101.22	52.26	29.84	-14.00	-1.74
SOYBEANS:							
Acres Harvested	72.73	68.45	67.54	66.28	66.61	68.32	-1.38
Acres Set Aside	0.00	0.65	0.79	1.24	0.41	0.62	-1.11
Production	2101.09	2026.08	2043.56	2050.55	2072.51	2058.76	-0.90
Total Supply	2251.09	2166.84	2171.54	2191.87	2210.78	2198.43	-1.42
Domestic Demand	1086.69	1086.66	1100.05	1145.88	1180.71	1120.00	-1.23
Ending Inventory	140.76	127.99	141.32	138.27	135.13	136.69	-1.86
Price	7.10	7.39	7.51	7.36	7.43	7.36	1.37
Consumer Surplus	-385.61	-472.63	-182.87	-450.66	-574.81	-413.32	-0.80
Producer Surplus	462.80	259.34	-264.38	289.15	499.15	249.21	1.80
Domestic Surplus	77.19	-213.29	-447.25	-161.51	-75.66	-164.10	1.78

TABLE XXXI (Continued)

VARIABLE[1]	1979	1980	1981	1982	1983	5 Year Average	t-Statistic[2]
COTTON:							
Acres Harvested	12.66	11.28	11.48	11.47	11.41	11.66	0.41
Acres Set Aside	0.00	1.27	1.92	2.42	2.71	1.66	-0.76
Production	12.71	11.50	11.83	12.03	12.11	12.04	0.40
Total Supply	16.91	16.82	16.90	16.98	17.02	16.93	-1.42
Domestic Demand	6.25	6.34	6.44	6.53	6.62	6.44	0.35
Ending Inventory	5.12	4.87	4.76	4.70	4.50	4.79	-2.67
Reserve Actions[4]	-0.07	0.01	0.03	0.02	0.01	0.00	----
Price	0.56	0.57	0.58	0.60	0.62	0.59	-0.80
Deficiency Payments	127.08	354.31	342.42	435.12	393.04	330.39	-2.17
Consumer Surplus	-122.56	-96.28	0.15	94.64	51.09	-14.59	1.04
Producer Surplus	187.01	96.93	-77.44	-177.45	-90.48	-12.29	-0.14
Domestic Surplus	64.45	0.65	-77.30	-82.81	-39.39	-26.88	0.97
CORN:							
Acres Harvested	70.51	71.63	73.31	74.85	75.38	73.14	2.01
Acres Set Aside	2.90	0.91	0.53	0.28	0.59	1.04	-0.93
Production	7168.40	7146.56	7301.28	7401.03	7387.03	7280.86	1.57
Total Supply	8406.40	8236.68	8402.41	8565.92	8638.60	8450.00	1.50
Domestic Demand	4817.17	4932.95	4947.90	5011.43	5072.16	4956.32	2.23
Ending Inventory	1089.12	1100.13	1163.89	1250.57	1266.55	1174.05	0.69
Reserve Actions[3]	1.80	79.67	9.68	4.09	6.78	20.41	-0.88
Price	2.44	2.59	2.56	2.50	2.51	2.52	-1.39
Deficiency Pymts	0.00	10.11	12.06	22.98	16.68	12.37	-3.22
Total Gov't Cost	155.02	140.14	132.18	135.16	127.23	137.95	----
Consumer Surplus	152.60	147.08	-409.88	-425.07	-352.15	-177.60	3.11
Producer Surplus	-167.97	-193.31	643.36	286.78	140.37	141.85	-0.41
Domestic Surplus	-15.37	-46.22	233.48	-138.89	-211.78	-35.76	3.46

TABLE XXXI (Continued)

VARIABLE[1]	1979	1980	1981	1982	1983	5 Year Average	t-Statistic[2]
GRAIN SORGHUM:							
Acres Harvested	13.01	14.09	14.57	14.21	14.34	14.04	1.13
Acres Set Aside	0.90	0.27	0.58	0.51	0.70	0.59	-1.62
Production	765.46	786.40	803.95	784.42	789.35	785.92	0.69
Total Supply	952.46	925.93	942.05	932.10	936.26	937.76	-0.13
Domestic Demand	532.86	529.12	533.65	523.64	528.45	529.54	1.39
Ending Inventory	139.52	138.10	147.68	146.91	151.41	144.73	-6.39
Reserve Actions[3]	-0.13	11.36	-5.57	-0.58	5.07	2.03	1.10
Price	2.32	2.37	2.32	2.34	2.31	2.33	-0.04
Deficiency Pymts	27.30	81.18	101.36	89.12	109.27	81.65	-0.90
Total Gov't Cost	53.08	105.50	125.47	113.58	132.56	106.04	----
Consumer Surplus	-60.23	-46.08	-76.00	-108.26	-95.06	-77.12	1.77
Producer Surplus	4.92	-57.64	27.72	-9.43	-42.85	-15.46	0.70
Domestic Surplus	-55.30	-103.72	-48.22	-117.69	-137.90	-92.58	1.92
OATS:							
Acres Harvested	10.07	12.08	11.87	12.05	11.99	11.61	-1.78
Acres Set Aside	0.00	0.19	0.17	0.03	0.02	0.08	3.15
Production	529.22	636.53	630.42	641.70	640.47	615.66	-1.46
Total Supply	838.22	851.07	856.81	864.14	869.92	856.03	-2.09
Domestic Demand	614.67	615.88	625.35	625.39	625.73	621.40	-2.82
Ending Inventory	213.54	225.39	221.44	228.45	233.85	224.53	-1.38
Price	1.29	1.34	1.33	1.36	1.34	1.33	1.10
Consumer Surplus	-2.43	-7.52	-7.16	-11.60	-21.27	-10.00	-2.33
Producer Surplus	-3.41	-3.50	2.84	4.75	6.16	1.37	0.55
Domestic Surplus	-5.84	-11.02	-4.32	-6.85	-15.11	-8.63	-1.03

TABLE XXXI (Continued)

VARIABLE[1]	1979	1980	1981	1982	1983	5 Year Average	t-Statistic[2]
BARLEY:							
Acres Harvested	7.37	8.11	8.54	8.42	8.65	8.37	1.17
Acres Set Aside	0.70	0.23	0.16	0.14	0.10	0.27	-1.16
Production	352.57	382.10	407.56	402.80	416.05	392.22	0.90
Total Supply	599.57	574.75	573.60	564.42	567.07	575.88	0.72
Domestic Demand	367.76	366.75	367.63	366.08	367.63	367.17	0.01
Ending Inventory	182.65	156.04	151.62	141.02	142.04	154.67	0.72
Price	2.04	2.14	2.12	2.16	2.24	2.14	-0.92
Deficiency Payments	30.52	67.49	81.10	66.00	66.98	62.42	-0.09
Consumer Surplus	-1.87	-5.94	-4.27	-11.02	-12.35	-7.09	0.24
Producer Surplus	-3.68	-4.21	7.13	5.82	6.34	2.28	0.02
Net Domestic Surplus	-5.55	-10.15	2.87	-5.19	-6.01	-4.81	0.19
TOTALS:							
Net Farm Income	32109.90	33045.30	35110.90	35498.40	33002.00	33753.30	-0.67
Consumer Surplus	-436.24	-493.93	-760.78	-1043.95	-1192.13	-911.76	2.72
Producer Surplus	422.23	-66.56	521.20	583.26	736.10	473.03	-0.64
Net Domestic Surplus	-14.01	-563.49	-239.58	-460.69	-456.02	-438.73	2.20
VALUE OF INFORMATION:							
Consumer Surplus	36.03	166.06	244.88	61.96	122.99	126.38	----
Producer Surplus	-15.58	-4.05	-98.06	32.28	-88.50	-34.78	----
Net Domestic Surplus	20.44	162.00	146.82	94.23	34.49	91.60	----

See footnotes at the end of Appendix A.

TABLE XXXII

AVERAGES FOR SELECTED VARIABLES FOR THE FIVE YEARS SIMULATED AND THE FIVE YEAR AVERAGE, WITH T-STATISTIC, BY CROP, HIGH ACCURACY LEVEL, HIGH CURRENT YEAR PRICE WEIGHT, LARGE SURPLUS WEIGHT, "WITH INFORMATION" CASE

VARIABLE [1]	1979	1980	1981	1982	1983	5 Year Average	t-Statistic [2]
WHEAT:							
Acres Harvested	66.55	65.99	64.11	64.13	66.12	65.38	2.17
Acres Set Aside	10.61	2.43	4.34	2.79	2.93	4.62	0.42
Production	2126.80	2138.16	2095.71	2055.70	2113.07	2105.89	1.40
Total Supply	3050.80	2980.62	2983.17	2915.60	2886.91	2963.42	3.92
Domestic Demand	822.88	796.63	800.57	795.77	795.33	802.24	3.63
Ending Inventory	840.46	885.46	857.90	771.84	717.89	814.71	3.35
Reserve Actions [3]	11.75	44.11	28.13	46.09	48.08	35.63	-1.95
Price	3.22	3.41	3.40	3.52	3.56	3.42	-4.01
Deficiency Pymts	341.36	91.97	152.31	67.48	51.77	140.98	-0.06
Total Gov't Cost	404.22	143.96	197.58	101.77	74.90	184.49	----
Consumer Surplus	-13.19	-15.90	-83.05	-135.64	-189.29	-87.41	4.38
Producer Surplus	-57.44	-163.13	182.57	186.88	220.24	73.83	-3.36
Domestic Surplus	-70.62	-179.03	99.52	51.24	30.96	-13.59	-1.73
SOYBEANS:							
Acres Harvested	72.73	68.45	67.54	66.28	66.61	68.32	-1.38
Acres Set Aside	0.00	0.65	0.79	1.24	0.41	0.62	-1.11
Production	2101.09	2026.08	2043.56	2050.55	2072.51	2058.76	-0.90
Total Supply	2251.09	2166.84	2171.54	2191.87	2210.78	2198.43	-1.42
Domestic Demand	1086.69	1086.66	1100.05	1145.88	1180.71	1120.00	-1.23
Ending Inventory	140.76	127.99	141.32	138.27	135.13	136.69	-1.86
Price	7.10	7.39	7.51	7.36	7.43	7.36	1.37
Consumer Surplus	-353.65	-451.39	-195.38	-441.88	-543.64	-397.19	-0.32
Producer Surplus	447.90	253.59	-250.40	286.91	484.50	244.50	1.69
Domestic Surplus	94.24	-197.80	-445.78	-154.97	-59.14	-152.69	2.40

TABLE XXXII (Continued)

VARIABLE[1]	1979	1980	1981	1982	1983	5 Year Average	t-Statistic[2]
COTTON:							
Acres Harvested	12.66	11.28	11.48	11.47	11.41	11.66	0.41
Acres Set Aside	0.00	1.27	1.92	2.42	2.71	1.66	-0.76
Production	12.71	11.50	11.83	12.03	12.11	12.04	0.40
Total Supply	16.91	16.82	16.90	16.98	17.02	16.93	-1.42
Domestic Demand	6.25	6.34	6.44	6.53	6.62	6.44	0.35
Ending Inventory	5.12	4.87	4.76	4.70	4.50	4.79	-2.67
Reserve Actions[4]	-0.07	0.01	0.03	0.02	0.01	0.00	----
Price	0.56	0.57	0.58	0.60	0.62	0.59	-0.80
Deficiency Payments	127.08	354.31	342.42	435.12	393.04	330.39	-2.17
Consumer Surplus	-114.62	-93.25	0.31	88.89	46.03	-14.53	1.06
Producer Surplus	182.37	96.34	-76.59	-171.99	-86.03	-11.18	-0.06
Domestic Surplus	67.76	3.09	-76.28	-83.10	-40.00	-25.71	1.14
CORN:							
Acres Harvested	70.51	71.63	73.31	74.85	75.38	73.14	2.01
Acres Set Aside	2.90	0.91	0.53	0.28	0.59	1.04	-0.93
Production	7168.40	7146.56	7301.28	7401.03	7387.03	7280.86	1.57
Total Supply	8406.40	8236.68	8402.41	8565.92	8638.60	8450.00	1.50
Domestic Demand	4817.17	4932.95	4947.90	5011.43	5072.16	4956.32	2.23
Ending Inventory	1089.12	1100.13	1163.89	1250.57	1266.55	1174.05	0.69
Reserve Actions[3]	1.80	79.67	9.68	4.09	6.78	20.41	-0.88
Price	2.44	2.59	2.56	2.50	2.51	2.52	-1.39
Deficiency Pymts	0.00	10.11	12.06	22.98	16.68	12.37	-3.22
Total Gov't Cost	155.02	140.14	132.18	135.16	127.23	137.95	----
Consumer Surplus	139.67	142.74	-410.06	-407.81	-345.67	-176.23	3.24
Producer Surplus	-154.94	-189.93	644.09	279.48	139.16	143.57	-0.35
Domestic Surplus	-15.27	-47.19	234.03	-128.33	-206.50	-32.65	3.69

TABLE XXXII (Continued)

VARIABLF[1]	1979	1980	1981	1982	1983	5 Year Average	t-Statistic[2]
GRAIN SORGHUM:							
Acres Harvested	13.01	14.09	14.57	14.21	14.34	14.04	1.13
Acres Set Aside	0.90	0.27	0.58	0.51	0.70	0.59	-1.62
Production	765.46	786.40	803.95	784.42	789.35	785.92	0.69
Total Supply	952.46	925.93	942.05	932.10	936.26	937.76	-0.13
Domestic Demand	532.86	529.12	533.65	523.64	528.45	529.54	1.39
Ending Inventory	139.52	138.10	147.68	146.91	151.41	144.73	-6.39
Reserve Actions[3]	-0.13	11.36	-5.57	-0.58	5.07	2.03	1.10
Price	2.32	2.37	2.32	2.34	2.31	2.33	-0.04
Deficiency Pymts	27.30	81.18	101.36	89.12	109.27	81.65	-0.90
Total Gov't Cost	53.08	105.50	125.47	113.58	132.56	106.04	----
Consumer Surplus	-56.27	-46.44	-74.00	-106.36	-92.93	-75.20	2.18
Producer Surplus	5.34	-56.57	27.42	-9.31	-42.65	-15.16	0.78
Domestic Surplus	-50.94	-103.00	-46.58	-115.67	-135.58	-90.35	2.33
OATS:							
Acres Harvested	10.07	12.08	11.87	12.05	11.99	11.61	-1.78
Acres Set Aside	0.00	0.19	0.17	0.03	0.02	0.08	3.15
Production	529.22	636.53	630.42	641.70	640.47	615.66	-1.46
Total Supply	838.22	851.07	856.81	864.14	869.92	856.03	-2.09
Domestic Demand	614.67	615.88	625.35	625.39	625.73	621.40	-2.82
Ending Inventory	213.54	225.39	221.44	228.45	233.85	224.53	-1.38
Price	1.29	1.34	1.33	1.36	1.34	1.33	1.10
Consumer Surplus	-1.80	-7.18	-6.82	-11.42	-20.49	-9.54	-1.75
Producer Surplus	-3.21	-3.39	3.03	4.99	6.27	1.54	0.80
Domestic Surplus	-5.01	-10.57	-3.79	-6.44	-14.22	-8.00	-0.58

TABLE XXXII (Continued)

VARIABLE[1]	1979	1980	1981	1982	1983	5 Year Average	t-Statistic[2]
BARLEY:							
Acres Harvested	7.37	8.11	8.54	8.42	8.65	8.37	1.17
Acres Set Aside	0.70	0.23	0.16	0.14	0.10	0.27	-1.16
Production	352.57	382.10	407.56	402.80	416.05	392.22	0.90
Total Supply	599.57	574.75	573.60	564.42	567.07	575.88	0.72
Domestic Demand	367.76	366.75	367.63	366.08	367.63	367.17	0.01
Ending Inventory	182.65	156.04	151.62	141.02	142.04	154.67	0.72
Price	2.04	2.14	2.12	2.16	2.24	2.14	-0.92
Deficiency Payments	30.52	67.49	81.10	66.00	66.98	62.42	-0.09
Consumer Surplus	-1.54	-5.75	-4.20	-10.86	-12.29	-6.93	0.46
Producer Surplus	-3.50	-4.08	7.14	5.96	6.58	2.42	0.17
Net Domestic Surplus	-5.04	-9.83	2.94	-4.90	-5.71	-4.51	0.48
TOTALS:							
Net Farm Income	32109.90	33045.30	35110.90	35498.40	33002.00	33753.30	-0.67
Consumer Surplus	-401.40	-477.17	-773.20	-1025.08	-1158.28	-767.02	3.23
Producer Surplus	416.51	-67.16	537.26	582.91	728.08	439.52	-0.64
Net Domestic Surplus	15.11	-544.33	-235.94	-442.17	-430.20	-327.50	2.72
VALUE OF INFORMATION:							
Consumer Surplus	70.32	186.90	232.14	80.43	157.07	145.37	----
Producer Surplus	-21.01	-5.00	-81.63	32.18	-96.61	-34.41	----
Net Domestic Surplus	49.31	181.90	150.51	112.61	60.46	110.96	----

See footnotes at the end of Appendix A.

TABLE XXXIII

AVERAGES FOR SELECTED VARIABLES FOR THE FIVE YEARS SIMULATED AND THE FIVE YEAR AVERAGE, WITH T-STATISTIC, BY CROP, HIGH ACCURACY LEVEL, LOW CURRENT YEAR PRICE WEIGHT, LARGE SURPLUS WEIGHT, "WITH INFORMATION" CASE

VARIABLE [1]	1979	1980	1981	1982	1983	5 Year Average	t-Statistic [2]
WHEAT:							
Acres Harvested	66.58	65.61	64.03	63.78	66.14	65.23	0.56
Acres Set Aside	10.61	2.63	3.93	2.90	2.63	4.54	-0.13
Production	2127.90	2125.80	2092.96	2044.82	2113.60	2101.02	0.37
Total Supply	3051.90	2968.54	2968.07	2891.03	2866.29	2949.17	1.00
Domestic Demand	823.69	796.90	799.16	792.35	791.52	800.72	1.16
Ending Inventory	840.74	873.11	844.21	750.69	701.08	801.97	0.82
Reserve Actions [3]	13.87	50.58	32.99	46.84	47.20	38.29	-0.52
Price	3.22	3.42	3.42	3.60	3.62	3.46	-1.12
Deficiency Pymts	351.25	83.93	150.49	66.48	46.68	139.77	-0.37
Total Gov't Cost	413.62	134.01	192.83	97.63	67.16	181.05	----
Consumer Surplus	3.59	-9.01	-116.61	-210.52	-275.22	-121.56	1.16
Producer Surplus	-60.73	-163.61	229.97	307.66	342.53	131.16	-0.95
Domestic Surplus	-57.15	-172.62	113.36	97.13	67.31	9.61	-0.57
SOYBEANS:							
Acres Harvested	73.23	68.51	67.00	66.88	66.86	68.50	0.38
Acres Set Aside	0.00	0.78	0.77	0.93	0.57	0.61	-0.77
Production	2115.13	2027.27	2026.86	2068.80	2079.76	2063.57	0.35
Total Supply	2265.13	2174.46	2154.80	2199.48	2223.32	2203.44	0.15
Domestic Demand	1094.31	1094.32	1093.94	1148.20	1188.72	1123.90	0.89
Ending Inventory	147.18	127.93	130.68	143.56	139.66	137.80	-0.68
Price	6.98	7.32	7.65	7.29	7.33	7.32	-0.48
Consumer Surplus	-239.20	-355.62	-322.46	-405.40	-426.08	-349.75	0.17
Producer Surplus	309.29	157.72	-46.87	238.90	325.77	196.96	0.46
Domestic Surplus	70.10	-197.90	-369.33	-166.50	-100.31	-152.79	1.02

TABLE XXXIII (Continued)

VARIABLE[1]	1979	1980	1981	1982	1983	5 Year Average	t-Statistic[2]
COTTON:							
Acres Harvested	13.02	11.19	11.28	11.23	11.46	11.64	-0.08
Acres Set Aside	0.00	1.62	2.12	2.33	2.42	1.70	-0.01
Production	13.08	11.42	11.62	11.78	12.16	12.01	-0.08
Total Supply	17.28	17.09	16.93	16.76	16.87	16.99	-1.14
Domestic Demand	6.26	6.36	6.45	6.51	6.59	6.43	0.37
Ending Inventory	5.47	5.12	4.78	4.50	4.38	4.85	-0.91
Reserve Actions[4]	-0.18	-0.03	0.05	0.09	0.03	-0.01	----
Price	0.55	0.56	0.58	0.62	0.63	0.59	-0.40
Deficiency Payments	159.98	424.95	375.74	406.61	336.59	340.77	-0.84
Consumer Surplus	-80.14	-48.48	17.26	46.15	-15.26	-16.09	0.51
Producer Surplus	134.62	33.02	-96.00	-107.88	-17.32	-10.71	0.09
Domestic Surplus	54.47	-15.46	-78.74	-61.72	-32.58	-26.81	0.76
CORN:							
Acres Harvested	69.88	71.57	73.58	74.95	75.16	73.02	0.33
Acres Set Aside	2.90	0.63	0.54	0.47	0.78	1.06	-0.58
Production	7103.62	7140.48	7327.65	7410.28	7365.36	7269.48	0.26
Total Supply	8341.62	8198.32	8426.94	8598.12	8630.84	8439.17	0.19
Domestic Demand	4784.67	4896.43	4949.47	5029.72	5075.98	4947.25	0.23
Ending Inventory	1056.84	1098.29	1186.84	1264.48	1254.97	1172.28	0.14
Reserve Actions[3]	4.76	64.41	10.81	12.71	14.10	21.36	-0.34
Price	2.49	2.61	2.53	2.48	2.52	2.52	-0.22
Deficiency Pymts	0.00	5.83	21.85	33.64	17.57	15.78	-1.31
Total Gov't Cost	154.28	138.93	144.76	146.47	126.94	142.28	----
Consumer Surplus	-23.12	-71.68	-400.64	-325.55	-328.23	-229.84	0.02
Producer Surplus	27.74	-77.29	491.03	136.22	166.30	148.80	-0.01
Domestic Surplus	4.63	-148.98	90.39	-189.33	-161.93	-81.05	0.54

TABLE XXXIII (Continued)

VARIABLE[1]	1979	1980	1981	1982	1983	5 Year Average	t-Statistic[2]
GRAIN SORGHUM:							
Acres Harvested	12.97	14.10	14.60	14.15	14.28	14.02	0.34
Acres Set Aside	0.90	0.26	0.60	0.58	0.77	0.62	-0.58
Production	763.43	786.83	805.90	781.41	786.28	784.77	0.20
Total Supply	950.43	925.53	945.92	932.90	935.33	938.02	-0.55
Domestic Demand	531.65	526.79	533.72	522.29	526.41	528.17	-0.09
Ending Inventory	138.71	140.03	151.49	149.05	152.51	146.36	0.38
Reserve Actions[3]	0.18	9.42	-7.60	-0.74	5.79	1.41	0.27
Price	2.33	2.38	2.30	2.33	2.30	2.33	0.07
Deficiency Pymts	25.54	79.96	103.94	92.42	114.35	83.24	-0.54
Total Gov't Cost	51.24	104.64	128.92	117.79	138.39	108.20	----
Consumer Surplus	-59.52	-55.05	-73.83	-111.28	-100.51	-80.04	1.09
Producer Surplus	10.74	-50.02	17.88	-16.49	-46.46	-16.87	0.37
Domestic Surplus	-48.78	-105.07	-55.96	-127.77	-146.97	-96.91	1.15
OATS:							
Acres Harvested	10.05	12.13	11.92	12.06	12.10	11.65	-0.44
Acres Set Aside	0.00	0.14	0.14	0.03	0.02	0.07	0.38
Production	528.19	638.91	633.06	642.10	646.11	617.68	-0.36
Total Supply	837.19	851.26	857.68	865.06	877.22	857.68	-0.66
Domestic Demand	615.84	617.84	625.70	624.65	627.73	622.35	-0.73
Ending Inventory	211.34	223.61	221.96	230.11	239.16	225.24	-0.55
Price	1.29	1.34	1.33	1.35	1.34	1.33	0.46
Consumer Surplus	-0.19	-4.14	-6.26	-12.32	-17.93	-8.17	0.37
Producer Surplus	-2.01	-0.85	3.22	3.50	3.22	1.42	0.75
Domestic Surplus	-2.20	-4.99	-3.04	-8.82	-14.71	-6.75	0.64

TABLE XXXIII (Continued)

VARIABLE[1]	1979	1980	1981	1982	1983	5 Year Average	t-Statistic[2]
BARLEY:							
Acres Harvested	7.41	8.12	8.52	8.43	8.55	8.21	0.52
Acres Set Aside	0.70	0.25	0.17	0.15	0.12	0.28	-0.38
Production	354.77	382.38	406.83	403.36	410.96	391.66	0.40
Total Supply	601.77	575.86	572.99	564.57	562.52	575.54	0.37
Domestic Demand	369.13	367.74	367.43	365.68	366.23	367.24	0.28
Ending Inventory	183.47	156.16	151.21	141.57	138.90	154.26	0.25
Price	2.04	2.14	2.12	2.16	2.25	2.14	-0.33
Deficiency Payments	30.62	67.60	83.84	65.79	65.31	62.63	-0.06
Consumer Surplus	0.69	-3.98	-4.60	-11.58	-14.62	-6.82	0.70
Producer Surplus	-1.74	-3.94	6.85	5.97	5.58	2.54	0.36
Net Domestic Surplus	-1.05	-7.91	2.25	-5.61	-9.04	-4.27	0.83
TOTALS:							
Net Farm Income	32018.30	33588.10	35072.00	35522.60	32711.00	33782.39	-0.42
Consumer Surplus	-397.89	-547.96	-907.14	-1030.50	-1177.85	-812.27	0.95
Producer Surplus	417.91	-104.96	606.08	567.88	779.61	453.30	-0.14
Net Domestic Surplus	20.02	-652.92	-301.06	-462.62	-398.24	-358.97	0.85
VALUE OF INFORMATION:							
Consumer Surplus	73.06	116.34	98.07	74.77	137.35	99.92	----
Producer Surplus	-19.18	-43.01	-13.18	18.42	-44.38	-20.27	----
Net Domestic Surplus	53.88	73.32	84.88	93.19	92.97	79.65	----

See footnotes at the end of Appendix A.

TABLE XXXIV

AVERAGES FOR SELECTED VARIABLES FOR THE FIVE YEARS SIMULATED AND THE FIVE YEAR AVERAGE, WITH T-STATISTIC, BY CROP, MIDDLE ACCURACY LEVEL, HIGH CURRENT YEAR PRICE WEIGHT, LARGE SURPLUS WEIGHT, "WITH INFORMATION" CASE

VARIABLE [1]	1979	1980	1981	1982	1983	5 Year Average	t-Statistic [2]
WHEAT:							
Acres Harvested	66.42	65.88	64.07	64.17	66.18	65.34	1.81
Acres Set Aside	10.61	2.39	4.07	2.51	2.81	4.48	-0.24
Production	2122.79	2134.73	2094.48	2057.18	2114.93	2104.82	1.18
Total Supply	3046.79	2973.44	2975.06	2909.34	2882.88	2957.50	2.80
Domestic Demand	822.62	796.32	800.20	795.40	794.94	801.89	3.09
Ending Inventory	836.71	878.58	850.16	765.96	714.25	809.13	2.34
Reserve Actions [3]	12.70	46.65	30.69	49.03	47.64	37.34	-1.18
Price	3.23	3.42	3.41	3.53	3.57	3.43	-3.26
Deficiency Pymts	331.71	89.64	141.87	64.17	51.65	135.81	-1.85
Total Gov't Cost	394.36	140.75	185.64	96.33	72.80	177.98	----
Consumer Surplus	-19.10	-26.63	-97.16	-149.85	-205.85	-99.72	3.38
Producer Surplus	-51.17	-154.74	202.71	199.55	247.34	88.74	-2.74
Domestic Surplus	-70.27	-181.38	105.55	49.70	41.49	-10.98	-1.55
SOYBEANS:							
Acres Harvested	73.02	68.65	67.71	66.29	66.69	68.47	-0.07
Acres Set Aside	0.00	0.83	1.06	1.52	0.56	0.79	2.56
Production	2109.50	2032.19	2048.60	2050.77	2075.10	2063.23	0.08
Total Supply	2259.50	2179.33	2185.36	2201.07	2219.26	2208.91	0.97
Domestic Demand	1088.72	1090.38	1104.88	1149.19	1183.46	1123.32	0.25
Ending Inventory	147.14	136.76	150.30	144.16	140.87	143.85	1.92
Price	7.06	7.32	7.43	7.31	7.39	7.30	-0.60
Consumer Surplus	-367.72	-436.47	-179.01	-429.40	-531.52	-388.82	-0.04
Producer Surplus	426.98	170.58	-338.76	224.70	436.38	183.98	-0.14
Domestic Surplus	59.26	-265.88	-517.77	-204.69	-95.14	-204.85	-0.30

TABLE XXXIV (Continued)

VARIABLE[1]	1979	1980	1981	1982	1983	5 Year Average	t-Statistic[2]
COTTON:							
Acres Harvested	12.67	11.27	11.47	11.48	11.44	11.67	0.62
Acres Set Aside	0.00	1.29	1.93	2.41	2.69	1.66	-0.77
Production	12.72	11.50	11.82	12.04	12.15	12.05	0.73
Total Supply	16.92	16.83	16.90	16.99	17.06	16.94	-2.67
Domestic Demand	6.25	6.34	6.44	6.52	6.62	6.44	0.36
Ending Inventory	5.14	4.88	4.76	4.72	4.55	4.81	-2.25
Reserve Actions[4]	-0.07	0.00	0.03	0.02	0.01	-0.002	----
Price	0.56	0.58	0.58	0.60	0.62	0.59	-0.84
Deficiency Payments	129.34	362.20	345.00	438.76	409.92	337.04	-1.49
Consumer Surplus	-116.55	-95.64	-5.04	83.17	45.57	-17.70	0.69
Producer Surplus	182.36	99.48	-73.52	-166.72	-92.42	-10.16	0.01
Domestic Surplus	65.81	3.85	-78.56	-83.55	-46.85	-27.86	0.84
CORN:							
Acres Harvested	70.43	71.48	73.12	74.70	75.25	73.00	0.28
Acres Set Aside	2.90	0.89	0.48	0.25	0.53	1.01	-1.62
Production	7159.41	7131.68	7282.37	7385.89	7374.39	7266.75	0.22
Total Supply	8397.41	8217.80	8375.39	8540.04	8616.22	8429.37	-0.40
Domestic Demand	4812.18	4922.19	4931.61	4995.29	5056.64	4943.58	-0.10
Ending Inventory	1085.12	1092.02	1153.15	1240.84	1259.69	1166.16	-0.64
Reserve Actions[3]	1.87	79.63	11.70	6.93	6.87	21.40	-0.53
Price	2.45	2.60	2.57	2.51	2.52	2.53	0.30
Deficiency Pymts	0.00	9.76	10.84	20.87	15.74	11.44	-3.80
Total Gov't Cost	155.00	139.78	130.44	131.84	125.05	136.42	----
Consumer Surplus	101.13	87.73	-495.94	-495.06	-429.54	-246.34	0.35
Producer Surplus	-124.07	-161.89	690.45	305.33	169.22	175.81	0.93
Domestic Surplus	-22.95	-74.16	194.51	-189.74	-260.33	-70.53	1.68

TABLE XXXIV (Continued)

VARIABLE[1]	1979	1980	1981	1982	1983	5 Year Average	t-Statistic[2]
GRAIN SORGHUM:							
Acres Harvested	13.00	14.08	14.55	14.19	14.32	14.03	0.66
Acres Set Aside	0.90	0.26	0.57	0.50	0.69	0.58	-1.84
Production	764.93	785.63	803.02	783.65	788.67	785.18	0.40
Total Supply	951.93	924.91	940.72	930.75	935.07	936.68	-0.61
Domestic Demand	532.58	528.50	532.90	552.79	527.45	528.84	0.72
Ending Inventory	139.28	137.70	147.10	146.40	151.22	144.34	-1.94
Reserve Actions[3]	-0.06	11.20	-5.36	-0.57	5.02	2.05	1.13
Price	2.32	2.38	2.32	2.34	2.31	2.33	0.44
Deficiency Pymts	26.80	79.98	98.80	88.21	106.42	80.04	-1.39
Total Gov't Cost	52.56	104.31	122.88	112.62	129.67	104.41	----
Consumer Surplus	-58.12	-48.80	-76.54	-109.72	-95.91	-77.82	1.68
Producer Surplus	6.40	-55.56	28.64	-8.28	-41.32	-14.02	1.08
Domestic Surplus	-51.72	-104.36	-47.90	-118.00	-137.23	-91.84	2.08
OATS:							
Acres Harvested	10.07	12.08	11.87	12.06	11.99	11.61	-1.66
Acres Set Aside	0.00	0.18	0.16	0.02	0.02	0.08	2.53
Production	529.20	636.66	630.72	641.99	640.70	615.85	-1.36
Total Supply	838.20	850.96	856.56	863.52	869.00	855.65	-2.43
Domestic Demand	614.89	616.32	626.00	625.93	626.06	621.84	-1.90
Ending Inventory	213.03	224.84	220.54	227.30	232.61	223.72	-2.49
Price	1.29	1.34	1.33	1.36	1.35	1.33	2.03
Consumer Surplus	-1.24	-6.58	-5.76	-10.56	-20.01	-8.83	-0.78
Producer Surplus	-3.04	-2.81	3.86	5.98	7.21	2.24	1.77
Domestic Surplus	-4.28	-9.39	-1.89	-4.58	-12.80	-6.59	0.55

TABLE XXXIV (Continued)

VARIABLE[1]	1979	1980	1981	1982	1983	5 Year Average	t-Statistic[2]
BARLEY:							
Acres Harvested	7.37	8.12	8.54	8.42	8.65	8.22	1.28
Acres Set Aside	0.70	0.23	0.16	0.14	0.10	0.27	-1.16
Production	352.86	382.47	407.58	402.71	415.90	392.30	0.99
Total Supply	599.86	575.22	573.76	564.16	566.53	575.91	0.75
Domestic Demand	367.95	367.08	367.96	366.20	367.60	367.36	0.50
Ending Inventory	182.75	156.18	151.45	140.63	141.54	154.51	0.54
Price	2.04	2.14	2.12	2.16	2.24	2.14	-0.68
Deficiency Payments	30.54	68.22	82.35	64.79	68.91	62.96	0.31
Consumer Surplus	-1.17	-5.26	-3.59	-10.67	-12.28	-6.59	0.91
Producer Surplus	-3.23	-3.85	7.46	6.55	7.10	2.81	0.59
Net Domestic Surplus	-4.40	-9.11	3.87	-4.12	-5.18	-3.79	1.20
TOTALS:							
Net Farm Income	32084.80	33095.70	35104.40	35572.60	32992.50	33769.99	-0.49
Consumer Surplus	-462.78	-531.65	-863.04	-1122.09	-1249.54	-845.82	1.48
Producer Surplus	434.23	-108.78	520.85	567.10	733.52	429.38	-0.84
Net Domestic Surplus	-28.55	-640.43	-342.19	-554.98	-516.02	-416.44	0.54
VALUE OF INFORMATION:							
Consumer Surplus	9.25	132.97	142.51	-16.39	66.55	66.98	----
Producer Surplus	-3.54	-45.72	-97.89	16.44	-92.14	-44.57	----
Net Domestic Surplus	5.70	87.25	44.62	0.06	-25.59	22.41	----

See footnotes at the end of Appendix A.

TABLE XXXV

AVERAGES FOR SELECTED VARIABLES FOR THE FIVE YEARS SIMULATED AND THE FIVE YEAR AVERAGE, WITH T-STATISTIC, BY CROP, MIDDLE ACCURACY LEVEL, LOW CURRENT YEAR PRICE WEIGHT, LARGE SURPLUS WEIGHT, "WITH INFORMATION" CASE

VARIABLE [1]	1979	1980	1981	1982	1983	5 Year Average	t-Statistic [2]
WHEAT:							
Acres Harvested	66.55	65.59	64.02	63.79	66.15	65.22	0.62
Acres Set Aside	10.61	2.61	3.87	2.86	2.58	4.50	0.04
Production	2126.78	2125.18	2092.81	2045.15	2114.12	2100.81	0.41
Total Supply	3050.78	2966.89	2966.32	2889.65	2865.57	2947.84	1.24
Domestic Demand	823.61	796.84	799.12	792.21	791.50	800.66	1.25
Ending Inventory	839.70	871.52	842.50	749.45	700.37	800.71	1.03
Reserve Actions [3]	14.09	51.55	33.86	47.26	47.13	38.78	-0.74
Price	3.22	3.42	3.42	3.60	3.62	3.46	-1.20
Deficiency Pymts	347.94	85.13	145.59	64.40	46.56	137.92	-0.18
Total Gov't Cost	410.26	134.92	187.42	94.95	66.56	178.82	----
Consumer Surplus	0.74	-13.62	-122.83	-217.90	-282.15	-127.15	1.56
Producer Surplus	-61.54	-166.68	231.45	312.42	342.44	131.62	-0.97
Domestic Surplus	-60.80	-180.30	108.62	94.52	60.29	4.47	-0.27
SOYBEANS:							
Acres Harvested	73.31	68.55	67.03	66.87	66.88	68.53	0.14
Acres Set Aside	0.00	0.81	0.81	0.96	0.58	0.63	-1.54
Production	2117.47	2028.44	2027.66	2068.41	2080.24	2064.44	0.16
Total Supply	2267.47	2177.09	2157.00	2200.24	2224.19	2205.20	-0.28
Domestic Demand	1095.17	1095.55	1095.00	1148.57	1188.98	1124.65	0.53
Ending Inventory	148.66	129.34	131.83	143.95	140.27	138.81	-1.24
Price	6.97	7.30	7.64	7.29	7.32	7.30	-0.11
Consumer Surplus	-274.75	-387.77	-370.01	-431.05	-450.33	-382.79	1.32
Producer Surplus	317.75	153.82	-36.99	248.74	335.34	203.73	0.25
Domestic Surplus	42.99	-233.95	-407.00	-182.31	-115.00	-179.05	2.35

TABLE XXXV (Continued)

VARIABLE[1]	1979	1980	1981	1982	1983	5 Year Average	t-Statistic[2]
COTTON:							
Acres Harvested	13.03	11.19	11.28	11.23	11.47	11.64	-0.15
Acres Set Aside	0.00	1.62	2.12	2.33	2.42	1.70	-0.10
Production	13.08	11.42	11.62	11.78	12.17	12.01	-0.14
Total Supply	17.28	17.09	16.94	16.77	16.88	16.99	-0.04
Domestic Demand	6.26	6.36	6.45	6.51	6.60	6.44	0.30
Ending Inventory	5.48	5.12	4.79	4.51	4.39	4.86	-1.07
Reserve Actions[4]	-0.18	-0.03	0.05	0.09	0.03	-0.01	----
Price	0.55	0.56	0.58	0.62	0.63	0.59	-0.29
Deficiency Payments	160.60	427.90	374.64	409.06	343.22	343.08	-1.06
Consumer Surplus	-84.06	-49.85	12.84	42.73	-17.35	-19.14	0.84
Producer Surplus	138.58	33.13	-91.89	-105.13	-19.67	-9.00	-0.03
Domestic Surplus	54.52	-16.72	-79.05	-62.40	-37.02	-28.13	0.92
CORN:							
Acres Harvested	69.85	71.54	73.55	74.94	75.13	73.00	0.58
Acres Set Aside	2.90	0.62	0.53	0.46	0.78	1.06	-0.36
Production	7101.12	7137.82	7325.17	7409.31	7363.13	7267.31	0.46
Total Supply	8339.12	8194.56	8422.81	8595.59	8627.24	8435.86	0.49
Domestic Demand	4783.28	4894.32	4946.90	5028.57	5074.04	4945.42	0.56
Ending Inventory	1055.73	1096.64	1185.29	1263.11	1253.31	1170.81	0.38
Reserve Actions[3]	4.79	65.04	11.18	14.73	14.10	21.97	-0.57
Price	2.49	2.61	2.54	2.48	2.52	2.53	-0.44
Deficiency Pymts	0.00	5.83	21.02	33.44	17.80	15.62	-1.22
Total Gov't Cost	154.27	138.77	143.66	145.50	126.40	141.72	----
Consumer Surplus	-43.89	-80.18	-421.23	-336.66	-342.81	-244.95	1.09
Producer Surplus	39.04	-82.40	500.14	129.96	173.66	152.08	-0.14
Domestic Surplus	-4.85	-162.58	78.91	-206.69	-169.15	-92.87	1.18

TABLE XXXV (Continued)

VARIABLE[1]	1979	1980	1981	1982	1983	5 Year Average	t-Statistic[2]
GRAIN SORGHUM:							
Acres Harvested	12.97	14.10	14.60	14.15	14.28	14.02	0.40
Acres Set Aside	0.90	0.25	0.60	0.58	0.77	0.62	-0.54
Production	763.28	786.72	805.73	781.39	786.22	784.67	0.24
Total Supply	950.28	925.34	945.62	932.65	935.32	937.84	-0.02
Domestic Demand	531.59	526.73	533.64	522.00	526.18	528.03	0.48
Ending Inventory	138.62	139.89	151.26	149.10	152.73	146.32	-0.52
Reserve Actions[3]	0.24	9.50	-7.52	-0.97	5.68	1.38	0.30
Price	2.33	2.38	2.30	2.33	2.30	2.33	-0.04
Deficiency Pymts	25.39	80.04	103.26	92.23	113.62	82.91	-0.44
Total Gov't Cost	51.08	104.69	128.19	117.61	137.70	107.85	----
Consumer Surplus	-60.75	-55.55	-74.54	-112.74	-100.98	-80.91	1.26
Producer Surplus	11.12	-50.45	18.39	-15.66	-46.86	-16.69	0.32
Domestic Surplus	-49.62	-106.00	-56.14	-128.40	-147.84	-97.60	1.26
OATS:							
Acres Harvested	10.05	12.13	11.92	12.06	12.10	11.65	-0.47
Acres Set Aside	0.00	0.14	0.13	0.03	0.02	0.07	0.52
Production	528.19	638.96	633.16	642.16	646.15	617.72	-0.38
Total Supply	837.19	851.24	857.66	865.00	877.18	857.65	-0.63
Domestic Demand	615.90	617.93	625.80	624.68	627.77	622.41	-0.87
Ending Inventory	211.28	223.51	221.84	230.02	239.07	225.14	-0.42
Price	1.29	1.34	1.33	1.35	1.34	1.33	0.35
Consumer Surplus	0.14	-4.08	-5.97	-12.22	-17.77	-7.98	0.11
Producer Surplus	-1.95	-0.77	3.36	3.59	3.28	1.50	0.63
Domestic Surplus	-1.80	-4.85	-2.61	-8.64	-14.49	-6.48	0.42

TABLE XXXV (Continued)

VARIABLE[1]	1979	1980	1981	1982	1983	5 Year Average	t-Statistic[2]
BARLEY:							
Acres Harvested	7.41	8.12	8.52	8.43	8.55	8.21	0.50
Acres Set Aside	0.70	0.25	0.18	0.15	0.12	0.28	-0.38
Production	354.85	382.48	406.80	403.34	410.92	391.68	0.38
Total Supply	601.85	575.98	573.01	564.51	562.44	575.56	0.35
Domestic Demand	396.18	367.81	367.48	365.66	366.23	367.27	0.20
Ending Inventory	183.50	156.21	151.17	141.52	138.82	154.25	0.27
Price	2.04	2.14	2.12	2.16	2.25	2.14	-0.35
Deficiency Payments	30.62	67.62	83.89	64.88	65.24	62.45	0.07
Consumer Surplus	0.84	-3.91	-4.43	-11.60	-14.63	-6.75	0.60
Producer Surplus	-1.63	-3.93	6.88	6.02	5.65	2.60	0.30
Net Domestic Surplus	-0.80	-7.84	2.45	-5.58	-8.98	-4.15	0.71
TOTALS:							
Net Farm Income	32010.00	33599.60	35049.10	35540.60	32674.40	33774.75	-0.34
Consumer Surplus	-461.72	-594.95	-986.17	-1079.44	-1226.04	-869.66	2.26
Producer Surplus	441.37	-117.28	631.34	579.94	793.84	465.84	-0.37
Net Domestic Surplus	-20.36	-712.23	-354.83	-499.50	-432.20	-403.82	1.93
VALUE OF INFORMATION:							
Consumer Surplus	9.09	70.18	18.99	25.74	89.54	42.71	----
Producer Surplus	4.26	-55.70	12.46	30.83	-30.76	-7.78	----
Net Domestic Surplus	13.36	14.48	31.45	56.57	58.78	34.93	----

See footnotes at the end of Appendix A.

TABLE XXXVI

AVERAGES FOR SELECTED VARIABLES FOR THE FIVE YEARS SIMULATED AND THE FIVE YEAR AVERAGE, WITH T-STATISTIC, BY CROP, LOW ACCURACY LEVEL, HIGH CURRENT YEAR PRICE WEIGHT, LARGE SURPLUS WEIGHT, "WITH INFORMATION" CASE

VARIABLE [1]	1979	1980	1981	1982	1983	5 Year Average	t-Statistic [2]
WHEAT:							
Acres Harvested	66.17	65.64	64.02	64.41	66.53	65.35	1.77
Acres Set Aside	10.61	2.35	3.59	2.11	2.80	4.29	-1.13
Production	2114.74	2126.54	2092.94	2065.04	2126.19	2105.09	1.20
Total Supply	3038.74	2957.65	2958.20	2901.10	2886.63	2948.46	1.11
Domestic Demand	822.16	795.86	799.43	794.68	794.48	801.32	2.18
Ending Inventory	829.11	863.26	834.07	758.44	718.45	800.67	0.82
Reserve Actions [3]	15.42	54.77	35.67	50.83	42.94	39.93	0.00
Price	3.25	3.43	3.43	3.54	3.58	3.45	-1.90
Deficiency Pymts	317.21	83.53	124.82	62.57	58.04	129.23	-1.26
Total Gov't Cost	379.22	132.07	164.84	90.58	76.28	168.60	----
Consumer Surplus	-33.49	-49.33	-132.39	-193.60	-244.34	-130.63	0.93
Producer Surplus	-44.31	-152.20	249.94	257.22	299.84	122.10	-1.37
Domestic Surplus	-77.80	-201.53	117.56	63.63	55.50	-8.53	-1.37
SOYBEANS:							
Acres Harvested	73.58	68.87	67.87	66.18	66.71	68.64	1.18
Acres Set Aside	0.00	1.32	1.64	2.07	0.94	1.19	8.29
Production	2125.88	2038.68	2053.69	2047.33	2075.41	2068.20	1.07
Total Supply	2275.88	2200.53	2207.72	2215.15	2231.58	2226.17	4.41
Domestic Demand	1090.31	1094.38	1109.73	1151.26	1184.73	1126.08	1.38
Ending Inventory	161.85	154.03	167.82	156.17	151.90	158.36	7.68
Price	6.99	7.22	7.32	7.27	7.35	7.23	-2.84
Consumer Surplus	-439.25	-457.50	-215.81	-481.49	-589.46	-436.70	-1.52
Producer Surplus	409.99	45.91	-471.37	145.95	386.95	103.49	-2.36
Domestic Surplus	-29.27	-411.58	-687.18	-335.54	-202.50	-333.21	-6.48

TABLE XXXVI (Continued)

VARIABLE[1]	1979	1980	1981	1982	1983	5 Year Average	t-Statistic[2]
COTTON:							
Acres Harvested	12.74	11.29	11.49	11.50	11.48	11.70	1.40
Acres Set Aside	0.00	1.38	1.99	2.43	2.67	1.69	-0.15
Production	12.80	11.52	11.84	12.07	12.18	12.08	1.30
Total Supply	17.00	16.92	17.01	17.13	17.23	17.06	0.66
Domestic Demand	6.25	6.34	6.45	6.53	6.63	6.44	1.18
Ending Inventory	5.21	4.97	4.86	4.84	4.70	4.92	1.12
Reserve Actions[4]	-0.10	-0.03	0.01	0.02	0.00	-0.02	----
Price	0.56	0.57	0.58	0.60	0.61	0.58	-2.07
Deficiency Payments	137.23	385.28	372.91	474.81	466.64	367.38	1.46
Consumer Surplus	-123.33	-99.01	-6.67	85.51	57.24	-17.25	0.70
Producer Surplus	186.37	97.84	-80.26	-183.76	-124.62	-20.89	-0.74
Domestic Surplus	63.04	-1.17	-86.93	-98.25	-67.39	-38.14	-0.52
CORN:							
Acres Harvested	70.22	71.21	72.73	74.37	74.97	72.70	-3.31
Acres Set Aside	2.90	0.82	0.42	0.21	0.43	0.95	-2.81
Production	7138.36	7104.27	7242.63	7352.58	7346.76	7236.92	-2.62
Total Supply	8376.36	8180.07	8320.82	8484.66	8568.63	8386.11	-4.30
Domestic Demand	4801.44	4899.28	4899.11	4959.88	5024.89	4916.92	-4.87
Ending Inventory	1074.80	1077.20	1131.08	1220.87	1243.85	1149.56	-3.42
Reserve Actions[3]	2.99	79.55	21.48	10.37	9.87	24.85	0.67
Price	2.46	2.62	2.59	2.53	2.53	2.55	3.82
Deficiency Pymts	0.00	7.87	9.13	16.46	13.41	9.38	-5.21
Total Gov't Cost	154.72	137.63	126.03	123.86	118.41	132.13	----
Consumer Surplus	18.62	-43.23	-667.23	-685.32	-608.43	-397.12	-5.40
Producer Surplus	-62.49	-91.33	770.88	388.43	223.64	245.82	3.63
Domestic Surplus	-43.88	-134.56	103.65	-269.89	-384.79	-151.29	-2.30

TABLE XXXVI (Continued)

VARIABLE[1]	1979	1980	1981	1982	1983	5 Year Average	t-Statistic[2]
GRAIN SORGHUM:							
Acres Harvested	12.98	14.05	14.51	14.16	14.29	14.00	-0.37
Acres Set Aside	0.90	0.26	0.55	0.49	0.67	0.58	-2.15
Production	764.05	783.99	800.97	781.72	786.89	783.53	-0.25
Total Supply	951.05	923.06	938.43	928.09	932.08	934.54	-1.53
Domestic Demand	531.90	526.89	531.35	521.34	526.09	527.51	0.04
Ending Inventory	139.07	137.46	146.36	145.19	149.60	143.54	-2.51
Reserve Actions[3]	0.06	10.89	-5.04	0.02	5.20	2.23	1.35
Price	2.33	2.38	2.33	2.34	2.32	2.34	1.44
Deficiency Pymts	26.18	79.82	94.80	85.44	107.49	78.75	-1.80
Total Gov't Cost	51.91	104.18	118.83	109.67	130.52	103.02	----
Consumer Surplus	-62.95	-55.74	-83.03	-116.74	-101.25	-83.94	0.51
Producer Surplus	9.19	-52.06	30.64	-6.40	-38.06	-11.34	1.82
Domestic Surplus	-53.76	-107.80	-52.39	-123.14	-139.31	-95.28	1.54
OATS:							
Acres Harvested	10.07	12.09	11.88	12.06	12.00	11.62	-1.44
Acres Set Aside	0.00	0.18	0.15	0.02	0.01	0.07	1.42
Production	529.18	636.93	631.33	642.38	641.13	616.19	-1.18
Total Supply	838.18	850.75	855.93	861.96	866.71	854.71	-3.26
Domestic Demand	615.35	617.35	627.32	627.08	626.63	622.75	-0.02
Ending Inventory	212.82	223.60	218.59	224.58	229.75	221.87	-4.99
Price	1.29	1.34	1.33	1.36	1.35	1.34	4.08
Consumer Surplus	-0.23	-4.89	-3.70	-8.72	-19.12	-7.33	1.22
Producer Surplus	-2.61	-1.62	5.67	8.29	9.48	3.84	3.85
Domestic Surplus	-2.84	-6.52	1.98	-0.42	-9.63	-3.49	2.95

TABLE XXXVI (Continued)

VARIABLE[1]	1979	1980	1981	1982	1983	5 Year Average	t-Statistic[2]
BARLEY:							
Acres Harvested	7.38	8.13	8.53	8.40	8.62	8.21	0.88
Acres Set Aside	0.70	0.23	0.16	0.14	0.09	0.27	-1.29
Production	353.42	383.09	407.24	401.61	414.44	391.96	0.66
Total Supply	600.42	576.00	573.56	562.37	563.68	575.21	-0.01
Domestic Demand	368.35	367.72	368.45	365.81	366.48	367.36	0.48
Ending Inventory	182.91	156.32	150.76	139.24	139.81	153.81	-0.22
Price	2.04	2.14	2.13	2.17	2.25	2.15	0.40
Deficiency Payments	30.56	66.64	80.50	65.70	67.83	62.24	-0.22
Consumer Surplus	-0.41	-4.27	-2.65	-11.21	-14.09	-6.53	0.96
Producer Surplus	-2.67	-3.25	8.09	7.98	8.59	3.75	1.58
Net Domestic Surplus	-3.08	-7.52	5.44	-3.23	-5.50	-2.78	2.16
TOTALS:							
Net Farm Income	32040.20	33219.80	35125.00	35751.80	33110.60	33849.50	0.37
Consumer Surplus	-641.04	-713.97	-1111.48	-1411.56	-1519.44	-1079.50	-3.66
Producer Surplus	493.47	-156.71	513.60	617.72	765.81	446.78	-0.50
Net Domestic Surplus	-147.58	-870.68	-597.88	-793.85	-753.62	-632.72	-4.63
VALUE OF INFORMATION:							
Consumer Surplus	-168.58	-48.36	-105.49	-305.71	-200.10	-165.65	----
Producer Surplus	55.03	-93.42	-104.49	66.88	-64.73	-28.14	----
Net Domestic Surplus	-113.54	-141.78	-209.98	-238.83	-264.83	-193.79	----

See footnotes at the end of Appendix A.

TABLE XXXVII

AVERAGES FOR SELECTED VARIABLES FOR THE FIVE YEARS SIMULATED AND THE FIVE YEAR AVERAGE, WITH T-STATISTIC, BY CROP, HIGH ACCURACY LEVEL, HIGH CURRENT YEAR PRICE WEIGHT, LARGE SURPLUS WEIGHT, EXCESS SUPPLY-DEMAND SCENARIO, "WITH INFORMATION" CASE

VARIABLE [1]	1979	1980	1981	1982	1983	5 Year Average	t-Statistic [2]
WHEAT:							
Acres Harvested	65.74	61.22	57.90	56.78	57.74	59.87	2.28
Acres Set Aside	10.61	9.02	18.40	18.08	18.62	14.95	-1.84
Production	2176.00	2057.04	1962.69	1901.98	1934.21	2006.39	2.59
Total Supply	3100.00	3066.35	3074.92	3018.69	2999.70	3051.93	12.16
Domestic Demand	832.69	811.12	820.21	820.19	825.47	821.94	7.56
Ending Inventory	1007.31	1110.22	1114.70	1063.50	1049.24	1068.99	15.07
Reserve Actions [3]	0.00	0.00	0.00	0.00	0.00	0.00	----
Price	2.79	2.96	2.85	2.90	2.83	2.87	-18.54
Deficiency Pymts	950.90	819.38	1266.39	1148.31	1305.82	1098.16	20.82
Total Gov't Cost	1016.59	885.07	1332.08	1214.00	1371.51	1163.85	----
Consumer Surplus	205.24	337.46	390.07	480.29	578.27	398.27	12.21
Producer Surplus	-783.08	-1112.06	-993.75	-1106.44	-1306.23	-1060.31	-13.62
Domestic Surplus	-577.84	-774.59	-603.67	-626.15	-727.96	-662.04	-10.15
SOYBEANS:							
Acres Harvested	72.23	65.28	63.16	61.12	62.08	64.77	-0.36
Acres Set Aside	0.00	3.40	4.00	4.60	2.93	2.99	1.45
Production	2159.75	1990.97	1983.40	1974.11	2023.84	2026.41	-0.67
Total Supply	2309.75	2235.82	2218.91	2225.36	2264.38	2250.85	0.58
Domestic Demand	1144.90	1165.31	1167.66	1219.82	1263.98	1192.33	0.58
Ending Inventory	244.85	235.52	251.25	240.54	260.40	246.51	0.18
Price	6.01	6.27	6.62	6.36	6.33	6.32	-1.72
Consumer Surplus	672.09	1072.09	1258.24	993.39	1040.37	1007.24	-2.66
Producer Surplus	-1327.62	-1881.88	-2048.27	-1765.02	-1626.71	-1729.90	-0.67
Domestic Surplus	-655.54	-809.79	-790.03	-771.63	-586.34	-722.66	-2.84

TABLE XXXVII (Continued)

VARIABLE[1]	1979	1980	1981	1982	1983	5 Year Average	t-Statistic[2]
COTTON:							
Acres Harvested	12.65	10.31	10.18	10.25	10.29	10.74	1.30
Acres Set Aside	0.00	2.55	3.08	3.12	3.25	2.40	-2.17
Production	13.16	10.90	10.98	11.28	11.32	11.52	1.72
Total Supply	17.36	17.19	17.02	17.07	17.11	17.15	-13.17
Domestic Demand	6.32	6.44	6.53	6.62	6.72	6.53	2.93
Ending Inventory	6.09	5.85	5.59	5.60	5.54	5.73	-11.49
Reserve Actions[4]	-0.08	0.00	0.00	0.00	0.00	-0.02	----
Price	0.50	0.51	0.53	0.54	0.55	0.53	-13.24
Deficiency Payments	269.28	795.18	735.58	841.89	831.23	700.03	4.76
Consumer Surplus	47.49	147.63	248.39	379.66	366.31	237.90	8.92
Producer Surplus	-53.98	-171.83	-273.61	-414.19	-384.80	-259.68	-11.49
Domestic Surplus	-6.49	-24.20	-25.22	-34.53	-18.49	-21.78	-20.39
CORN:							
Acres Harvested	70.66	68.32	70.16	72.45	72.03	70.72	1.19
Acres Set Aside	2.90	6.37	3.96	2.97	5.23	4.29	1.52
Production	7419.53	7077.43	7261.68	7470.05	7382.99	7322.34	1.45
Total Supply	8657.53	8518.28	8664.85	8906.88	8983.29	8746.17	1.65
Domestic Demand	4967.68	5176.12	5269.01	5377.55	5444.29	5246.93	0.02
Ending Inventory	1439.85	1402.16	1435.84	1599.34	1649.04	1505.24	2.82
Reserve Actions[3]	-73.76	110.84	0.00	0.00	0.00	7.41	4.45
Price	2.20	2.35	2.27	2.23	2.24	2.26	-1.88
Deficiency Pymts	0.00	307.46	501.80	495.64	828.26	426.63	-2.73
Total Gov't Cost	141.70	421.45	615.79	609.63	942.24	546.16	----
Consumer Surplus	1019.67	1694.23	1451.85	1686.13	1837.47	1537.87	-2.59
Producer Surplus	-1306.32	-1657.60	-999.85	-1010.34	-1214.43	-1237.71	-3.18
Domestic Surplus	-286.65	36.64	452.00	675.79	623.04	300.16	-3.71

TABLE XXXVII (Continued)

VARIABLE [1]	1979	1980	1981	1982	1983	5 Year Average	t-Statistic [2]
GRAIN SORGHUM:							
Acres Harvested	13.04	13.49	14.21	13.99	14.19	13.78	1.41
Acres Set Aside	0.90	1.31	0.90	0.77	0.96	0.97	-8.77
Production	806.98	779.86	814.22	804.58	817.35	804.60	3.00
Total Supply	993.98	958.60	973.93	970.21	979.21	975.19	-0.25
Domestic Demand	565.25	569.88	583.30	588.35	591.10	579.38	3.89
Ending Inventory	178.74	159.71	165.63	161.86	178.11	168.81	-5.12
Reserve Actions [3]	-17.66	14.65	-0.74	0.00	0.00	-0.75	4.56
Price	2.09	2.24	2.11	2.13	2.13	2.14	-3.85
Deficiency Pymts	91.90	223.15	212.19	171.70	221.56	184.10	-4.99
Total Gov't Cost	111.32	238.90	228.13	187.64	237.50	200.70	----
Consumer Surplus	54.65	114.62	104.10	132.47	138.85	108.94	3.82
Producer Surplus	-78.66	-129.35	-75.87	-86.91	-90.92	-92.34	-7.27
Domestic Surplus	-24.01	-14.73	28.23	45.56	47.93	16.60	-1.30
OATS:							
Acres Harvested	10.07	11.81	11.33	11.56	11.57	11.27	-1.19
Acres Set Aside	0.00	0.68	0.95	0.56	0.49	0.54	-1.09
Production	548.92	648.40	623.10	636.00	636.16	618.52	-1.12
Total Supply	857.92	884.49	885.58	893.25	903.62	884.97	-3.04
Domestic Demand	613.83	614.21	620.73	618.39	620.60	617.55	-4.74
Ending Inventory	235.09	261.48	256.24	266.46	274.82	258.82	-2.39
Price	1.25	1.28	1.28	1.30	1.29	1.28	3.31
Consumer Surplus	-4.90	-11.69	-15.11	-23.32	-29.89	-16.98	-3.20
Producer Surplus	1.54	-8.51	-6.39	-4.98	-4.38	-4.54	1.50
Domestic Surplus	-3.36	-20.19	-21.50	-28.30	-34.27	-21.53	-1.99

TABLE XXXVII (Continued)

VARIABLE[1]	1979	1980	1981	1982	1983	5 Year Average	t-Statistic[2]
BARLEY:							
Acres Harvested	7.49	7.99	8.29	8.12	8.39	8.06	2.57
Acres Set Aside	0.70	0.63	0.69	0.74	0.63	0.68	-4.67
Production	369.16	390.59	410.37	405.82	423.86	399.96	2.26
Total Supply	616.16	602.31	603.30	597.54	607.03	605.27	5.30
Domestic Demand	369.44	373.38	375.58	377.36	381.20	375.39	1.61
Ending Inventory	201.72	182.93	181.72	173.18	177.84	183.48	2.62
Price	1.97	2.04	2.01	2.04	2.10	2.04	-2.21
Deficiency Payments	35.41	45.25	54.99	58.14	43.38	47.43	-2.48
Consumer Surplus	0.50	6.27	10.52	10.22	14.07	8.32	0.20
Producer Surplus	0.21	-16.80	-15.33	-14.15	-12.39	-11.69	-3.73
Net Domestic Surplus	0.70	-10.53	-4.81	-3.93	1.68	-3.38	-5.70
TOTALS:							
Net Farm Income	32183.60	29052.80	33552.50	30312.90	31335.70	31287.49	0.18
Consumer Surplus	1994.73	3360.62	3448.05	3658.83	3945.46	3281.54	2.12
Producer Surplus	-3547.91	-4978.02	-4413.05	-4402.02	-4639.86	-4396.17	-9.30
Net Domestic Surplus	-1553.18	-1617.40	-965.00	-743.19	-694.40	-1114.63	-6.98
VALUE OF INFORMATION:							
Consumer Surplus	-73.81	33.40	69.87	31.61	187.67	49.75	----
Producer Surplus	-29.83	7.72	-101.63	-345.74	-348.73	-163.64	----
Net Domestic Surplus	103.64	41.12	-31.76	-314.13	-161.06	-113.89	----

See footnotes at the end of Appendix A.

TABLE XXXVIII

AVERAGES FOR SELECTED VARIABLES FOR THE FIVE YEARS SIMULATED AND THE FIVE YEAR AVERAGES, BY CROP, EXCESS SUPPLY-DEMAND SCENARIO, "NO INFORMATION" CASE

VARIABLE[1]	1979	1980	1981	1982	1983	5 Year Average
WHEAT:						
Acres Harvested	66.60	59.89	57.48	56.18	57.74	59.58
Acres Set Aside	10.61	10.41	18.39	18.06	18.62	15.22
Production	2204.42	2012.14	1948.54	1882.03	1934.39	1996.30
Total Supply	3128.42	3047.88	3042.48	2969.17	2955.22	3028.63
Domestic Demand	834.68	810.93	817.35	815.34	820.78	819.82
Ending Inventory	1033.74	1091.95	1085.13	1018.83	1009.44	1047.82
Reserve Actions[3]	0.00	0.00	0.00	0.00	0.00	0.00
Price	2.74	3.01	2.92	3.01	2.93	2.92
Deficiency Pymts	1013.40	843.35	1095.94	878.91	1051.48	976.61
Total Gov't Cost	1079.08	909.03	1161.63	944.60	1117.17	1042.30
Consumer Surplus	251.30	347.47	326.73	367.80	464.19	351.50
Producer Surplus	-842.59	-1111.49	-890.06	-947.28	-1133.06	-984.90
Domestic Surplus	-591.28	-764.02	-563.33	-579.48	-668.88	-633.40
SOYBEANS:						
Acres Harvested	73.42	63.84	61.33	63.46	62.10	64.83
Acres Set Aside	0.00	4.54	3.66	2.76	3.54	2.90
Production	2195.24	1947.20	1925.82	2049.88	2024.29	2028.48
Total Supply	2345.24	2225.24	2150.78	2243.73	2283.83	2249.76
Domestic Demand	1147.20	1165.28	1156.93	1219.20	1268.41	1191.40
Ending Inventory	278.04	224.96	193.85	259.53	275.42	246.36
Price	5.96	6.29	6.88	6.32	6.24	6.34
Consumer Surplus	735.11	1107.18	1068.80	1006.94	1156.07	1014.82
Producer Surplus	-1292.32	-2083.77	-1873.70	-1545.73	-1820.94	-1723.29
Domestic Surplus	-557.21	-976.59	-804.90	-538.79	-664.86	-708.47

TABLE XXXVIII (Continued)

VARIABLE [1]	1979	1980	1981	1982	1983	5 Year Average
COTTON:						
Acres Harvested	13.16	10.21	9.99	9.89	10.16	10.68
Acres Set Aside	0.00	3.04	3.08	3.12	3.25	2.50
Production	13.70	10.79	10.77	10.88	11.17	11.46
Total Supply	17.90	17.62	17.24	16.90	16.84	17.30
Domestic Demand	6.32	6.44	6.53	6.59	6.69	6.51
Ending Inventory	6.63	6.27	5.81	5.46	5.30	5.89
Reserve Actions [4]	-0.42	0.00	0.00	0.00	0.00	-0.08
Price	0.50	0.51	0.53	0.57	0.57	0.54
Deficiency Payments	284.36	901.89	733.87	699.52	701.45	664.22
Consumer Surplus	45.96	167.47	240.81	286.10	269.74	202.02
Producer Surplus	-5.61	-205.45	-251.89	-284.86	-295.58	-208.68
Domestic Surplus	40.36	-37.98	-11.08	1.24	-25.85	-6.66
CORN:						
Acres Harvested	69.63	69.33	70.93	71.58	71.88	70.67
Acres Set Aside	2.90	4.82	4.39	4.34	4.68	4.22
Production	7311.07	7182.16	7341.49	7379.45	7367.94	7316.42
Total Supply	8549.07	8528.28	8770.00	8896.36	8934.88	8735.72
Domestic Demand	4953.94	5160.77	5294.10	5400.42	5424.62	5246.77
Ending Inventory	1345.13	1427.52	1515.91	1565.94	1620.26	1494.95
Reserve Actions [3]	0.00	1.64	0.00	0.00	0.00	0.33
Price	2.23	2.36	2.24	2.22	2.28	2.26
Deficiency Pymts	0.00	220.00	723.71	768.23	564.46	455.28
Total Gov't Cost	123.26	342.84	846.56	891.08	687.31	578.21
Consumer Surplus	982.84	1590.02	1642.84	1864.24	1750.65	1566.12
Producer Surplus	-1299.56	-1447.85	-1196.95	-1185.43	-935.48	-1213.05
Domestic Surplus	-316.72	142.17	445.89	678.82	815.17	353.07

TABLE XXXVIII (Continued)

VARIABLE [1]	1979	1980	1981	1982	1983	5 Year Average
GRAIN SORGHUM:						
Acres Harvested	12.96	13.60	14.36	13.80	14.08	13.76
Acres Set Aside	0.90	1.15	0.92	1.06	1.07	1.02
Production	802.25	786.16	822.58	793.80	811.02	803.16
Total Supply	989.25	959.51	982.81	968.68	976.21	975.29
Domestic Demand	565.91	569.29	582.92	583.48	588.39	578.00
Ending Inventory	173.35	160.23	174.89	165.20	177.83	170.30
Reserve Actions [3]	-15.27	12.46	-9.68	0.02	0.00	-2.49
Price	2.09	2.24	2.10	2.17	2.14	2.15
Deficiency Pymts	92.10	194.89	218.37	221.73	240.93	193.60
Total Gov't Cost	110.92	210.61	236.52	239.88	259.07	211.40
Consumer Surplus	57.94	116.29	104.58	116.45	129.95	105.04
Producer Surplus	-82.04	-119.05	-72.51	-72.64	-89.08	-87.07
Domestic Surplus	-24.10	-2.76	32.06	43.80	40.87	17.98
OATS:						
Acres Harvested	10.04	11.84	11.37	11.54	11.68	11.30
Acres Set Aside	0.00	0.62	0.93	0.64	0.56	0.55
Production	547.18	650.21	625.56	634.71	642.44	620.02
Total Supply	856.18	884.48	887.33	894.30	911.82	886.82
Domestic Demand	613.91	614.92	620.13	617.52	624.25	618.15
Ending Inventory	233.27	260.76	258.59	268.38	279.37	260.07
Price	1.26	1.29	1.27	1.30	1.28	1.28
Consumer Surplus	-4.42	-9.68	-16.22	-24.96	-24.65	-15.99
Producer Surplus	3.11	-6.33	-7.59	-6.88	-6.04	-4.74
Domestic Surplus	-1.31	-16.01	-23.81	-31.84	-30.70	-20.73

TABLE XXXVIII (Continued)

VARIABLE[1]	1979	1980	1981	1982	1983	5 Year Average
BARLEY:						
Acres Harvested	7.43	8.12	8.23	8.12	8.23	8.03
Acres Set Aside	0.70	0.55	0.80	0.76	0.65	0.69
Production	366.30	397.12	407.37	405.99	415.60	398.48
Total Supply	613.30	606.45	603.42	598.04	599.31	604.10
Domestic Demand	368.97	374.40	375.37	377.33	379.77	375.17
Ending Inventory	199.32	186.05	182.05	173.70	171.54	182.53
Price	1.98	2.03	2.01	2.04	2.12	2.04
Deficiency Payments	34.67	39.20	64.98	59.47	43.54	48.37
Consumer Surplus	-0.06	8.66	10.47	10.49	11.84	8.28
Producer Surplus	0.66	-12.30	-18.08	-13.32	-11.18	-10.84
Net Domestic Surplus	0.61	-3.64	-7.61	-2.83	0.66	-2.56
TOTALS:						
Net Farm Income	32187.70	29392.70	33547.40	30259.80	31000.90	31277.69
Consumer Surplus	2068.68	3327.41	3378.00	3627.06	3757.79	3231.79
Producer Surplus	-3518.35	-4986.22	-4310.77	-4056.14	-4291.37	-4232.57
Net Domestic Surplus	-1449.67	-1658.81	-932.77	-429.08	-533.58	-1000.78

See footnotes at the end of Appendix A.

TABLE XXXIX

AVERAGES FOR SELECTED VARIABLES FOR THE FIVE YEARS SIMULATED AND THE FIVE YEAR AVERAGE, WITH T-STATISTIC, BY CROP, HIGH ACCURACY LEVEL, HIGH CURRENT YEAR PRICE WEIGHT, LARGE SURPLUS WEIGHT, TIGHT SUPPLY-DEMAND SCENARIO, "WITH INFORMATION" CASE

VARIABLE [1]	1979	1980	1981	1982	1983	5 Year Average	t-Statistic [2]
WHEAT:							
Acres Harvested	67.25	67.82	69.34	72.38	72.72	69.90	2.65
Acres Set Aside	10.61	0.00	0.00	0.00	0.00	2.12	0.00
Production	2077.99	2122.92	2170.38	2214.99	2225.09	2162.27	3.12
Total Supply	3001.99	2771.37	2700.31	2627.47	2549.36	2730.10	7.07
Domestic Demand	815.54	783.44	779.83	751.40	694.60	764.96	10.82
Ending Inventory	646.45	527.94	410.48	322.27	301.00	441.63	4.53
Reserve Actions [3]	99.21	207.51	5.73	0.00	0.00	62.49	-0.02
Price	3.54	3.55	4.09	4.88	5.70	4.35	-4.35
Deficiency Pymts	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total Gov't Cost	40.96	1.42	0.00	0.00	0.00	8.48	----
Consumer Surplus	-187.09	-329.45	-638.98	-1253.33	-2235.93	-928.95	13.73
Producer Surplus	463.85	-3.45	1757.17	3310.36	4563.94	2018.37	-2.86
Domestic Surplus	276.77	-332.90	1118.19	2057.03	2328.01	1089.42	6.50
SOYBEANS:							
Acres Harvested	73.97	70.30	67.73	66.11	66.03	68.83	-18.09
Acres Set Aside	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Production	2078.40	2003.64	1964.29	1956.84	1967.71	1994.18	-34.21
Total Supply	2228.40	2093.74	2054.29	2046.84	2057.71	2096.19	-23.50
Domestic Demand	1024.76	974.18	945.33	946.53	957.29	969.62	-37.12
Ending Inventory	90.10	90.00	90.00	90.00	90.00	90.02	1.99
Price	8.26	8.99	9.64	9.69	9.83	9.28	23.51
Consumer Surplus	-1458.85	-2386.58	-2785.01	-3483.79	-3990.45	-2820.94	-8.44
Producer Surplus	2693.14	3082.23	2985.85	3739.43	3988.33	3297.79	12.91
Domestic Surplus	1234.28	695.65	200.84	255.64	-2.13	476.86	0.58

TABLE XXXIX (Continued)

VARIABLE[1]	1979	1980	1981	1982	1983	5 Year Average	t-Statistic
COTTON:							
Acres Harvested	12.52	12.10	12.78	12.75	12.81	12.59	6.73
Acres Set Aside	0.00	0.01	0.52	1.48	1.86	0.77	-4.55
Production	12.27	11.92	12.72	12.85	13.16	12.58	5.77
Total Supply	16.47	16.31	16.69	16.89	17.13	16.70	0.11
Domestic Demand	6.18	6.24	6.34	6.43	6.51	6.34	-0.78
Ending Inventory	4.19	3.77	3.85	3.76	3.62	3.84	0.26
Reserve Actions[4]	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Price	0.62	0.65	0.64	0.66	0.69	0.65	-3.05
Deficiency Payments	0.00	78.82	37.14	119.37	65.66	60.20	12.63
Consumer Surplus	-258.92	-341.79	-238.09	-176.54	-261.01	-255.27	8.57
Producer Surplus	420.17	428.14	202.78	92.08	272.09	283.05	-8.36
Domestic Surplus	161.25	86.35	-35.30	-84.46	11.07	27.78	-6.24
CORN:							
Acres Harvested	70.18	71.88	74.15	75.55	76.49	73.65	10.31
Acres Set Aside	2.90	0.00	0.00	0.00	0.00	0.58	0.00
Production	6948.16	6943.62	7088.36	7116.41	7167.51	7052.81	24.87
Total Supply	8186.16	7768.66	7716.66	7636.33	7664.94	7794.55	14.62
Domestic Demand	4612.11	4676.36	4597.74	4469.90	4447.12	4560.65	17.74
Ending Inventory	824.04	627.30	518.93	496.43	502.82	593.90	10.60
Reserve Actions[3]	84.94	350.38	57.70	0.00	0.00	98.60	0.00
Price	2.74	2.75	2.89	2.99	3.02	2.88	-10.49
Deficiency Pymts	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total Gov't Cost	102.02	14.42	0.00	0.00	0.00	23.29	----
Consumer Surplus	-960.03	-1386.67	-2318.80	-3222.18	-3631.08	-2303.75	10.84
Producer Surplus	1392.52	299.10	2248.03	2695.25	2674.03	1861.79	-5.85
Domestic Surplus	432.49	-1087.58	-70.77	-526.92	-957.05	-441.96	10.41

TABLE XXXIX (Continued)

VARIABLE [1]	1979	1980	1981	1982	1983	5 Year Average	t-Statistic
GRAIN SORGHUM:							
Acres Harvested	12.95	14.21	14.85	14.47	14.80	14.26	2.91
Acres Set Aside	0.90	0.00	0.00	0.00	0.00	0.18	0.00
Production	755.08	765.93	785.74	759.60	779.90	769.25	7.95
Total Supply	942.08	895.93	907.90	881.76	900.22	905.58	6.73
Domestic Demand	509.74	489.64	492.55	472.39	491.91	491.25	-1.36
Ending Inventory	130.00	122.16	122.16	120.32	107.67	120.46	13.99
Reserve Actions [3]	0.00	7.83	0.00	1.85	12.64	4.47	-13.03
Price	2.53	2.59	2.52	2.61	2.50	2.55	-0.83
Deficiency Pymts	0.00	0.00	11.17	0.00	19.17	6.07	-0.82
Total Gov't Cost	15.00	13.04	24.21	12.58	28.59	18.68	----
Consumer Surplus	-137.73	-192.76	-210.12	-283.16	-232.48	-211.25	5.29
Producer Surplus	142.80	52.80	125.75	116.01	48.82	97.24	1.10
Domestic Surplus	5.07	-139.96	-84.37	-167.15	-183.65	-114.01	4.27
OATS:							
Acres Harvested	10.06	12.18	12.00	12.08	12.06	11.67	-0.14
Acres Set Aside	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Production	515.90	622.20	618.02	623.10	623.38	600.52	0.05
Total Supply	824.90	816.43	805.76	794.71	786.41	805.64	2.06
Domestic Demand	620.67	618.49	623.74	621.20	612.79	619.38	-1.47
Ending Inventory	193.23	186.74	170.62	162.03	162.00	174.92	2.78
Price	1.32	1.40	1.40	1.46	1.47	1.41	-1.63
Consumer Surplus	7.29	-2.31	-9.13	-17.70	-39.85	-12.34	1.62
Producer Surplus	-2.46	8.22	21.43	36.69	44.94	21.76	-0.75
Domestic Surplus	4.83	5.91	12.30	18.99	5.09	9.42	1.81

TABLE XXXIX (Continued)

VARIABLE[1]	1979	1980	1981	1982	1983	5 Year Average	t-Statistic[2]
BARLEY:							
Acres Harvested	7.25	8.20	8.32	7.97	8.34	8.02	2.79
Acres Set Aside	0.70	0.00	0.00	0.00	0.00	0.14	0.00
Production	337.31	373.80	380.34	364.37	385.50	368.26	3.14
Total Supply	584.31	545.86	518.82	477.99	497.50	524.89	-0.40
Domestic Demand	367.26	359.38	353.51	317.76	329.05	345.39	1.65
Ending Inventory	162.05	128.48	103.62	102.00	102.24	119.68	-2.92
Price	2.12	2.24	2.30	2.50	2.46	2.32	-5.52
Deficiency Payments	25.13	79.48	66.26	18.36	29.00	43.65	2.00
Consumer Surplus	-1.92	-19.80	-28.21	-87.74	-82.14	-43.96	3.65
Producer Surplus	-3.93	9.85	21.71	52.91	16.26	19.36	-12.11
Net Domestic Surplus	-5.85	-9.95	-6.51	-34.83	-65.88	-24.60	-4.79
TOTALS:							
Net Farm Income	32287.60	39175.90	36984.60	46145.60	42171.10	39352.93	-1.41
Consumer Surplus	-2997.25	-4659.34	-6228.34	-8524.43	-10472.92	-6576.46	7.11
Producer Surplus	5106.09	3876.87	7362.71	10042.73	11608.39	7599.36	-2.00
Net Domestic Surplus	2108.83	-782.48	1134.37	1518.30	1135.47	1022.90	10.64
VALUE OF INFORMATION:							
Consumer Surplus	448.03	179.11	580.94	2187.47	308.94	740.90	----
Producer Surplus	9.21	401.17	-1200.21	-2617.36	2266.72	-228.09	----
Net Domestic Surplus	457.24	580.28	-619.27	-429.89	2575.67	512.80	----

See footnotes at the end of Appendix A.

TABLE XL

AVERAGES FOR SELECTED VARIABLES FOR THE FIVE YEARS SIMULATED AND THE FIVE YEAR AVERAGES, BY CROP, TIGHT SUPPLY-DEMAND SCENARIO, "NO INFORMATION" CASE

VARIABLE[1]	1979	1980	1981	1982	1983	5 Year Average
WHEAT:						
Acres Harvested	66.60	67.53	65.51	69.43	78.59	69.53
Acres Set Aside	10.61	0.00	0.00	0.00	0.00	2.12
Production	2057.91	2113.76	2050.42	2124.65	2404.84	2150.31
Total Supply	2981.91	2747.76	2560.99	2426.65	2706.84	2684.83
Domestic Demand	809.90	779.19	755.13	661.66	722.70	745.72
Ending Inventory	632.00	508.57	300.00	300.00	359.14	419.94
Reserve Actions[3]	118.68	194.07	0.00	0.00	0.00	62.55
Price	3.56	3.61	4.84	6.35	4.17	4.51
Deficiency Pymts	0.00	0.00	0.00	0.00	0.00	0.00
Total Gov't Cost	38.74	0.00	0.00	0.00	0.00	7.75
Consumer Surplus	-314.59	-451.55	-1139.02	-3212.49	-1939.60	-1411.45
Producer Surplus	440.84	74.52	2915.03	6024.16	1670.56	2225.02
Domestic Surplus	126.26	-377.03	1776.00	2811.68	-269.05	813.57
SOYBEANS:						
Acres Harvested	73.42	71.41	70.34	68.83	68.69	70.54
Acres Set Aside	0.00	0.00	0.00	0.00	0.00	0.00
Production	2063.08	2035.21	2039.83	2037.26	2047.04	2044.48
Total Supply	2213.08	2125.21	2129.83	2127.26	2137.04	2146.48
Domestic Demand	1014.03	995.43	1000.66	1008.42	1019.43	1007.60
Ending Inventory	90.00	90.00	90.00	90.00	90.00	90.00
Price	8.41	8.63	8.87	9.06	9.26	8.85
Consumer Surplus	-1767.67	-2283.34	-2245.99	-3012.49	-3575.88	-2577.07
Producer Surplus	2963.22	2702.55	2285.68	3454.64	3818.39	3044.90
Domestic Surplus	1195.55	419.21	39.69	442.15	242.52	467.82

TABLE XL (Continued)

VARIABLE [1]	1979	1980	1981	1982	1983	5 Year Average
COTTON:						
Acres Harvested	13.16	11.74	12.68	12.37	12.54	12.50
Acres Set Aside	0.00	0.68	0.76	1.55	1.44	0.89
Production	12.90	11.56	12.62	12.46	12.89	12.48
Total Supply	17.10	16.52	16.76	16.56	16.54	16.70
Domestic Demand	6.24	6.27	6.36	6.41	6.43	6.34
Ending Inventory	4.76	3.95	3.90	3.46	3.11	3.83
Reserve Actions [4]	0.00	0.00	0.00	0.00	0.00	0.00
Price	0.57	0.63	0.64	0.69	0.76	0.66
Deficiency Payments	33.42	78.52	57.73	32.68	0.00	40.47
Consumer Surplus	-146.07	-285.24	-238.41	-258.45	-492.51	-284.14
Producer Surplus	203.02	363.07	212.80	228.35	644.23	330.29
Domestic Surplus	56.95	77.83	-25.61	-30.10	151.72	46.16
CORN:						
Acres Harvested	69.63	71.27	73.06	75.28	74.77	72.80
Acres Set Aside	2.90	0.00	0.00	0.00	0.00	0.58
Production	6893.30	6884.86	6984.69	7091.73	7006.25	6972.16
Total Supply	8131.30	7663.06	7539.65	7547.96	7498.72	7676.14
Domestic Demand	4604.09	4644.11	4484.42	4386.48	4332.04	4490.23
Ending Inventory	777.21	553.96	455.23	491.48	451.68	545.91
Reserve Actions [3]	124.53	368.48	0.00	0.00	0.00	98.60
Price	2.75	2.77	3.02	3.00	3.11	2.93
Deficiency Pymts	0.00	0.00	0.00	0.00	0.00	0.00
Total Gov't Cost	92.12	0.00	0.00	0.00	0.00	18.42
Consumer Surplus	-1074.46	-1599.17	-2957.70	-3816.36	-4350.29	-2759.60
Producer Surplus	1347.71	274.81	2961.39	2737.92	3069.71	2078.31
Domestic Surplus	273.24	-1324.35	3.70	-1078.44	-1280.58	-681.29

TABLE XL (Continued)

VARIABLE [1]	1979	1980	1981	1982	1983	5 Year Average
GRAIN SORGHUM:						
Acres Harvested	12.96	14.16	14.96	14.41	14.43	14.18
Acres Set Aside	0.90	0.00	0.00	0.00	0.00	0.18
Production	755.59	763.39	791.28	756.39	760.50	765.43
Total Supply	942.59	893.39	910.78	875.89	876.93	899.92
Domestic Demand	510.24	489.89	497.77	470.87	490.57	491.87
Ending Inventory	130.00	119.50	119.50	116.43	86.42	114.37
Reserve Actions [3]	0.00	10.50	0.00	3.07	30.00	8.71
Price	2.52	2.59	2.52	2.62	2.51	2.55
Deficiency Pymts	0.00	0.00	12.82	0.00	18.76	6.32
Total Gov't Cost	15.00	12.38	25.20	11.61	22.86	17.41
Consumer Surplus	-150.52	-201.74	-209.27	-302.24	-239.86	-220.73
Producer Surplus	145.75	49.28	132.45	124.56	25.24	95.45
Domestic Surplus	-4.77	-152.46	-76.82	-177.68	-214.62	-125.27
OATS:						
Acres Harvested	10.04	12.20	12.02	12.09	12.03	11.68
Acres Set Aside	0.00	0.00	0.00	0.00	0.00	0.00
Production	515.05	623.65	619.29	623.92	621.76	600.73
Total Supply	824.05	816.90	806.24	790.80	784.76	804.55
Domestic Demand	620.80	619.75	628.96	617.47	611.27	619.65
Ending Inventory	192.25	185.95	165.88	162.00	162.00	173.62
Price	1.32	1.40	1.41	1.47	1.47	1.41
Consumer Surplus	6.83	-1.58	-1.80	-25.04	-45.37	-13.39
Producer Surplus	-3.09	8.31	25.19	41.61	39.22	22.25
Domestic Surplus	3.74	6.73	23.39	16.57	-6.15	8.86

TABLE XL (Continued)

VARIABLE[1]	1979	1980	1981	1982	1983	5 Year Average
BARLEY:						
Acres Harvested	7.43	8.15	8.61	8.06	7.63	7.98
Acres Set Aside	0.70	0.00	0.00	0.00	0.00	0.14
Production	345.49	371.46	393.50	368.29	352.52	366.25
Total Supply	592.49	549.18	533.06	488.28	464.52	525.51
Domestic Demand	369.77	361.62	361.08	327.17	300.33	343.99
Ending Inventory	167.72	129.56	109.99	102.00	102.00	122.25
Price	2.10	2.24	2.27	2.45	2.75	2.36
Deficiency Payments	26.33	83.70	71.06	26.81	0.00	41.58
Consumer Surplus	1.45	-16.24	-17.07	-82.29	-135.10	-49.85
Producer Surplus	-1.02	4.63	28.16	43.91	73.04	29.74
Net Domestic Surplus	0.43	-11.61	11.10	-38.38	-62.07	-20.10
TOTALS:						
Net Farm Income	32179.10	39168.70	37450.70	49678.40	39633.00	39621.98
Consumer Surplus	-3445.04	-4838.84	-6809.25	-10709.34	-10778.61	-7316.21
Producer Surplus	5096.41	3477.16	8560.69	12655.14	9340.38	7825.96
Net Domestic Surplus	1651.38	-1361.68	1751.44	1945.81	-1438.23	509.75

See footnotes at the end of Appendix A.

TABLE XLI

AVERAGES FOR SELECTED VARIABLES FOR THE FIVE YEARS SIMULATED AND THE FIVE YEAR AVERAGE, WITH T-STATISTIC, BY CROP, HIGH ACCURACY LEVEL, HIGH CURRENT YEAR PRICE WEIGHT, LARGE SURPLUS WEIGHT, FLUCTUATING SUPPLY-DEMAND SCENARIO, "WITH INFORMATION" CASE

VARIABLE [1]	1979	1980	1981	1982	1983	5 Year Average	t-Statistic [2]
WHEAT:							
Acres Harvested	65.61	60.92	63.96	64.56	58.60	63.88	-4.16
Acres Set Aside	10.61	10.27	0.00	0.00	0.00	4.18	-1.63
Production	2171.72	1906.66	2001.94	2162.90	2155.87	2079.82	-3.20
Total Supply	3095.72	2940.25	2685.45	2565.28	2798.80	2817.10	-1.12
Domestic Demand	834.12	798.74	775.07	789.34	814.43	802.34	12.05
Ending Inventory	1031.59	681.51	400.38	640.94	859.38	722.76	-2.78
Reserve Actions [3]	0.00	179.50	132.85	0.00	-28.36	56.80	4.96
Price	2.75	3.51	4.19	3.18	2.57	3.24	-4.71
Deficiency Pymts	1021.23	0.00	0.00	186.82	467.58	335.13	-9.90
Total Gov't Cost	1086.92	20.81	0.00	186.82	474.67	353.84	----
Consumer Surplus	237.61	16.40	-683.00	-303.10	300.83	-86.25	13.86
Producer Surplus	-885.85	-496.11	1488.39	-266.93	-1685.79	-369.26	-3.91
Domestic Surplus	-648.24	-479.70	805.39	-570.03	-1384.96	-455.51	1.96
SOYBEANS:							
Acres Harvested	72.17	68.48	68.45	66.66	62.36	67.63	3.84
Acres Set Aside	0.00	3.93	0.00	0.00	5.06	1.80	-2.91
Production	2158.00	1951.80	1984.93	2153.20	2033.10	2056.20	3.72
Total Supply	2308.00	2212.27	2074.94	2243.20	2340.13	2235.71	2.47
Domestic Demand	1147.52	1069.96	968.36	1171.17	1268.08	1125.02	2.01
Ending Inventory	260.47	90.01	90.00	307.03	332.05	215.91	-0.19
Price	5.96	8.17	9.76	5.98	5.93	7.16	-1.24
Consumer Surplus	727.32	-1008.44	-2622.53	29.92	1104.83	-353.78	2.89
Producer Surplus	-1460.62	1456.71	3641.68	-2033.63	-2448.48	-168.87	0.07
Domestic Surplus	-733.29	448.27	1019.15	-2003.70	-1343.65	-522.64	4.54

TABLE XLI (Continued)

VARIABLE [1]	1979	1980	1981	1982	1983	5 Year Average	t-Statistic [2]
COTTON:							
Acres Harvested	12.67	10.27	11.85	12.70	11.37	11.77	-3.18
Acres Set Aside	0.00	2.79	0.80	0.59	3.25	1.49	-2.03
Production	13.18	10.11	11.79	13.97	12.51	12.31	-2.63
Total Supply	17.38	16.58	15.97	17.36	18.72	17.20	-8.73
Domestic Demand	6.32	6.30	6.27	6.55	6.73	6.44	0.69
Ending Inventory	6.26	3.98	3.20	6.01	7.19	5.33	-5.85
Reserve Actions [4]	-0.01	0.01	0.00	0.00	0.00	0.00	----
Price	0.50	0.63	0.73	0.52	0.52	0.58	-0.33
Deficiency Payments	297.57	243.14	0.22	217.06	976.62	346.92	-2.39
Consumer Surplus	48.83	-196.40	-427.81	181.96	401.28	1.57	2.48
Producer Surplus	-55.32	223.27	627.00	-547.21	-572.02	-64.86	-1.07
Domestic Surplus	-6.49	26.87	199.18	-365.25	-170.74	-63.29	1.33
CORN:							
Acres Harvested	70.66	66.24	72.04	75.10	75.80	71.97	-2.36
Acres Set Aside	2.90	7.23	0.00	0.00	0.01	2.03	4.08
Production	7419.18	6398.78	6887.28	7742.63	7769.94	7243.56	-1.37
Total Supply	8657.18	7891.27	7452.00	8143.98	9043.27	8237.54	-0.50
Domestic Demand	4965.69	4862.56	4460.36	4941.66	5374.40	4920.93	-2.16
Ending Inventory	1491.48	563.71	400.35	1272.32	1778.87	1101.35	0.60
Reserve Actions [3]	-126.98	620.00	0.00	-193.75	-143.22	31.21	0.42
Price	2.20	2.67	3.16	2.21	2.08	2.46	0.04
Deficiency Pymts	0.00	0.00	0.00	230.77	459.95	138.14	-0.51
Total Gov't Cost	155.00	0.00	0.00	279.20	544.19	195.68	----
Consumer Surplus	1019.53	-116.33	-2987.69	-853.14	1424.54	-302.62	-1.64
Producer Surplus	-1349.16	-1032.54	3862.46	-1444.20	-2299.34	-452.56	-0.78
Domestic Surplus	-329.63	-1148.87	874.77	-2297.35	-874.80	-755.18	-4.18

TABLE XLI (Continued)

VARIABLE [1]	1979	1980	1981	1982	1983	5 Year Average	t-Statistic [2]
GRAIN SORGHUM:							
Acres Harvested	13.04	13.16	14.57	14.54	14.81	14.02	-1.01
Acres Set Aside	0.90	1.48	0.00	0.00	0.21	0.52	3.25
Production	807.34	709.58	770.53	835.99	852.81	795.25	-0.71
Total Supply	994.34	894.18	819.64	885.05	989.70	916.58	-0.95
Domestic Demand	564.75	555.51	485.24	528.16	580.99	542.93	-1.43
Ending Inventory	184.59	49.11	49.06	136.89	198.71	123.67	-0.19
Reserve Actions [3]	-23.92	104.86	0.00	-60.43	0.00	4.10	-0.87
Price	2.09	2.34	2.74	2.10	1.99	2.25	-0.01
Deficiency Pymts	91.71	169.61	0.00	137.97	58.65	91.59	4.77
Total Gov't Cost	112.69	169.61	0.00	153.08	73.76	101.83	----
Consumer Surplus	53.46	62.90	-243.48	-99.24	99.01	-25.47	-0.84
Producer Surplus	-79.33	-193.55	292.13	-118.09	-187.61	-57.29	-0.78
Domestic Surplus	-25.86	-130.65	48.65	-217.33	-88.60	-82.76	-2.76
OATS:							
Acres Harvested	10.07	11.78	11.85	12.05	12.10	11.57	-0.84
Acres Set Aside	0.00	0.68	0.00	0.00	0.00	0.14	0.54
Production	549.01	601.84	610.33	662.84	665.57	617.92	-0.77
Total Supply	858.01	838.12	824.83	839.28	875.83	847.21	-5.63
Domestic Demand	613.94	613.42	637.98	621.62	604.65	618.32	-1.95
Ending Inventory	235.27	213.50	175.44	209.26	262.98	219.29	-2.64
Price	1.25	1.36	1.40	1.38	1.30	1.34	2.03
Consumer Surplus	-4.88	-10.94	13.53	-20.32	-54.30	-15.38	-1.51
Producer Surplus	1.31	-21.21	19.89	45.61	0.07	9.13	1.91
Domestic Surplus	-3.57	-32.15	33.43	25.29	-54.23	-6.25	0.28

TABLE XLI (Continued)

VARIABLE[1]	1979	1980	1981	1982	1983	5 Year Average	t-Statistic[2]
BARLEY:							
Acres Harvested	7.50	7.88	8.30	8.62	9.06	8.27	6.81
Acres Set Aside	0.70	0.67	0.00	0.00	0.00	0.27	1.43
Production	369.99	359.44	379.10	430.89	457.65	399.41	6.02
Total Supply	616.99	572.46	534.03	547.34	611.13	576.39	7.99
Domestic Demand	369.96	369.54	365.60	356.86	373.82	367.16	6.94
Ending Inventory	203.02	144.93	106.45	143.48	189.31	157.44	4.11
Price	1.97	2.18	2.28	2.15	2.06	2.13	-5.15
Deficiency Payments	35.81	40.06	76.78	77.92	127.47	71.61	4.91
Consumer Surplus	1.35	-0.54	-6.71	-32.46	-1.25	-7.92	5.20
Producer Surplus	-0.59	-25.25	20.41	44.14	-6.33	6.47	-1.13
Net Domestic Surplus	0.76	-25.79	13.70	11.68	-7.58	-1.45	3.41
TOTALS:							
Net Farm Income	32176.20	28176.40	39283.20	44146.20	23030.80	33362.55	-0.81
Consumer Surplus	2083.23	-1253.35	-6957.68	-1096.37	3274.94	-789.84	2.78
Producer Surplus	-3829.57	-88.68	9951.95	-4320.30	-7199.48	-1097.22	-1.34
Net Domestic Surplus	1746.34	-1342.03	2994.27	-5416.67	-3924.54	-1887.06	0.68
VALUE OF INFORMATION:							
Consumer Surplus	-215.59	794.32	670.26	331.86	284.69	373.11	----
Producer Surplus	245.76	-550.59	-889.96	-145.72	-160.05	-300.11	----
Net Domestic Surplus	30.17	243.73	-219.70	186.14	124.64	72.99	----

See footnotes at the end of Appendix A.

TABLE XLII

AVERAGES FOR SELECTED VARIABLES FOR THE FIVE YEARS SIMULATED AND THE FIVE YEAR AVERAGES, BY CROP, FLUCTUATING SUPPLY-DEMAND SCENARIO, "NO INFORMATION" CASE

VARIABLE[1]	1979	1980	1981	1982	1983	5 Year Average
WHEAT:						
Acres Harvested	66.60	58.82	59.91	68.71	67.76	64.36
Acres Set Aside	10.61	11.86	0.00	0.00	0.00	4.49
Production	2204.42	1841.06	1875.15	2301.83	2270.09	2098.51
Total Supply	3128.42	2905.12	2519.87	2603.83	2969.03	2825.26
Domestic Demand	836.36	802.40	732.14	771.90	804.83	789.53
Ending Inventory	1062.06	642.73	300.00	696.94	1039.19	748.18
Reserve Actions[3]	0.00	260.80	51.95	0.00	-125.99	37.35
Price	2.68	3.19	5.49	3.03	2.56	3.39
Deficiency Pymts	1119.26	474.86	0.00	284.53	477.17	471.16
Total Gov't Cost	1184.94	487.85	0.00	284.53	508.67	493.20
Consumer Surplus	290.22	129.50	-1650.90	-719.71	52.70	-379.64
Producer Surplus	-993.71	-1243.53	3588.84	-473.09	-1624.90	-149.28
Domestic Surplus	-703.49	-1114.03	1937.94	-1192.80	-1572.20	-528.92
SOYBEANS:						
Acres Harvested	73.42	63.23	70.52	67.08	61.11	67.07
Acres Set Aside	0.00	5.07	0.00	0.00	5.18	2.05
Production	2195.24	1802.03	2045.23	2166.71	1992.06	2040.25
Total Supply	2345.24	2095.70	2135.23	2256.71	2302.59	2227.09
Domestic Demand	1151.57	986.78	1003.84	1181.18	1263.54	1117.38
Ending Inventory	293.67	90.00	90.00	310.53	299.05	216.65
Price	5.87	9.41	8.78	6.00	6.09	7.23
Consumer Surplus	822.58	-2441.64	-2183.44	225.62	1053.78	-504.62
Producer Surplus	-1495.65	2670.27	2167.66	-1896.29	-2319.87	-174.78
Domestic Surplus	-673.06	228.63	-15.77	-1670.67	-1266.09	-679.39

TABLE XLII (Continued)

VARIABLE [1]	1979	1980	1981	1982	1983	5 Year Average
COTTON:						
Acres Harvested	13.16	10.23	11.12	13.20	11.75	11.89
Acres Set Aside	0.00	3.04	1.41	0.23	3.25	1.58
Production	13.70	10.08	11.06	14.52	12.92	12.46
Total Supply	17.90	17.06	15.68	17.65	19.46	17.55
Domestic Demand	6.32	6.34	6.25	6.52	6.73	6.43
Ending Inventory	6.78	4.42	2.93	6.34	7.92	5.68
Reserve Actions [4]	-0.58	0.58	0.00	0.00	-0.52	-0.10
Price	0.50	0.59	0.76	0.55	0.50	0.58
Deficiency Payments	285.01	465.70	0.00	66.88	1073.86	378.29
Consumer Surplus	45.36	-111.49	-535.33	71.26	403.13	-25.41
Producer Surplus	-6.70	26.54	730.50	-321.74	-662.88	-46.86
Domestic Surplus	38.65	-84.95	195.18	-250.48	-259.75	-72.27
CORN:						
Acres Harvested	69.63	69.00	71.49	74.96	76.12	72.24
Acres Set Aside	2.90	5.35	0.00	0.00	0.01	1.65
Production	7311.07	6665.88	6834.59	7728.18	7802.38	7268.42
Total Supply	8549.07	8043.90	7453.02	8129.18	9062.54	8247.54
Domestic Demand	4972.06	4961.47	4468.58	4940.03	5376.67	4943.76
Ending Inventory	1377.02	617.43	400.00	1259.16	1795.87	1089.89
Reserve Actions [3]	0.00	493.03	0.00	-179.71	-178.27	27.01
Price	2.20	2.63	3.19	2.21	2.07	2.46
Deficiency Pymts	0.00	0.00	0.00	230.61	477.86	141.69
Total Gov't Cost	123.26	0.00	0.00	275.53	567.35	193.23
Consumer Surplus	1093.37	320.21	-3039.99	-860.85	1454.10	-206.63
Producer Surplus	-1498.88	-764.53	4021.00	-1433.59	-2269.56	-389.11
Domestic Surplus	-405.50	-444.32	981.01	-2294.44	-815.46	-595.74

TABLE XLII (Continued)

VARIABLE [1]	1979	1980	1981	1982	1983	5 Year Average
GRAIN SORGHUM:						
Acres Harvested	12.96	13.51	14.57	14.33	14.88	14.05
Acres Set Aside	0.90	1.34	0.00	0.00	0.02	0.45
Production	802.25	728.25	770.53	824.18	857.27	796.50
Total Supply	989.25	907.72	829.23	880.19	987.73	918.82
Domestic Demand	564.79	559.02	487.93	529.73	581.88	544.67
Ending Inventory	179.46	58.70	56.01	130.46	195.85	124.10
Reserve Actions [3]	-18.32	92.31	0.00	-45.56	0.14	5.71
Price	2.10	2.33	2.74	2.10	2.00	2.25
Deficiency Pymts	91.77	163.16	0.00	142.18	4.89	80.40
Total Gov't Cost	111.35	163.16	0.00	153.57	16.24	88.86
Consumer Surplus	53.56	72.48	-242.36	-94.56	103.26	-21.52
Producer Surplus	-81.45	-178.63	296.87	-119.92	-177.69	-52.16
Domestic Surplus	-27.88	-106.15	54.51	-214.48	-74.42	-73.68
OATS:						
Acres Harvested	10.04	11.82	11.90	12.08	12.12	11.59
Acres Set Aside	0.00	0.66	0.00	0.00	0.00	0.13
Production	547.18	604.28	613.06	664.42	666.78	619.14
Total Supply	856.18	839.63	831.83	845.98	880.24	850.77
Domestic Demand	613.03	610.65	639.87	625.13	607.07	619.15
Ending Inventory	234.35	217.78	180.56	212.46	264.97	222.02
Price	1.25	1.35	1.39	1.38	1.30	1.33
Consumer Surplus	-5.85	-16.79	16.32	-12.45	-51.97	-14.15
Producer Surplus	2.15	-24.92	16.04	45.08	-0.59	7.55
Domestic Surplus	-3.70	-41.71	32.35	32.64	-52.57	-6.60

TABLE XLII (Continued)

VARIABLE[1]	1979	1980	1981	1982	1983	5 Year Average
BARLEY:						
Acres Harvested	7.43	8.12	8.73	7.74	8.69	8.14
Acres Set Aside	0.70	0.59	0.00	0.00	0.00	0.26
Production	366.30	370.19	398.77	386.81	439.02	392.22
Total Supply	613.30	580.72	561.61	522.46	571.58	569.93
Domestic Demand	368.77	369.88	373.96	352.89	361.79	365.46
Ending Inventory	200.53	152.84	125.65	122.57	161.79	152.67
Price	1.98	2.15	2.22	2.23	2.16	2.15
Deficiency Payments	35.03	35.89	93.27	69.76	97.05	66.20
Consumer Surplus	-0.44	-0.23	7.71	-36.36	-24.42	-10.75
Producer Surplus	-0.94	-22.49	19.95	23.64	16.50	7.33
Net Domestic Surplus	-1.38	-22.72	27.66	-12.73	-7.91	-3.42
TOTALS:						
Net Farm Income	32175.60	28444.40	40171.30	44722.10	22456.00	33593.86
Consumer Surplus	2298.80	-2047.95	-7627.96	-1427.06	2990.59	-1162.72
Producer Surplus	-4075.17	462.71	10840.86	-4175.90	-7038.99	-797.30
Net Domestic Surplus	-1776.37	-1585.24	3212.90	-5602.95	-4048.41	-1960.01

See footnotes at the end of Appendix A.

TABLE XLIII

POLYSIM BASELINE VALUES FOR SELECTED VARIABLES, 1979-1983

CROP	VARIABLE[1]	1979	1980	1981	1982	1983
WHEAT:						
	Acres Harvested	66.60	67.33	65.70	64.57	66.52
	Acres Set Aside	10.61	0.00	0.00	0.00	0.00
	Production	2131.20	2187.40	2143.35	2067.96	2133.70
	Total Supply	3055.20	3020.82	3068.89	3009.95	2994.74
	Domestic Demand	823.77	797.28	803.90	800.91	802.77
	Ending Inventory	831.43	923.54	939.99	859.04	816.97
	Reserve Actions	0.00	0.00	0.00	0.00	0.00
	Price	3.23	3.43	3.27	3.41	3.42
	Deficiency Payments	247.30	0.00	234.05	0.00	0.00
	Total Government Costs	312.99	65.69	299.74	65.69	65.69
SOYBEANS:						
	Acres Harvested	73.42	68.91	67.32	68.51	67.54
	Acres Set Aside	0.00	0.00	0.00	0.00	0.00
	Production	2129.18	2033.06	2033.03	2120.20	2109.19
	Total Supply	2279.18	2177.49	2147.85	2229.10	2258.32
	Domestic Demand	1109.74	1112.67	1108.95	1169.97	1212.31
	Ending Inventory	144.44	114.82	108.90	149.14	146.01
	Price	6.76	7.20	7.63	7.01	7.05
COTTON:						
	Acres Harvested	13.16	10.84	11.01	11.12	11.59
	Acres Set Aside	0.00	2.00	2.20	2.30	2.30
	Production	13.30	11.07	11.41	11.74	12.48
	Total Supply	17.50	16.97	16.60	16.39	16.78
	Domestic Demand	6.30	6.38	6.44	6.49	6.60
	Ending Inventory	5.70	4.99	4.46	4.10	4.28
	Price	0.52	0.56	0.59	0.64	0.62
	Deficiency Payments	228.83	527.20	323.42	264.64	287.59

TABLE XLIII (Continued)

CROP	VARIABLE[1]	1979	1980	1981	1982	1983
CORN:						
	Acres Harvested	69.63	72.13	74.28	75.24	75.88
	Acres Set Aside	2.90	0.00	0.00	0.00	0.00
	Production	7109.22	7217.64	7393.29	7420.47	7443.77
	Total Supply	8347.22	8275.86	8560.16	8681.64	8736.42
	Domestic Demand	4790.00	4909.99	5020.00	5089.99	5134.96
	Ending Inventory	1057.22	1165.87	1260.17	1291.65	1301.46
	Reserve Actions	0.00	0.00	0.00	0.00	0.00
	Price	2.48	2.60	2.45	2.45	2.47
	Deficiency Payments	0.00	0.00	0.00	0.00	0.00
	Total Government Costs	155.47	150.40	142.90	136.00	136.06
GRAIN SORGHUM:						
	Acres Harvested	12.96	14.24	15.06	14.63	14.94
	Acres Set Aside	0.90	0.00	0.00	0.00	0.00
	Production	778.90	794.78	829.22	804.53	823.92
	Total Supply	965.90	929.68	959.22	944.74	953.92
	Domestic Demand	551.00	541.61	556.00	554.46	555.98
	Ending Inventory	134.90	130.00	140.22	130.00	138.94
	Reserve Actions	0.00	0.00	0.00	0.00	0.00
	Price	2.26	2.42	2.24	2.31	2.30
	Deficiency Payments	22.37	70.48	126.35	100.34	104.10
	Total Government Costs	48.11	97.51	151.78	125.97	129.82
OATS:						
	Acres Harvested	10.04	12.21	12.04	12.11	12.17
	Acres Set Aside	0.00	0.00	0.00	0.00	0.00
	Production	531.12	647.16	646.15	653.94	659.55
	Total Supply	840.12	861.65	878.11	893.00	910.94
	Domestic Demand	616.63	620.69	630.05	632.60	639.36
	Ending Inventory	213.48	230.96	238.06	250.40	261.58
	Reserve Actions	0.00	0.00	0.00	0.00	0.00
	Price	1.29	1.33	1.30	1.32	1.30

TABLE XLIII (Continued)

CROP	VARIABLE[1]	1979	1980	1981	1982	1983
BARLEY:						
	Acres Harvested	7.43	8.28	8.64	8.62	8.67
	Acres Set Aside	0.70	0.00	0.00	0.00	0.00
	Production	355.90	391.24	411.31	412.46	419.13
	Total Supply	602.90	585.13	584.45	582.91	584.04
	Domestic Demand	369.00	370.00	370.00	372.00	373.99
	Ending Inventory	183.90	163.13	160.45	154.91	152.04
	Reserve Actions	0.00	0.00	0.00	0.00	0.00
	Price	2.04	2.12	2.09	2.11	2.20
	Deficiency Payments	73.57	116.06	127.08	105.83	104.19
NET FARM INCOME:		31890.20	33394.50	35199.60	33853.50	32732.60

See footnotes on the next page.

[1]Acres harvested and acres set aside are in millions of acres. Prod uction, total supply, domestic demand, ending inventory, and reserve actions are in millions of bushels for all crops except cotton which is in millions of bales. Price is in dollars per bushel for all crops except cotton which is in cents per pound. Deficiency payments and total gevernment costs are in millions of dollars. Consumer, producer, and domestic surpluses are in millions of dollars and represent the change in surplus from the surplus computed for the POLYSIM baseline.

[2]The t-statistic is calculated as;

$$t = \frac{(\bar{Y}_1 - \bar{Y}_2)}{\text{sq.rt.}(S_1^2/n_1 + S_2^2/n_2)}$$

where $\bar{Y}_1$ and $\bar{Y}_2$ are the means of the variables, S_1 and S_2 are the standard deviations of the variables, and n_1 and n_2 are the number of observations for each variable. A t value equal to or greater than 1.64 is significant at the 10 percent level.

[3]A negative reserve action represents the crop placed into the reserve program. A positive reserve action represents a release from the reserve program.

[4]Reserve actions for cotton are government CCC stock actions.

APPENDIX B

YIELDS AND EXPORTS

YIELDS AND EXPORTS

Table XXX presents the crop exports for the six stochastic simulations concerning the alternative accuracy levels, current year price weights, and preliminary surplus weights. The final export value is used for the no information simulation along with one of the preliminary export values. Averaged over the 300 iterations the export forecasts are closer to the final export value as the accuracy level increases.

Table XXXI presents the crop exports for the three alternative supply-demand scenarios. In these situations the final export value is predetermined and the preliminary export forecast value is drawn at random about the final export. Some deviations in final export values do occur due to the reduction of total crop demand by any amount the total amount available plus the pipeline values is below the total demand. This affects the error level slightly, but not significantly.

Table XXXII presents the crop yields used for the stochastic and the three supply-demand scenarios. These values are used along with the final crop export values to determine the model output for the without information results.

TABLE XLIV

COMPARISON OF THE PRELIMINARY EXPORT AND THE FINAL EXPORT, WITH STATISTICS, BY YEAR, FOR THE SEVEN CROPS, ALTERNATIVE ACCURACY LEVELS

CROP	EXPORT LEVEL	ACCURACY LEVEL	1979	1980	1981	1982	1983	FIVE YEAR AVERAGE
					(million bushels)			
WHEAT	FINAL	ALL						
		Mean	1387.5	1298.5	1324.7	1348.0	1373.7	1346.5
		Minimum	1064.7	949.6	1047.3	947.6	1068.5	947.6
		Maximum	1647.6	1617.1	1596.7	1633.4	1715.9	1715.9
		Variance	10742.3	10603.9	10859.9	9698.7	10922.2	11577.2
	PRELIMINARY	HIGH						
		Mean	1385.5	1298.3	1325.6	1351.1	1370.6	1346.2
		Minimum	1065.3	930.4	1036.8	993.6	1078.3	930.4
		Maximum	1689.6	1581.5	1606.2	1642.5	1744.4	1744.4
		Variance	12077.1	12701.8	12914.0	10819.9	11956.1	13037.7
		MIDDLE						
		Mean	1381.8	1298.8	1326.6	1356.2	1365.4	1345.6
		Minimum	1040.7	901.6	960.2	965.5	957.5	901.6
		Maximum	1827.1	1682.7	1715.5	1770.2	1825.2	1827.1
		Variance	19830.8	21144.1	20955.6	18108.2	19195.2	20666.5
		LOW						
		Mean	1375.6	1299.7	1328.3	1364.7	1356.7	1345.0
		Minimum	829.3	768.8	791.6	724.0	661.3	661.3
		Maximum	2078.5	1895.6	1988.9	1982.9	2011.9	2078.5
		Variance	47819.7	48989.8	47539.6	45115.5	46281.0	47783.1

TABLE XLIV (Continued)

CROP	EXPORT LEVEL	ACCURACY LEVEL	1979	1980	1981	1982	1983	FIVE YEAR AVERAGE
					(million bushels)			
SOYBEANS	FINAL	ALL						
		Mean	1023.6	952.2	930.2	907.7	894.9	941.7
		Minimum	880.0	796.0	756.7	767.3	688.3	688.3
		Maximum	1187.6	1083.3	1116.8	1080.6	1098.4	1187.6
		Variance	2802.0	2856.7	3383.3	2928.1	3311.4	5109.1
	PRELIMINARY	HIGH						
		Mean	1026.0	952.6	933.9	906.9	895.8	943.0
		Minimum	844.6	778.7	754.8	753.1	673.4	673.4
		Maximum	1214.3	1135.3	1141.8	1101.4	1118.0	1214.3
		Variance	4393.5	4192.7	4997.4	4020.3	4380.0	6504.7
		MIDDLE						
		Mean	1092.9	953.4	939.2	905.7	896.8	944.9
		Minimum	726.4	684.1	564.0	628.1	651.1	564.0
		Maximum	1376.8	1244.5	1303.2	1219.0	1237.2	1376.8
		Variance	13020.8	11304.9	12569.3	10417.8	10294.7	13702.7
		LOW						
		Mean	1034.5	954.8	948.2	903.7	898.5	948.0
		Minimum	518.0	425.7	246.0	419.7	455.8	246.0
		Maximum	1647.6	1469.3	1572.4	1426.3	1468.6	1647.6
		Variance	43981.8	36746.1	38910.9	33767.5	31597.3	39190.0

TABLE XLIV (Continued)

CROP	EXPORT LEVEL	ACCURACY LEVEL	1979	1980	1981	1982	1983	FIVE YEAR AVERAGE
					(million bales)			
COTTON	FINAL	ALL						
		Mean	5.54	5.61	5.70	5.75	5.90	5.70
		Minimum	3.04	3.45	3.23	3.18	3.30	3.04
		Maximum	7.80	8.15	8.12	8.28	7.96	8.28
		Variance	0.72	0.73	0.74	0.80	0.66	0.74
	PRELIMINARY	HIGH						
		Mean	5.55	5.60	5.70	5.75	5.89	5.70
		Minimum	2.89	3.40	3.14	3.08	3.26	2.89
		Maximum	7.92	8.79	8.22	8.29	8.17	8.79
		Variance	0.82	0.77	0.82	0.83	0.75	0.81
		MIDDLE						
		Mean	5.57	5.58	5.70	5.75	5.89	5.70
		Minimum	2.66	3.31	3.01	2.93	3.20	2.66
		Maximum	8.54	9.75	8.37	9.50	8.98	9.75
		Variance	1.18	1.03	1.18	1.09	1.13	1.13
		LOW						
		Mean	5.60	5.55	5.71	5.74	5.88	5.70
		Minimum	0.58	1.70	1.42	2.17	2.13	0.58
		Maximum	9.92	11.35	9.84	11.55	10.32	11.55
		Variance	2.32	1.96	2.43	2.08	2.35	2.23

TABLE XLIV (Continued)

CROP	EXPORT LEVEL	ACCURACY LEVEL	1979	1980	1981	1982	1983	FIVE YEAR AVERAGE
					(million bushels)			
CORN	FINAL	ALL						
		Mean	2500.1	2203.6	2290.6	2303.9	2299.9	2319.6
		Minimum	2113.6	1874.7	1952.1	1913.5	1843.7	1843.7
		Maximum	2905.1	2528.2	2621.6	2655.6	2662.5	2905.1
		Variance	15977.4	17503.4	16807.0	16304.5	18433.6	26469.0
	PRELIMINARY	HIGH						
		Mean	2505.9	2200.8	2297.7	2302.4	2298.8	2321.1
		Minimum	2035.2	1775.6	1877.3	1819.1	1794.8	1775.6
		Maximum	2915.4	2619.8	2818.9	2836.0	2785.8	2915.4
		Variance	24355.9	25610.5	28289.5	25860.4	24506.4	35613.7
		MIDDLE						
		Mean	2513.9	2197.4	2307.6	2300.1	2297.4	2323.3
		Minimum	1549.7	1513.3	1473.8	1590.4	1652.6	1473.8
		Maximum	3389.6	2876.5	3205.1	3130.4	3089.9	3389.6
		Variance	75635.4	65154.6	79598.9	69016.4	63023.3	80836.1
		LOW						
		Mean	2527.7	2191.6	2324.2	2296.5	2295.1	2327.0
		Minimum	740.6	901.2	801.3	956.8	1222.0	740.6
		Maximum	4179.8	3459.9	3848.8	3621.0	3596.8	4179.8
		Variance	264326.1	198485.9	255766.2	219293.6	205597.3	240204.8

TABLE XLIV (Continued)

CROP	EXPORT LEVEL	ACCURACY LEVEL	1979	1980	1981	1982	1983	FIVE YEAR AVERAGE
					(million bushels)			
GRAIN SORGHUM	FINAL	ALL						
		Mean	280.1	258.7	260.7	261.6	256.4	263.5
		Minimum	157.2	165.1	149.5	137.3	146.5	137.3
		Maximum	373.8	378.6	354.4	356.8	365.4	378.6
		Variance	1395.4	1391.2	1297.1	1239.8	1197.3	1372.6
	PRELIMINARY	HIGH						
		Mean	279.8	258.3	259.9	261.6	255.7	263.0
		Minimum	157.1	165.5	145.1	139.6	145.7	139.6
		Maximum	385.1	383.8	361.0	387.4	367.2	387.4
		Variance	1513.2	1560.0	1406.4	1303.8	1316.4	1490.3
		MIDDLE						
		Mean	279.4	257.6	258.6	261.7	254.6	262.4
		Minimum	156.9	134.0	138.4	143.2	144.5	134.0
		Maximum	422.1	398.6	389.7	438.7	409.6	438.7
		Variance	2148.8	2194.9	1960.3	1876.2	1970.1	2102.3
		LOW						
		Mean	278.7	256.4	256.5	261.8	252.7	261.2
		Minimum	117.1	62.2	102.2	122.2	77.6	62.2
		Maximum	483.8	454.2	463.2	539.7	480.2	539.7
		Variance	4430.5	4268.3	3923.2	4099.3	4324.8	4282.7

TABLE XLIV (Continued)

CROP	EXPORT LEVEL	ACCURACY LEVEL	1979	1980	1981	1982	1983	FIVE YEAR AVERAGE
			(million bushels)					
OATS	FINAL	ALL						
		Mean	10.0	9.8	10.0	10.3	10.3	10.1
		Minimum	0.5	1.0	0.6	1.6	0.0	0.0
		Maximum	21.4	17.9	20.1	18.6	21.5	21.5
		Variance	12.0	10.6	11.2	11.0	11.2	11.2
	PRELIMINARY	HIGH						
		Mean	10.0	9.8	10.0	10.3	10.3	10.1
		Minimum	0.5	1.0	0.6	1.6	0.0	0.0
		Maximum	21.7	17.2	20.5	18.5	21.9	21.9
		Variance	12.2	10.8	11.2	11.1	11.4	11.4
		MIDDLE						
		Mean	10.0	9.8	9.9	10.3	10.3	10.1
		Minimum	0.5	1.0	0.5	1.6	0.0	0.0
		Maximum	22.1	18.2	21.2	20.2	22.5	22.5
		Variance	13.2	11.6	11.9	12.0	12.6	12.3
		LOW						
		Mean	10.0	9.7	9.9	10.2	10.3	10.0
		Minimum	0.5	0.9	0.4	1.6	0.0	0.0
		Maximum	23.8	20.6	23.4	23.1	23.5	23.8
		Variance	16.2	14.5	14.6	15.1	16.6	15.4

TABLE XLIV (Continued)

CROP	EXPORT LEVEL	ACCURACY LEVEL	1979	1980	1981	1982	1983	FIVE YEAR AVERAGE
					(million bushels)			
BARLEY	FINAL	ALL						
		Mean	49.2	52.0	54.4	57.3	57.4	54.0
		Minimum	2.9	0.0	15.0	16.0	16.0	0.0
		Maximum	93.3	106.8	104.0	95.7	124.8	124.8
		Variance	263.6	279.5	259.5	266.7	242.5	271.7
	PRELIMINARY	HIGH						
		Mean	49.3	51.9	54.3	57.4	57.3	54.0
		Minimum	2.9	0.0	14.2	15.5	15.1	0.0
		Maximum	93.4	107.7	102.7	101.4	127.0	127.0
		Variance	274.7	293.8	267.6	282.2	252.6	283.2
		MIDDLE						
		Mean	49.5	51.9	54.3	57.4	57.2	54.1
		Minimum	2.9	0.0	13.0	14.7	13.8	0.0
		Maximum	99.6	118.8	100.7	110.4	130.3	130.3
		Variance	308.5	333.0	299.6	328.3	293.5	321.2
		LOW						
		Mean	49.8	51.8	54.1	57.5	57.1	54.1
		Minimum	3.0	0.0	11.1	13.3	11.7	0.0
		Maximum	116.6	141.4	119.1	125.5	135.7	141.4
		Variance	410.1	445.1	404.0	465.6	430.3	438.8

TABLE XLV

COMPARISON OF THE PRELIMINARY EXPORT FORECAST AND THE FINAL EXPORT, WITH STATISTICS, BY YEAR, FOR THE SEVEN CROPS, THREE SUPPLY-DEMAND SCENARIOS

CROP	SCENARIO	1979	1980	1981	1982	1983	FIVE YEAR AVERAGE
				(Million Bushels)			
WHEAT	EXCESS SUPPLY						
	Final Export	1260.0	1145.0	1140.0	1135.0	1125.0	1161.0
	Preliminary Export						
	Mean	1257.8	1145.0	1140.4	1138.0	1122.3	1160.7
	Minimum	1157.2	1043.7	1064.3	1024.9	1018.7	1018.7
	Maximum	1352.2	1226.5	1232.9	1235.4	1198.9	1352.2
	Variance	1226.5	1060.6	968.6	1051.4	988.4	3472.8
	FLUCTUATING SUPPLY						
	Final Export	1230.6	1460.0	1487.7	1135.0	1125.0	1287.5
	Preliminary Export						
	Mean	1227.8	1460.0	1510.5	1138.0	1122.3	1291.7
	Minimum	1129.6	1330.9	1409.7	1024.9	1018.7	1018.7
	Maximum	1320.0	1564.0	1633.0	1235.4	1198.9	1633.0
	Variance	1168.7	1724.4	1699.5	1051.4	988.5	27861.7
	TIGHT SUPPLY						
	Final Export	1540.0	1460.0	1505.9	1465.0	1625.0	1505.9
	Preliminary						
	Mean	1537.3	1460.0	1510.1	1556.3	1618.8	1536.5
	Minimum	1414.3	1330.9	1409.7	1413.2	1471.4	1330.9
	Maximum	1652.7	1564.0	1615.1	1618.4	1731.7	1731.7
	Variance	1832.1	1724.1	1643.2	1067.0	1820.9	4357.6

TABLE XLV (Continued)

CROP	SCENARIO	1979	1980	1981	1982	1983	FIVE YEAR AVERAGE
				(Million Bushels)			
SOYBEANS	EXCESS SUPPLY						
	Final Export	920.0	835.0	800.0	765.0	740.0	812.0
	Preliminary Export						
	Mean	921.9	835.5	803.0	764.4	740.6	813.1
	Minimum	826.5	740.5	684.6	688.1	667.4	667.4
	Maximum	1027.7	924.5	887.3	841.3	822.5	1027.7
	Variance	1332.4	1043.1	1019.7	893.3	772.8	5027.3
	FLUCTUATING SUPPLY						
	Final Export	900.0	1018.9	1041.4	765.0	740.0	893.1
	Preliminary Export						
	Mean	901.9	1037.5	1044.6	764.4	740.6	897.8
	Minimum	808.5	944.5	907.1	688.1	667.4	667.4
	Maximum	1005.3	1114.2	1125.5	841.3	822.5	1125.5
	Variance	1275.1	857.7	1017.7	893.3	772.8	17690.4
	TIGHT SUPPLY						
	Final Export	1109.1	1039.8	1039.2	1028.8	1027.6	1048.9
	Preliminary						
	Mean	1125.8	1057.3	1062.4	1053.9	1060.5	1072.0
	Minimum	1015.2	944.5	907.1	948.9	956.0	907.1
	Maximum	1219.1	1138.6	1161.8	1160.2	1165.1	1219.1
	Variance	1386.1	1160.6	1632.6	1669.2	1539.2	2207.0

TABLE XLV (Continued)

CROP	SCENARIO	1979	1980	1981	1982	1983	FIVE YEAR AVERAGE
				(Million Bales)			
COTTON	EXCESS SUPPLY						
	Final Export	4.95	4.90	4.90	4.85	4.85	4.89
	Preliminary Export						
	Mean	4.96	4.89	4.90	4.85	4.84	4.89
	Minimum	4.06	4.24	4.17	4.29	4.28	4.06
	Maximum	5.43	5.48	5.45	5.39	5.37	5.48
	Variance	0.04	0.04	0.05	0.04	0.04	0.04
	FLUCTUATING SUPPLY						
	Final Export	4.80	6.30	6.50	4.80	4.80	5.44
	Preliminary Export						
	Mean	4.81	6.29	6.50	4.80	4.79	5.44
	Minimum	3.94	5.45	5.54	4.24	4.24	3.94
	Maximum	5.27	7.05	7.24	5.33	5.32	7.24
	Variance	0.04	0.06	0.08	0.04	0.04	0.67
	TIGHT SUPPLY						
	Final Export	6.10	6.30	6.50	6.70	7.00	6.52
	Preliminary						
	Mean	6.11	6.28	6.50	6.70	6.99	6.52
	Minimum	5.00	5.45	5.54	5.92	6.18	5.00
	Maximum	6.69	7.05	7.24	7.44	7.76	7.76
	Variance	0.06	0.06	0.08	0.07	0.08	0.17

TABLE XLV (Continued)

CROP	SCENARIO	1979	1980	1981	1982	1983	FIVE YEAR AVERAGE
				(Million Bushels)			
CORN	EXCESS SUPPLY						
	Final Export	2250.0	1940.0	1960.0	1930.0	1890.0	1994.0
	Preliminary Export						
	Mean	2255.3	1937.8	1965.2	1928.5	1889.5	1995.3
	Minimum	1941.2	1716.5	1714.3	1705.5	1728.2	1705.5
	Maximum	2523.6	2145.8	2162.7	2121.9	2064.1	2523.6
	Variance	8382.3	5428.2	6550.9	5488.7	5225.3	23706.1
	FLUCTUATING SUPPLY						
	Final Export	2200.0	2465.0	2584.4	1930.0	1890.0	2213.9
	Preliminary Export						
	Mean	2205.2	2462.1	2605.2	1928.5	1889.5	2218.1
	Minimum	1898.1	2181.0	2274.1	1705.5	1728.2	1705.5
	Maximum	2467.5	2726.4	2837.1	2121.9	2064.1	2837.1
	Variance	8013.9	8763.6	10879.1	5488.7	5225.3	87988.4
	TIGHT SUPPLY						
	Final Export	2750.0	2465.0	2600.0	2670.0	2715.0	2640.0
	Preliminary						
	Mean	2756.5	2462.1	2607.0	2667.9	2714.3	2641.6
	Minimum	2372.7	2181.0	2274.1	2359.4	2482.5	2181.0
	Maximum	3084.4	2726.4	2868.8	2935.4	2965.1	3084.4
	Variance	12521.7	8763.6	11527.5	10504.6	10782.6	21316.0

TABLE XLV (Continued)

CROP	SCENARIO	1979	1980	1981	1982	1983	FIVE YEAR AVERAGE
				(Million Bushels)			
GRAIN SORGHUM	EXCESS SUPPLY						
	Final Export	250.0	230.0	225.0	220.0	210.0	227.0
	Preliminary Export						
	Mean	249.7	229.5	224.2	220.2	209.4	226.6
	Minimum	223.5	197.9	202.5	194.9	179.8	179.8
	Maximum	277.0	253.7	247.8	246.1	242.4	277.0
	Variance	94.1	78.9	75.2	84.0	83.5	260.3
	FLUCTUATING SUPPLY						
	Final Export	245.0	290.0	285.3	220.0	210.0	250.1
	Preliminary Export						
	Mean	244.7	289.4	287.1	220.2	209.4	250.2
	Minimum	219.1	249.5	262.7	194.9	179.8	179.8
	Maximum	271.5	319.9	312.1	246.4	242.4	319.9
	Variance	90.4	125.5	89.6	84.1	83.5	1194.2
	TIGHT SUPPLY						
	Final Export	302.4	284.0	293.5	288.6	299.9	293.7
	Preliminary						
	Mean	306.1	285.9	296.9	294.5	301.6	297.0
	Minimum	277.2	249.5	270.0	265.3	261.2	249.5
	Maximum	334.1	312.9	322.9	324.0	346.8	346.8
	Variance	103.5	92.4	100.3	109.5	141.9	155.6

TABLE XLV (Continued)

CROP	SCENARIO	1979	1980	1981	1982	1983	FIVE YEAR AVERAGE
				(Million Bushels)			
OATS	EXCESS SUPPLY						
	Final Export	9.0	8.8	8.6	8.4	8.2	8.6
	Preliminary Export						
	Mean	9.0	8.8	8.6	8.4	8.2	8.6
	Minimum	7.9	7.4	7.7	7.5	7.3	7.3
	Maximum	10.0	9.7	9.5	9.4	9.3	10.0
	Variance	0.1	0.1	0.1	0.1	0.1	0.2
	FLUCTUATING SUPPLY						
	Final Export	8.8	11.2	11.4	8.4	8.2	9.6
	Preliminary Export						
	Mean	8.8	11.2	11.4	8.4	8.2	9.6
	Minimum	7.7	9.4	10.1	7.5	7.3	7.3
	Maximum	9.7	12.4	12.5	9.4	9.3	12.5
	Variance	0.1	0.2	0.2	0.1	0.1	0.1
	TIGHT SUPPLY						
	Final Export	11.0	11.2	11.4	11.3	11.5	11.3
	Preliminary						
	Mean	11.0	11.2	11.4	11.6	11.8	11.4
	Minimum	9.7	9.4	10.1	10.4	10.4	9.4
	Maximum	12.2	12.4	12.5	13.0	13.5	13.5
	Variance	0.2	0.2	0.2	0.2	0.2	0.3

TABLE XLV (Continued)

CROP	SCENARIO	1979	1980	1981	1982	1983	FIVE YEAR AVERAGE
				(Million Bushels)			
BARLEY	EXCESS SUPPLY						
	Final Export	45.0	46.0	46.0	47.0	48.0	46.4
	Preliminary Export						
	Mean	45.1	45.9	45.9	46.9	47.3	46.3
	Minimum	39.0	38.7	39.2	40.8	41.7	38.7
	Maximum	50.0	50.3	51.7	52.4	53.6	53.6
	Variance	3.5	3.2	3.6	3.8	4.7	4.7
	FLUCTUATING SUPPLY						
	Final Export	44.0	58.0	62.0	47.0	48.0	51.8
	Preliminary Export						
	Mean	44.0	57.9	61.9	46.9	47.9	51.7
	Minimum	38.1	48.8	52.8	40.8	41.7	38.1
	Maximum	48.9	63.5	69.7	52.4	53.6	69.7
	Variance	3.3	5.1	6.5	3.8	4.7	52.2
	TIGHT SUPPLY						
	Final Export	55.0	58.0	62.0	59.1	62.2	59.3
	Preliminary						
	Mean	55.1	57.9	61.9	64.6	67.7	61.4
	Minimum	47.6	48.8	52.8	56.4	59.0	47.6
	Maximum	61.1	63.5	69.7	70.8	75.9	75.9
	Variance	5.2	5.1	6.5	5.8	9.4	27.0

TABLE XLVI

COMPARISON OF CROP YIELDS USED FOR ALTERNATIVE ACCURACY LEVELS AND THE THREE SUPPLY-DEMAND SCNEARIOS, BY YEAR

CROP[1]	SIMULATION		1979	1980	1981	1982	1983	FIVE YEAR AVERAGE
WHEAT	STOCHASTIC	Mean	31.96	32.40	32.69	32.06	31.95	32.21
		Minimum	27.76	28.35	28.83	27.02	27.56	27.02
		Maximum	35.00	35.00	35.00	35.00	35.00	35.00
		Variance	2.39	2.53	2.47	2.71	2.66	2.63
	EXCESS SUPPLY		33.10	33.60	33.90	33.50	33.50	33.52
	FLUCTUATING SUPPLY		33.10	31.30	31.30	33.50	33.50	32.54
	TIGHT SUPPLY		30.90	31.30	31.30	30.60	30.60	30.94
SOYBEANS	STOCHASTIC	Mean	28.88	29.59	30.25	30.93	31.11	30.15
		Minimum	25.29	25.86	26.44	27.04	26.69	25.29
		Maximum	33.00	33.00	33.00	33.00	33.00	33.00
		Variance	2.35	2.11	2.09	1.80	1.82	2.72
	EXCESS SUPPLY		29.90	30.50	31.40	32.30	32.60	31.34
	FLUCTUATING SUPPLY		29.90	28.50	29.00	32.30	32.60	30.46
	TIGHT SUPPLY		28.10	28.50	29.00	29.60	29.80	29.00
COTTON	STOCHASTIC	Mean	482.05	489.60	494.52	503.47	509.36	495.80
		Minimum	399.85	399.18	410.41	420.88	425.88	399.18
		Maximum	528.00	528.00	528.00	528.00	528.00	528.00
		Variance	895.24	815.56	719.79	614.59	453.69	792.[illegible]
	EXCESS SUPPLY		499.50	507.10	517.30	529.20	539.90	515.98
	FLUCTUATING SUPPLY		499.50	472.80	477.50	529.20	539.90	501.16
	TIGHT SUPPLY		470.40	472.80	477.50	483.60	493.40	479.54

TABLE XLVI (Continued)

CROP[1]	SIMULATION		1979	1980	1981	1982	1983	FIVE YEAR AVERAGE
CORN	STOCHASTIC	Mean	101.66	99.77	99.59	98.88	98.00	99.58
		Minimum	92.57	89.34	89.51	89.69	90.17	.89.34
		Maximum	105.00	105.00	105.00	105.00	105.00	105.00
		Variance	7.87	11.68	10.85	12.47	10.47	12.11
	EXCESS SUPPLY		105.00	103.60	103.50	103.10	102.50	103.54
	FLUCTUATING SUPPLY		105.00	96.60	95.60	103.10	102.50	100.56
	TIGHT SUPPLY		99.00	96.60	95.60	94.20	93.70	95.82
GRAIN SORGHUM	STOCHASTIC	Mean	58.85	55.80	55.20	55.21	55.06	56.02
		Minimum	45.31	40.86	43.80	41.49	42.42	40.86
		Maximum	63.00	63.00	63.00	63.00	63.00	63.00
		Variance	15.06	21.93	18.68	20.59	18.54	20.97
	EXCESS SUPPLY		61.90	57.80	57.30	57.50	57.60	58.42
	FLUCTUATING SUPPLY		61.90	53.90	52.90	57.50	57.60	56.76
	TIGHT SUPPLY		58.30	53.90	52.90	52.50	52.70	54.06
OATS	STOCHASTIC	Mean	52.57	52.68	53.12	53.25	53.42	53.01
		Minimum	46.38	43.47	44.64	46.56	46.27	43.47
		Maximum	55.00	55.00	55.00	55.00	55.00	55.00
		Variance	5.06	5.29	4.01	3.97	3.73	4.51
	EXCESS SUPPLY		54.50	54.90	55.80	56.40	56.60	54.88
	FLUCTUATING SUPPLY		54.50	51.10	51.50	56.40	56.60	53.42
	TIGHT SUPPLY		51.30	51.10	51.50	51.60	51.70	51.44

TABLE XLVI (Continued)

CROP[1]	SIMULATION		1979	1980	1981	1982	1983	FIVE YEAR AVERAGE
BARLEY	STOCHASTIC	Mean	47.86	47.12	47.74	47.83	48.08	47.73
		Minimum	41.13	40.35	41.56	41.20	41.37	40.35
		Maximum	51.00	51.00	51.00	51.00	51.00	51.00
		Variance	3.92	4.59	4.13	4.41	4.04	4.31
	EXCESS SUPPLY		49.30	48.90	49.50	50.00	50.50	49.64
	FLUCTUATING SUPPLY		49.30	45.60	45.70	50.00	50.50	48.22
	TIGHT SUPPLY		46.50	45.60	45.70	45.70	46.20	45.94

[1]All yields are in bushels per acre except for cotton which is in pounds per acre.

APPENDIX C

LIVESTOCK PRODUCTION

LIVESTOCK PRODUCTION

Table XXXIII presents the levels of livestock production resulting from the alternative with and without information assumptions. Livestock production is a function of the previous year prices of livestock and, also, the previous year price of corn. Any change in livestock production resulting from the use of more accurate and timely crop forecast information has to result from the different corn prices. With a short run price elasticity of -0.05, no statistically significant changes in livestock production occur, although definite differences are apparent. As one expects, with large differences in the previous year corn prices, under the with and without information assumptions, make the most apparent differences.

In the model the livestock production levels are determined first. Thus, the 1979 livestock production levels never change. The crop production changes occur in 1979 after the livestock levels are computed. The livestock production levels in the succeeding years is affected by the previous year prices of livestock and corn. The largest differences occur in the alternative supply-demand scenarios that are evaluated. None of the differences are statistically significant.

TABLE XLVII

LIVESTOCK PRODUCTION BY YEAR FOR THE WITH AND WITHOUT INFORMATION ASSUMPTIONS, ALTERNATIVE ACCURACY, PRICE WEIGHT, AND SUPPLY-DEMAND LEVELS

Livestock[1]	1979	1980	1981	1982	1983
WITHOUT INFORMATION:					
Cattle and Calves	22575.0	21929.2	22013.9	22972.4	24001.6
Hogs	14525.0	15497.2	15161.1	14942.3	15278.2
Sheep and Lambs	299.0	309.9	319.7	324.7	324.8
Chickens	10860.0	11214.3	11665.4	12232.4	12704.9
Turkeys	2305.0	2408.7	2469.1	2409.9	2555.8
Eggs	5670.0	5746.5	5726.9	5859.5	5941.0
Milk	124000.0	122367.1	120814.4	121975.5	122379.7
WITH INFORMATION:					
HIGH ACCURACY, HIGH PRICE WEIGHT					
Cattle and Calves	22575.0	21955.3	22010.1	22962.2	23992.4
Hogs	14525.0	15589.6	15106.5	14936.8	15250.2
Sheep and Lambs	299.0	309.9	319.8	324.7	324.8
Chickens	10860.0	11273.1	11663.8	12205.2	12681.6
Turkeys	2305.0	2420.1	2473.6	2406.2	2550.5
Eggs	5670.0	5758.9	5731.7	5853.9	5935.1
Milk	124000.0	122600.3	120903.4	121848.8	122277.8
HIGH ACCURACY, LOW PRICE WEIGHT					
Cattle and Calves	22575.0	21936.4	22011.0	22969.5	24001.4
Hogs	14525.0	15522.7	15139.9	14943.6	15276.6
Sheep and Lambs	299.0	309.9	319.7	324.7	324.8
Chickens	10860.0	11230.5	11660.8	12224.3	12704.2
Turkeys	2305.0	2411.8	2469.5	2408.4	2555.3
Eggs	5670.0	5749.9	5727.4	5857.5	5940.4
Milk	124000.0	122431.4	120823.0	121931.9	122372.7

TABLE XLVII (Continued)

Livestock[1]	1979	1980	1981	1982	1983
WITH INFORMATION (Continued):					
MIDDLE ACCURACY, HIGH PRICE WEIGHT					
Cattle and Calves	22575.0	21952.6	22007.6	22957.7	23990.9
Hogs	14525.0	15580.0	15102.1	14923.9	15251.3
Sheep and Lambs	299.0	309.9	319.8	324.7	324.7
Chickens	10860.0	11267.0	11657.1	12194.1	12676.7
Turkeys	2235.0	2339.0	2386.8	2323.5	2463.5
Eggs	5670.0	5657.6	5729.9	5851.2	5933.2
Milk	124000.0	122576.1	120868.3	121801.0	122245.4
MIDDLE ACCURACY, LOW PRICE WEIGHT					
Cattle and Calves	22575.0	21935.7	22010.8	22968.8	24002.2
Hogs	14525.0	15520.1	15140.3	14940.9	15280.3
Sheep and Lambs	299.0	309.9	319.7	324.7	324.8
Chickens	10860.0	11228.9	11660.1	12222.6	12705.7
Turkeys	2235.0	2411.5	2469.3	2408.0	2555.4
Eggs	5670.0	5749.6	5727.1	5857.1	5840.5
Milk	124000.0	122425.0	120818.1	121925.2	122375.2
LOW ACCURACY, HIGH PRICE WEIGHT					
Cattle and Calves	22575.0	21946.6	22002.4	22949.2	23985.0
Hogs	14525.0	15558.7	15093.0	14899.1	15244.4
Sheep and Lambs	299.0	309.9	319.7	324.6	324.7
Chickens	10860.0	11253.4	11643.4	12173.0	12660.7
Turkeys	2235.0	2416.3	2468.1	2398.3	2543.5
Eggs	5670.0	5754.7	5725.9	5846.0	5928.3
Milk	124000.0	122522.3	120794.7	121709.2	122159.6

TABLE XLVII (Continued)

Livestock [1]	1979	1980	1981	1982	1983
EXCESS SUPPLY - WITH INFORMATION:					
Cattle and Calves	22575.0	22061.1	22055.3	23086.9	24051.8
Hogs	14525.0	15964.0	15093.5	15361.6	15237.6
Sheep and Lambs	299.0	310.1	320.1	325.0	325.2
Chickens	10860.0	11511.4	11798.1	12502.9	12859.7
Turkeys	2305.0	2466.7	2518.9	2475.7	2611.6
Eggs	5670.0	5808.8	5779.5	5922.7	5995.8
Milk	124000.0	123544.5	121794.7	123030.2	123358.4
FLUCTUATING SUPPLY - WITH INFORMATION:					
Cattle and Calves	22575.0	22062.6	21920.7	22745.6	24230.5
Hogs	14525.0	15969.5	14628.0	14458.2	16216.8
Sheep and Lambs	299.0	310.1	319.9	324.2	324.6
Chickens	10860.0	11514.9	11484.6	11659.3	13179.2
Turkeys	2305.0	2467.3	2458.9	2298.6	2602.0
Eggs	5670.0	5809.5	5716.8	5731.7	5990.4
Milk	124000.0	123558.3	120619.4	119491.8	123378.2
TIGHT SUPPLY - WITH INFORMATION:					
Cattle and Calves	22575.0	21823.2	22011.5	22784.1	23862.6
Hogs	14525.0	15121.5	15322.3	14241.1	15173.9
Sheep and Lambs	299.0	309.8	319.5	324.4	324.2
Chickens	10860.0	10975.1	11631.1	11797.6	12317.5
Turkeys	2305.0	2362.0	2443.0	2324.1	2448.3
Eggs	5670.0	5696.5	5699.2	5772.3	5829.0
Milk	124000.0	121419.7	120298.2	120455.9	120323.1

TABLE XLVII (Continued)

Livestock [1]	1979	1980	1981	1982	1983
EXCESS SUPPLY - WITHOUT INFORMATION					
Cattle and Calves	22575.0	22050.4	22059.8	23100.3	24051.3
Hogs	14525.0	15926.1	15125.9	15389.5	15223.7
Sheep and Lambs	299.0	310.1	320.0	325.0	325.2
Chickens	10860.0	11487.3	11805.6	12536.7	12862.1
Turkeys	2305.0	2462.0	2518.4	2481.9	2614.3
Eggs	5670.0	5803.7	5778.9	5930.0	5998.6
Milk	124000.0	124348.9	122683.9	124074.7	124305.1
FLUCUATING SUPPLY - WITHOUT INFORMATION					
Cattle and Calves	22575.0	22062.4	21935.4	22722.5	24245.4
Hogs	14525.0	15968.9	14678.9	14359.2	16312.2
Sheep and Lambs	299.0	310.1	319.9	324.2	324.6
Chickens	10860.0	11514.6	11518.9	11609.3	13205.2
Turkeys	2305.0	2467.3	2465.4	2292.5	2603.8
Eggs	5670.0	5809.4	5723.7	5724.9	5991.3
Milk	124000.0	123556.9	120748.0	119365.2	123381.9
TIGHT SUPPLY - WITHOUT INFORMATION					
Cattle and Calves	22575.0	21820.3	22004.5	22727.8	23888.3
Hogs	14525.0	15111.4	15302.5	14065.3	15337.9
Sheep and Lambs	299.0	309.7	319.5	324.3	324.1
Chickens	10860.0	10968.7	11613.8	11663.0	12360.0
Turkeys	2305.0	2360.7	2439.1	2298.4	2445.8
Eggs	5670.0	5695.1	5695.2	5744.6	5826.4
Milk	124000.0	121394.2	120222.7	119945.9	120280.9

[1] Beef, pork, and sheep production are measured in millions of pounds carcass weight. Chicken and turkey production are measured in millions of pounds ready-to-cook. Egg production is measured in millions of dozens. Milk production is measured in millions of pounds fluid equivalent.

APPENDIX D

LISTINGS OF THE SUBROUTINES

```
      COMMON /BLK1/ C(14,421),H(14,350),EXOG(14,220),C1(14,350),R(14,421
     1),NGAUSS(14,3),NF1(40),NHAR(7),OLDEXO(14,220)
      COMMON /BLK2/ F(275),ADJ(100),CONST(120),FE(275),DM(7,9),PM(7,9)
      COMMON /BLK3/ ACRE(14,30),YIELD(16,7),DUM(14,7)
      COMMON /BLK4/ KCAS(350),KRAY(350),KGR(200),KDR(200),INDF1(200)
     1,INDF2(200),INDF3(200),INDF4(200),INDF5(350),INDF6(350),NYEAR(10)
      INTEGER US(33,20),SIMNAM(20)
      COMMON /BLK5/ US,SIMNAM
      INTEGER SUMFIL(160),SUMTAB(160,6),SUMF(160)
      COMMON /BLK6/ SUMFIL,SUMTAB,SUMF,NAAA
      COMMON /BLK7/ NB1(34),NB2(06),NB3(13),NB4(07),NB5(07)
      COMMON/BLK8/  LEU,NPRB,TEN,TESTYR,ISIMND,IMONTH,IDAY,THASYR,NPRF,
     1NESTOP,KING,NPRDM,IDROP,IFLAG,NESTST,NSANDY,NSUZY,IHOLD1,NSAND1
     3,NRPA,IUDXX
      COMMON /BLK9/ NC,N,N2,IVAL
      INTEGER DIVAC,TARGET,FREMKT
      COMMON /BLK10/ DIVAC,TARGET,FREMKT,LOAN,IAJSET,JA73,JLRPOL,NSUPFG,
     1JSUPCO,JSUPWH,JSUPSO,IAJLOT,IAPART
      COMMON /BLK11/ I,J,NOBS,NOB,NSHOOT,NDEX,NERD
      COMMON /BLK12/ DUMP1(14,7),DUMP2(14,7),DUMP5(14,7),DUMP6(14,7)
      COMMON /BLK13/ KROP(7,14),J37
      COMMON /BLK14/ IDATA(4,350),CDATA(14,100),INTER,NTER
      COMMON /BLK15/ S(14,421), WGHT2(7),PR1(7),JRUN,MDL,WWX,DDEV1,
     1DDEV2,WGHT1,WGHT4(7),KLM
      COMMON /BLK16/ TEI(202),IEND1,IEND2,IST1,KLO,KLN
      DEFINE FILE 10(999,90,U,JNEXT)
      DEFINE FILE 11(50,700,U,JNEWT)
      DEFINE FILE 12(0301,1220,U,JNET2)
      DEFINE FILE 13(0301,1220,U,JNET3)
CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC
C
C
CC    DETERMINISTIC POLYSIM MAIN
C
C
CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC
12345 FORMAT(1H0, 'POLYSIM    MAIN    BEGUN')
    2 FORMAT(' ','ITERATION NUMBER ',I4)
      WRITE(8,12345)
      CALL INT1
CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC
C
C
CC    THE SIMULATOR WILL DO 100 SIMULATIONS IN ANY ONE RUN
C
C
CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC
      DO 1900  LFM=1,100
  200 CALL INITAL
      CALL INT2
CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC
C
C
CC    SIMULATION LOOP
C
C
CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC
      KLO = 0
      KLN = 0
      IF(IFLAG.EQ.5) GO TO 200
      DO 2000 INTER=1,IHOLD1
      NTER=INTER
```

```
      WRITE(6,2) NTER
      JRUN = 0
  500 CONTINUE
      JRUN = JRUN + 1
      DO 1000 I= 3  ,NOBS
      J=I-1
      HOL = 0
      CALL SETUP
      CALL AJLOAN
      CALL LVSK
      IF(JRUN.EQ.1) CALL YAEXCN
      IVAL=4
      CALL INIT
      CALL CROPQ
      CALL SHOD
      CALL LOANRP
      CALL FGWTD
      IF(I.EQ.4.AND.LOAN.NE.0.AND.NTER.EQ.1) CALL CHECKR
      CALL LOANRP
      CALL SUPPRT
      CALL CUTDD
      CALL LOANRP
      CALL SURPLS
      IF(JRUN.EQ.2) GO TO 300
      CALL NUPREX
      CALL CROPQ
      CALL SHDD
      CALL LOANRP
      CALL FGWTD
      CALL LOANRP
      CALL SUPPRT
      CALL CUTDD
      CALL LOANRP
      CALL SURPLS
  300 CALL RECPTS
      CALL FEEDAG
      CALL FEED
      CALL FED2
      CALL INDEX
      CALL GOVP
      CALL TOTALS
 1000 CONTINUE
      IF(JRUN.EQ.1) CALL RESET
      IF(JRUN.EQ.1) GO TO 500
      IF(IHOLD1.NE.1) CALL STORE
 2000 CONTINUE
      CALL NUMIT
      CALL CHDATA
      CALL PRICED
      IF(NOB.LE.5)  CALL  WRITE
      IF(NOB.GT.5)  CALL  WRITEA
      IF(NOB.LE.5)  CALL  WRITE1
      IF(NOB.GT.5)  CALL  WRITEB
      IF(NOB.LE.5)  CALL  WRITE5
      IF(NOB.GT.5)  CALL  WRITEE
      IF(NOB.LE.5)  CALL  WRITE6
      IF(NOB.GT.5)  CALL  WRITEF
      IF(NOB.LE.5)  CALL  WRITE3
      IF(NOB.GT.5)  CALL  WRITEC
      IF(NOB.LE.5)  CALL  WRITE4
      IF(NOB.GT.5)  CALL  WRITED
      CALL RITSUR
 1900 CONTINUE
       STOP
       END
```

```
0001        SUBROUTINE RESET
      C
      C     RESET COPIES THE RESULTS FROM THE FIRST FULL PASS THROUGH POLYSIM
      C         INTO THE 'S' MATRIX.  THEN RESET RESTORES THE 'C' MATRIX TO THE
      C          INITIALIZED STATE AT PER INIT AL----FIRST 2 ROWS OF B AND C FOU
      C          REMAINDER OF C = 0.0,  ALSO ADDS FINAL YIELDS TO C MATRIX.
      C
0002        COMMON /BLK1/ C(14,421),B(14,350),EXOG(14,220),CI(14,350),R(14,421
           1),NGAUSS(14,3),NF1(40),NBAR(7),OLDEXO(14,220)
0003        COMMON /BLK4/ KPAR(350),KRAY(350),KGR(200),KOR(200),INDE1(200)
           1,INDE2(200),INDE3(200),INDE4(200),INDE5(350),INDE6(350),NYEAR(10)
0004        COMMON/BLK8/  IFO,NPER,IEN,IFSTYR,ISINDD,IMONTH,IDAY,IHASYR,NPRF,
           1NESTOR,KING,NPRDN,IDROP,IFLAG,NFSIST,NSANDY,NSUZY,IHOLD1,NSANDI
           3,NRPR,IODXX
0005        INTEGER DIVAC,TARGET,FREMKT
0006        COMMON /BLK10/ DIVAC,TARGET,FREMKT,LUAN,IAJSET,JA73,JLRPOL,NSUPFG,
           1JSUPCO,JSUPWH,JSUPSO,IAJLOT,IAPART
0007        COMMON /BLK11/ I,J,NOBS,NOB,NSHOOT,NUEX,NERD
0008        COMMON /BLK13/ KROP(7,14),J37
0009        COMMON /BLK14/ IDATA(4,350),CDATA(14,100),INTER,NTER
0010        COMMON /BLK15/ S(14,421), WGHT2(7),PR1(7),JRUN,MDL,WWX,DDEV1,
           1DDEV2,WGHT1,WGHT4(7),KLM
      C
      C
0011        DIMENSION NQ(7)
0012        DATA NQ/7,219,6,220,221,222,8/
      C
      C
0013   1234 FORMAT('0',' SUBROUTINE RESET ENTERED')
0014        WRITE(8,1234)
0015        IF(IHOLD1.GT.1) CALL STORE1
0016        IF(NTER.EQ.IHOLD1) CALL DUMPER
      C
      C     COPY 'C' MATRIX INTO THE 'S' MATRIX
      C
0017        DO 10 J1 = 1,421
0018        DO 10 L1 = 1,14
0019     10 S(L1,J1) = C(L1,J1)
      C
      C     ZERO OUT THE 'C' MATRIX.
      C
0020        DO 20 J1 = 1,414
0021        DO 20 I1 = 3,14
0022     20 C(I1,J1) = 0.0
      C
      C     ADD THE FINAL YIELD TO THE C MATRIX.
      C
0023        DO 30 J1 = 1,7
0024        DO 30 I1 = 3,NOBS
0025     30 IF(R(I1,NQ(J1)).NE.0.0) C(I1,NQ(J1)) = R(I1,NQ(J1))
      C
0026        RETURN
0027        END
```

```
0001          SUBROUTINE NUPREX
       C
       C       THIS SUBROUTINE CALCULATES THE NEW WEIGHTED PRICES ON WHICH TO
       C          BASE PRODUCER SUPPLY RESPONSE, WWX IS THE WEIGHT GIVEN TO
       C          CURRENT YEAR PRICES, (1-WWX) IS THE WEIGHT GIVEN TO PREVIOUS
       C          YEAR PRICES.
       C      FINAL YIELDS AND EXPORTS ARE PLACED INTO THE C AND B MATRIX FOR
       C          LAST PASS THROUGH POLYSIM "INFORMATION" CASE.
       C
0002          COMMON /BLK1/ C(14,421),B(14,350),EXOG(14,220),C1(14,350),R(14,421
             1),NGAUSS(14,3),NF1(40),NBAR(7),OLDEXO(14,220)
0003          COMMON /BLK7/ NB1(34),NB2(06),NB3(13),NB4(07),NB5(07)
0004          COMMON/BLK9/NC,N,N2,IVAL
0005          COMMON/BLK11/I,J,NOBS,NOB,NSHOOT,NOEX,NERD
0006          COMMON /BLK15/ S(14,421), WGHT2(7),PR1(7),JRUN,MDL,WWX,DDEV1,
             1DDEV2,WGHT1,WGHT4(7),KLM
       C
       C
0007          DIMENSION NQ(7),NR(7),NV(7),NU(7),N1(7)
       C
0008          DATA NQ/7,219,6,220,221,222,8/
0009          DATA NR/38,39,40,239,243,247,251/
0010          DATA NV/19,258,18,259,260,261,20/
0011          DATA NU/11,223,10,224,225,226,12/
0012          DATA N1/3,215,2,216,217,218,4/
       C
0013    1234  FORMAT('0','SUBROUTINE NUPREX ENTERED')
0014          WRITE(8,1234)
0015          DO 50 J1 = 1,7
0016          PR1(J1) = (WWX * C(I,NB4(J1)) + (1.0-WWX) * C(J,NB4(J1)))
0017      50  WRITE(8,66) C(I,NB4(J1)), C(J,NB4(J1)), PR1(J1)
0018      66  FORMAT(3F10.3)
0019          MDL = 1
0020          DO 60 J1 = 1,7
0021          IF(R(I,NQ(J1)).NE.0.0) C(I,NQ(J1)) = R(I,NQ(J1))
0022          R(I,NR(J1)) = R(I,(414+J1))
0023          C(I,(414+J1)) = C(I,NR(J1))
0024      60  CONTINUE
       C      ZERO OUT AREA, PRODUCTION, AND VARIABLE COSTVALUES.
0025          DO 75 J1 = 1,7
0026          C(I,NV(J1)) = 0.0
0027          C(I,NU(J1)) = 0.0
0028          C(I,N1(J1)) = 0.0
0029      75  CONTINUE
0030          B(I,008) = B(I,008) * 480.
0031          RETURN
0032          END
```

```
      SUBROUTINE SURPLS
C
C     THIS SUBROUTINE COMPUTES CONSUMER SURPLUS FOR DOMESTIC AND
C     EXPORT CONSUMPTION PLUS PRODUCER SURPLUS. NO INFORMATION RESULTS A
C     STORED IN LOCATIONS 351-382 OF THE "C" MATRIX. INFORMATION RESULTS
C     ARE STORED IN LOCATIONS 351-382 OF THE "S" MATRIX. VALUE OF
C     INFORMATION RESULTS ARE STORED IN LOCATIONS 383-414 OF THE "C"
C     MATRIX
C
      COMMON /BLK1/ C(14,421),B(14,350),EXOG(14,220),C1(14,350),R(14,421
     1),NGAUSS(14,3),NF1(40),NBAR(7),OLDEXO(14,220)
      COMMON /BLK2/ E(275),ADJ(100),CONST(120),EE(275),DM(7,9),PM(7,9)
      COMMON/BLK9/NC,N,N2,IVAL
      COMMON/BLK11/I,J,NOBS,NOB,NSHOUT,NDEX,NERD
      COMMON /BLK15/ S(14,421), WGHT2(7),PR1(7),JRUN,MDL,WWX,DDEV1,
     1DDEV2,WGHT1,WGHT4(7),KLM
C
C     CROP 1=SOYBEANS, 2=CORN, 3=WHEAT, 4=GRAIN SORGHUM, 5=OATS,
C     6=BARLEY, AND 7=COTTON. 8=TOTAL OF SEVEN CROPS.
C
C     NT = INDEX FOR DOMESTIC ELATSICITY OF DEMANDS FOR 7 CROPS.
C     NW = C & B INDEX FOR TOTAL DOMESTIC DEMAND FOR 7 CROPS.
C     NB = C & B INDEX FOR PRICES OF 7 CROPS.
C     NS = INDEX FOR EXPORT DEMAND ELASTICITY FOR 7 CROPS.
C     NR = C & B INDEX FOR EXPORT DEMAND FOR 7 CROPS.
C     NU = C & B INDEX FOR PRODUCTION FOR 7 CROPS.
C     NV = C & B INDEX FOR VARIABLE COSTS FOR 7 CROPS.
C
      DIMENSION NT(7),NW(7),SLOP1(7),NB(7),SLOP2(7),NS(7),NR(7),NU(7)
      DIMENSION NV(7),CSTEMP(3)
C
      DATA NT/234,240,245,250,255,258,262/
      DATA NW/35,265,34,266,267,268,32/
      DATA NB/27,102,26,103,105,104,28/
      DATA NS/235,242,246,252,252,252,263/
      DATA NR/39,239,38,243,247,251,40/
      DATA NU/11,223,10,224,225,226,12/
      DATA NV/19,258,18,259,260,261,20/
C
      WRITE(9,1)
    1 FORMAT('0','SUBROUTINE SURPLUS ENTERED')
C     CONVERT COTTON DOMESTIC DEMAND, EXPORT DEMAND, AND PRODUCTION TO
C         POUNDS FROM BALES.
C
      B(I,12) = B(I,12) * 480.
      C(I,12) = C(I,12) * 480.
      B(I,32) = B(I,32) * 480.
      C(I,32) = C(I,32) * 480.
      B(I,40) = B(I,40) * 480.
      C(I,40) = C(I,40) * 480.
C     COMPUTE DOMESTIC ELASTICITY OF DEMAND FOR WHEAT AS THE WEIGHTED
C       VALUE OF FOOD AND FEED DEMANDS.
      EDWHT = (B(I,84) * E(245) + B(I,30) *E(247))/(B(I,84) + B(I,30))
C
C
C     COMPUTE SLOPES OF DOMESTIC DEMAND.
C
      WRITE(9,2)
```

```
      2 FORMAT('0',' CROP DOMESTIC DEMAND',/,13X,'SLOPE')
        SLOP1(3) = ((-1.0 /ED*HT) / (B(I,34) / B(I,26)))
        DO 10 J1 = 1,7
        IF(J1.EQ.3) GO TO 10
        SLOP1(J1) = ((-1.0/E(NT(J1))) / (B(I,NW(J1))/ B(I,NB(J1))))
     10 WRITE(9,3)  J1, SLOP1(J1)
      3 FORMAT('0',2X,I2,4X,F15.7)
C
C
C       WGHT1 IS THE WEIGHT GIVEN TO THE PRELIMINARY OR BASELINE PRODUCER
C       CONSUMER SURPLUS WHEN MDL = 0.0 AND (1-WGHT1) IS THE WEIGHT GIVEN
C       PS OR CS WHEN MDL = 1.0.
C       WGHT2 IS SIMILAR TO WGHT1 EXCEPT IT GIVES MORE WEIGHT TO PRELIMINA
C       OR BASELINE VALUES.
C
        WGHT3 = WGHT1
        IF(MDL.EQ.1) WGHT3 = (1.0 - WGHT3)
        DO 60 J1 = 1,7
        WGHT4(J1) = WGHT2(J1)
        IF(C(I,NB(J1)).LT.B(I,NB(J1))) WGHT4(J1) = WGHT4(J1)/2.0
     65 IF(MDL.EQ.1) WGHT4(J1) = (1.0 - WGHT4(J1))
     60 CONTINUE
C
C       COMPUTE DOMESTIC CONSUMER SURPLUS.
C
        IF(JRUN.NE.2) GO TO 120
        WGHT3 = 1.0
        DO 110 J1 = 1,7
    110 WGHT4(J1) = 1.0
    120 WRITE(9,21)
     21 FORMAT('0','CROP DOMESTIC CONSUMER SURPLUS')
        DO 20 J1 = 1,7
        J2 = 351 + (J1 * 4 - 4)
        C(I,J2) = ((0.5 * SLOP1(J1) * ((C(I,NW(J1))**2.0) - (B(I,NW(J1))
       1**2.0))) * WGHT4(J1) + C(I,J2))
        C(I,379) = C(I,379) + C(I,J2)
        WRITE(9,22) J1,C(I,J2)
     20 CONTINUE
     22 FORMAT('0',1X,I2,9X,F15.3)
        J1 = 8
        WRITE(9,22) J1,C(I,379)
C
C       COMPUTE SLOPES FOR EXPORT DEMAND.
C
        SLOP2(5) = 0.0
        SLOP2(6) = 0.0
        WRITE(9,31)
     31 FORMAT('0',' CROP EXPORT DEMAND',/,12X,'SLOPE')
        DO 30 J1=1,7
        IF(J1.EQ.5) GO TO 30
        IF(J1.EQ.6) GO TO 30
        SLOP2(J1) = ((-1.0/E(NS(J1))) / (B(I,NR(J1))/ B(I,NB(J1))))
     30 WRITE(9,3) J1,SLOP2(J1)
C
C       COMPUTE EXPORT CONSUMER SURPLUS.
C
        WRITE(9,41)
     41 FORMAT('0','CROP EXPORT CONSUMER SURPLUS')
```

```
      DO 40 J1 = 1,7
      J2 = 352 + (J1 * 4) - 4
      C(I,J2) = ((0.5 * SLOP2(J1) * ((C(I,NR(J1))**2.0) - (B(I,NR(J1))**
     12.0)) * WGHT4(J1)) + C(I,J2))
      C(I,380) = C(I,380) + C(I,J2)
      WRITE(9,22) J1,C(I,J2)
   40 CONTINUE
      J1 = 8
      WRITE(9,22) J1,C(I,380)
C
C     COMPUTE PRODUCER SURPLUS AS THE DIFFERENCE IN SIMULATED AND
C        BASELINE (TOTAL REVENUE - VARIABLE COSTS).
C
      WRITE(9,51)
   51 FORMAT('0','CROP PRODUCER SURPLUS')
      DO 50 J1 = 1,7
      J2 = 353 + (J1 * 4) - 4
      C(I,J2) = (((C(I,NB(J1)) * C(I,NU(J1))) - C(I,NV(J1))) - ((B(I,NB
     1(J1)) * B(I,NU(J1))) - B(I,NV(J1)))) * WGHT3 + C(I,J2)
      C(I,381) = C(I,381) + C(I,J2)
      WRITE(9,22) J1,C(I,J2)
   50 CONTINUE
      J1 = 8
      WRITE(9,22) J1,C(I,381)
C
C     COMPUTE NET DOMESTIC SURPLUS
C
      WRITE(9,71)
   71 FORMAT('0','CROP NET DOMESTIC SURPLUS')
      DO 70 J1 = 1,8
      J2 = 354 + (J1 * 4) - 4
      C(I,J2) = C(I,(J2-1)) + C(I,(J2-3))
   70 WRITE(9,22) J1,C(I,J2)
   80 CONTINUE
      IF(JRUN.EQ.1) GO TO 900
C
C     ON THE LAST PASS THROUGH POLYSIM (NO INFORMATION) CASE, COMPUTE TH
C     DIFFERENCE BETWEEN "WITH INFORMATION" CASE AND THE "NO INFORMATION
C     CASE. STORE THESE VALUES IN THE "C" MATRIX LOCATIONS 383-414.
C
      WRITE(9,101)
  101 FORMAT('0','VALUE OF INFO',5X,'NO INFORMATION',5X,'INFORMATION')
  100 FORMAT('0',2X,F15.3,5X,F15.3,5X,F15.3)
      DO 90 J1 = 1,32
      C(I,(382 + J1)) = S(I,(350 + J1)) - C(I,(350 + J1))
   90 WRITE(9,100) C(I,(382 + J1)), C(I,(350 + J1)), S(I,(350 + J1))
  900 CONTINUE
      IF((MDL.EQ.0).AND.(JRUN.EQ.1)) C(I,379) = 0.0
      IF((MDL.EQ.0).AND.(JRUN.EQ.1)) C(I,380) = 0.0
      IF((MDL.EQ.0).AND.(JRUN.EQ.1)) C(I,381) = 0.0
C
C      CONVERT COTTON DOMEST DEMAND, EXPORT DEMAND, AND PRODUCTION TO
C                BALES FROM POUNDS.
C
      B(I,12) = B(I,12) / 480.
      C(I,12) = C(I,12) / 480.
      B(I,32) = B(I,32) / 480.
      C(I,32) = C(I,32) / 480.

      B(I,40) = B(I,40) / 480.
      C(I,40) = C(I,40) / 480.
C
      RETURN
      END
```

```
      SUBROUTINE RITSUR
C
C     THIS SUBROUTINE WRITES OUT THE RESULTS OF THE CONSUMER AND PRODUCE
C     SURPLUS COMPUTATIONS.
C
      COMMON /BLK1/ C(14,421)[illegible],XOG(14,220),CI(14,350),R(14,421
     1),NGAUSS(14,3),NFI(40),NCURS[illegible],OLF,XO(14,220)
      COMMON /BLK4/ KPAR(350),KRAY(350),KGR(200),KUR(200),INDE1(200)
     1,INDE2(200),INDE3(200),INDE4(200),INDE5(350),INDE6(350),NYEAR(10)
      COMMON /BLK11/ I,J,NOBS,NOB,NSHOUT,NOEX,NERD
      COMMON /BLK15/ S(14,421), WGHT2(7),PRI(7),JRUN,MDL,WWX,DDEV1,
     1DDEV2,WGHT1,WGHT4(7),KLM
C
C
C
      DIMENSION NA(7),DUMPU(5)
      DATA NA/38,39,40,239,243,247,251/
C
C
    1 FORMAT('1')
    2 FORMAT('0',51X,'CONSUMER AND PRODUCER SURPLUS',40X,'PAGE',I3)
    5 FORMAT('0',32X,5('      NO        VALUE OF'))
    3 FORMAT(' ',47X,'NO INFORMATION - VALUE OF INFORMATION')
    4 FORMAT(' ',54X,'BY CROP, BY YEAR')
    6 FORMAT(' ',32X,10(' INFORMA- '))
    7 FORMAT(' ',32X,10('   TION    '))
  209 FORMAT('0',32X,5(8X,I4,8X))
   80 FORMAT('0')
    9 FORMAT(' ',17X,'SURPLUS')
   10 FORMAT('0',2X,5X, I4,1X,'DOMESTIC CONSUMER    ',10(F9.3,1X))
   11 FORMAT('0',2X,5X, I4,1X,'EXPORT CONSUMER      ',10(F9.3,1X))
   12 FORMAT('0',2X,5X, I4,1X,'PRODUCER SURPLUS     ',10(F9.3,1X))
   13 FORMAT('0',2X,5X, I4,1X,'NET DOMESTIC SURPLUS',10(F9.3,1X))
   14 FORMAT('0',15X,'SOYBEANS')
   15 FORMAT('0',15X,'CORN')
   16 FORMAT('0',15X,'WHEAT')
   17 FORMAT('0',15X,'GRAIN SORGHUM')
   18 FORMAT('0',15X,'OATS')
   19 FORMAT('0',15X,'BARLEY')
   20 FORMAT('0',15X,'COTTON')
   21 FORMAT('0',15X,'ALL CROPS')
   22 FORMAT('0',12X,'PRELIMINARY EXPORTS',5(5X,F9.3,6X))
   23 FORMAT(' ',12X,'FINAL EXPORTS      ',5(5X,F9.3,6X))
   24 FORMAT('0',47X,'PRELIMINARY AND FINAL EXPORT VALUES')
   25 FORMAT(' ',12X,'PRELIMINARY/FINAL % ',5(6X,F7.3,7X))
C
C
C
      JJJ =0
      IXLI = 351
      DO 500 LM = 1,3
      WRITE(6,1)
      WRITE(6,2) LM
      WRITE(6,3)
      WRITE(6,4)
      WRITE(6,209) (NYEAR(J3),J3 = 1,NOB)
      WRITE(6,5)
      WRITE(6,6)
```

```
      WRITE(6,7)
      LMZ = LM - 1
      DO 400 IXL = 1,3
      WRITE(6,80)
      IF(IXL1.EQ.351) WRITE(6,14)
      IF(IXL1.EQ.355) WRITE(6,15)
      IF(IXL1.EQ.359) WRITE(6,16)
      IF(IXL1.EQ.363) WRITE(6,17)
      IF(IXL1.EQ.367) WRITE(6,18)
      IF(IXL1.EQ.371) WRITE(6,19)
      IF(IXL1.EQ.375) WRITE(6,20)
      IF(IXL1.EQ.379) WRITE(6,21)
      WRITE(6,10)  IXL1, (C(I,IXL1),C(I,(IXL1+32) ),I = 3,NOBS)
      IXL1 = IXL1 + 1
      WRITE(6,9)
      WRITE(6,11) IXL1, (C(I,IXL1),C(I,(IXL1+32) ),I = 3,NOBS)
      WRITE(6,9)
      IXL1 = IXL1 + 1
      WRITE(6,12)  IXL1, (C(I,IXL1),C(I,(IXL1+32) ),I = 3,NOBS)
      IXL1 = IXL1 + 1
      WRITE(6,13)  IXL1, (C(I,IXL1),C(I,(IXL1+32) ),I = 3,NOBS)
      IXL1 = IXL1 + 1
      IF(IXL1.EQ.383) GO TO 500
  400 CONTINUE
  500 CONTINUE
      IF(JRUN.EQ.1) GO TO 602
      WRITE(6,1)
      WRITE(6,24)
      WRITE(6,209) (NYEAR(J3),J3=1,NUM)
      DO 600 JJ=1,7
      IF(JJ.EQ.1) WRITE(6,16)
      IF(JJ.EQ.2) WRITE(6,14)
      IF(JJ.EQ.3) WRITE(6,20)
      IF(JJ.EQ.4) WRITE(6,15)
      IF(JJ.EQ.5) WRITE(6,17)
      IF(JJ.EQ.6) WRITE(6,18)
      IF(JJ.EQ.7) WRITE(6,19)
      WRITE(6,22) (C(I,(JJ+414)),I=3,NOBS)
      WRITE(6,23) (C(I,NA(JJ)),I=3,NOBS)
      DO 601 I=3,NOBS
      JK=I-2
      DUMPO(JK)   =  C(I,(JJ+414))/C(I,NA(JJ)) * 100.
  601 CONTINUE
      WRITE(6,25) (DUMPO(I),I=1,5)
  600 CONTINUE
  602 CONTINUE
      RETURN
      END
```

```
      SUBROUTINE CROPQ
      COMMON /BLK1/ C(14,421),B(14,350),EXOG(14,220),C1(14,350),R(14,421
     1),NGAUSS(14,3),NF1(40),NBAR(7),OLDEXO(14,220)
      COMMON /BLK2/ E(275),ADJ(100),CONST(120),EE(275),DM(7,9),PM(7,9)
      COMMON /BLK3/ ACRE(14,30),YIELD(16,7),DUM(14,7)
      COMMON /BLK7/ NB1(34),NB2(06),NB3(13),NB4(07),NB5(07)
      COMMON /BLK9/ NC,N,N2,IVAL
      COMMON /BLK11/ I,J,NOBS,NOB,NSHOOT,NOEX,NERD
      COMMON /BLK15/ S(14,421), WGHT2(7),PR1(7),JRUN,MDL,WWX,DDEV1,
     1DDEV2,WGHT1,WGHT4(7),KLM
      DIMENSION  NG(160),PR(7)
      WRITE(8,500)
  500 FORMAT('0','THE SUBROUTINE CROPQ WAS ENTERED')
      READ(10' 926)  (NG(L),L=91,147)
      READ(10' 925)  (NG(L),L=1,90)
      B(I,008)=B(I,008)/480.0
      DO 5 J1=1,7
    5 PR(J1)=0.0
CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC
C
C
CC    DETERMINE WHICH IS GREATER, LAGGED PRICE OR CURRENT LOAN RATES FOR
CC    ALL MODEL CROPS
C
C
CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC
      DO 10 J1=1,7
      PR(J1) = C(J,NB4(J1))
      IF(MDL.NE.1) GO TO 30
      C(J,NB4(J1)) = PR1(J1)
   30 IF(C(J,NB4(J1)).LT.EXOG(I,NB5(J1))) C(J,NB4(J1)) = EXOG(I,NB5(J1))
   10 CONTINUE
      IF(MDL.NE.1) GO TO 50
   60 WRITE(8,1346)
 1346 FORMAT('0','PRODUCER RESPONSE BEING CALCULATED')
   50 CONTINUE
      DO 100 J2=1,7
  100 WRITE(8,66) C(J,NB4(J2)),B(J,NB4(J2)),EXOG(I,38)
   66 FORMAT(3F10.3)
C   CALCULATION OF ACREAGE,YIELD,PRODUCTION,VAR.EXP.PER HARVESTED ACRE
C   AND TOTAL VAR. EXP. FOR THE  SEVEN MODEL CROPS
      DO 11 J1=1,7
      NG1=NG(J1)
      NG2=NG(J1+7)
      NG3=NG(J1+14)
      NG4=NG(J1+21)
      NGA=NG(J1+28)
      NGB=NG(J1+35)
      NG7=NG(J1+42)
      NG8=NG(J1+49)
      NG9=NG(J1+56)
      NG10=NG(J1+63)
      NG11=NG(J1+70)
      NG12=NG(J1+77)
      NG13=NG(J1+84)
      NG14=NG(J1+91)
      NG15=NG(J1+98)
      NG16=NG(J1+105)
```

```
0047          NG17=NG(J1+112)
0048          NG18=NG(J1+119)
0049          NG19=NG(J1+126)
0050          NG20=NG(J1+133)
0051          NG21=NG(J1+140)
0052          IF(C(I,NG1).EQ.0.0)
             1C(I,NG1)=B(I,NG1)*(1.0+E(NG2)*((C(J,27)-B(J,27))/B(J,27))+
             2E(NG3)*((C(J,102)-B(J,102))/B(J,102))+E(NG4)*((C(J,26)-B(J,26))/
             3B(J,26))+E(NG5)*((C(J,103)-B(J,103))/B(J,103))+E(NG6)*((C(J,105)
             4-B(J,105))/B(J,105))+E(NG7)*((C(J,104)-B(J,104))/B(J,104))
             5+E(NG8)*((C(J,28)-B(J,28))/B(J,28))+E(NG9)*EXOG(I,38))
             6+(1.0-ADJ(NG10))*(C(J,NG1)-B(J,NG1))
0053          IF(C(I,NG11).EQ.0.0)
             1C(I,NG11)=B(I,NG11)*(1.0+E(NG12)*((C(J,NG13)-B(J,NG13))/B(J,
             2NG13))+E(NG14)*EXOG(I,38))+(1.0-ADJ(NG15))*(C(J,NG11)-B(J,NG11))
0054          IF(C(I,NG16).EQ.0.0)
             1C(I,NG16)=C(I,NG1)*C(I,NG11)
0055          IF((C(I,NG1)*C(I,NG11)).NE.C(I,NG16)) C(I,NG11)=C(I,NG16)/C(I,NG1)
0056          IF(C(I,NG17).EQ.0.0)
             1C(I,NG17)=B(I,NG17)*(1.0+E(NG18)*((C(J,NG13)-B(J,NG13))/B(J,NG13))
             2+E(NG19)*EXOG(I,38))+(1.0-ADJ(NG20))*(C(J,NG17)-B(J,NG17))
0057          C(I,NG21)=C(I,NG17)*C(I,NG1)
0058     11   CONTINUE
0059          DO 12 J1=1,7
0060          IF(PR(J1).NE.0.0) C(J,NB4(J1))=PR(J1)
0061     12   CONTINUE
0062          RETURN
0063          END
```

```
      SUBROUTINE INT2
      COMMON /BLK1/ C(14,421),B(14,350),EXOG(14,220),C1(14,350),R(14,421
     1),NGAUSS(14,3),NF1(40),NBAR(7),OLDEXO(14,220)
      COMMON /BLK2/ E(275),ADJ(100),CONST(120),EE(275),DM(7,9),PM(7,9)
      COMMON /BLK3/ ACRE(14,30),YIELD(16,7),DUM(14,7)
      COMMON /BLK4/ KPAR(350),KRAY(350),KGR(200),KDR(200),INDE1(200)
     1,INDE2(200),INDE3(200),INDE4(200),INDE5(350),INDE6(350),NYEAR(10)
      INTEGER US(33,20),SIMNAM(20)
      COMMON /BLK5/ US,SIMNAM
      COMMON/BLK8/  LFM,NPRB,IEN,IFSTYR,ISIMND,IMONTH,IDAY,IBASYR,NPRE,
     1NESTOR,KING,NPRDM,IDROP,IFLAG,NFSTST,NSANDY,NSUZY,IHOLD1,NSANDI
     3,NRPB,INDXX
      INTEGER DIVAC,TARGET,FREMKT
      COMMON /BLK10/ DIVAC,TARGET,FREMKT,LOAN,IAJSET,JA73,JLRPOL,NSUPFG,
     1JSUPCO,JSUPWH,JSUPSO,IAJLOT,IAPART
      COMMON /BLK11/ I,J,NOBS,NOB,NSHOOT,NOEX,NERD
      COMMON /BLK14/ IDATA(4,350),CDATA(14,100),INTER,NTER
      DIMENSION AA(40),A(40)
   62 FORMAT ('1','THE LAST EXOGENOUS OR ENDOGENOUS DATA CARD READ WAS '
     1,I4,' THE FIRST YEAR OF DATA IS ',I4,', POLYSIM ONLY ALLOWS A TWO
     2YEAR LAG')
   63 FORMAT ('1','THE LAST EXOGENOUS OR ENDOGENOUS DATA CARD READ WAS '
     1,I4,' THE USER READ MORE OBSERVATIONS THAN THERE IS ARRAY STORAGE'
     2)
   68 FORMAT('0',10X,'THE CODE YOU READ IN FOR AN ENDOGENOUS VARIABLE CH
     1ANGE DOES NOT COINCIDE WITH A DESIGNATION')
   65 FORMAT('0',10X,'THE CODE YOU READ IN FOR AN EXOGENOUS VARIABLE CHA
     1NGE DOES NOT COINCIDE WITH A DESIGNATION')
   66 FORMAT(' ',10X,'YOUR CODE WAS',I4,'OPTIONAL DATA CARD ',I4)
   67 FORMAT(' ',10X,'SIMULATION HAS BEEN TERMINATED')
   77 FORMAT ('1','POLYSIM WAS READING OPTIONAL DATA    CARDS WHEN ERROR
     1OCCURRED, CHECK #CARDS & COL. 36-38 OF ELASTICITY CARD ',I4)
12345 FORMAT(1H0, 'SUBROUTINE INT2   ENTERED')
10002 FORMAT(I1, 2X, 19A4)
10016 FORMAT(I1, 19X, I3, I2,4X,  I1, 5F10.0)
30012 FORMAT(1H0, 'THE REMAINING PARAMETER CARDS FOR THIS SIMULATION ',
     1            'ARE PRINTED BELOW')
30022 FORMAT(1H0, I1, 2X, 20A4)
   17 FORMAT          (8F10.4)
      WRITE(8,12345)
      NE=193
      DO 16 J1=1,7
      NBAR(J1)=0
   16 CONTINUE
      DO 119 I=1,14
      DO 119 J=1,7
  119 DUM(I,J)=0.0
      DO 3708 J=1,200
      INDE3(J)=0
      INDE4(J)=0
 3708 CONTINUE
      DO 3709 J=1,350
      INDE5(J)=0
      INDE6(J)=0
 3709 CONTINUE
      NSHOOT=0
      NERD=0
      NOEX=0
```

```
      IGOOF=0
      DO 9999 I=3,10
      DO 9999 J1=1,300
      R(I,J1)=0.0
 9999 CONTINUE
C
C     READ OPTIONAL DATA CARDS
C
  800 READ(5,10016,          ERR=3000)ICHEC,KOD,IYEAR,NUMYRS,(AA(I),I=1,5)
C     MUST PLACE A '9' CARD AFTER THE DATA CHANGES IN ORDER TO ALLOW
C      THE INPUT OF PRELIMINARY EXPORT VALUES IN 'YAEXCN' SUBROUTINE.
      IF(ICHEC.EQ.9) GO TO 690
      IGOOF=IGOOF+1
      IF(ICHEC.EQ.0) GO TO 700
      IF(ICHEC.EQ.4) GO TO 410
      IYEAR=IYEAR+1900
      IF(IYEAR.GT.3000) IYEAR = IYEAR-1900
      IF (IYEAR.LT.IFSTYR-2) GO TO 2400
      IF((IYEAR-IFSTYR + NUMYRS).GT.14) GO TO 2500
      IF(NUMYRS-5) 509,509,227
  227 READ(5,17) ( AA (I),I=6,NUMYRS)
  509 CONTINUE
      ISTART=3+(IYEAR-IFSTYR)
      IEND=(NUMYRS+ISTART)-1
      IF(ICHEC.EQ.5) GO TO 510
      IF(ICHEC.EQ.6) GO TO 610
C    ---- READ NEW ELASTICITIES----
  400 CONTINUE
  410 NERD=NERD+1
      E(KOD)=AA(1)
      EE(KOD)=AA(2)
      J10=1
  492 IF(J10.GT.NE) GO TO 2306
      J11=J10
      J10=J10+1
      IF(INDE1(J11).EQ.KOD)  INDE3(J11)=INDE1(J11)
      IF(INDE1(J11).EQ.KOD)  INDE4(J11)=INDE2(J11)
      IF(INDE1(J11).NE.KOD)  GO TO 492
      IF(EE(INDE3(J11)).EQ.0.0) EE(INDE3(J11))=E(INDE3(J11))
      IF(E(INDE1(J11)).EQ.0) GO TO 493
      ADJ(INDE4(J11))=1.0D0-(E(INDE3(J11))/EE(INDE3(J11)))
      IF(ADJ(INDE4(J11)).EQ.0.0) ADJ(INDE4(J11))=1.0
  493 GO TO 800
C     READ POLICY CHANGES FOR EXOGENEOUS DATA
  510 NOEX=NOEX+1
      JOCK=1
  228 IF(JOCK.GE.NSANDY) GO TO 2300
      IF(KOD.EQ.KGR(JOCK)) INDE5(JOCK)=JOCK
      IF(KOD.EQ.KGR(JOCK)) GO TO 511
      JOCK=JOCK
      JOCK =JOCK+1
      IF(KOD.NE.KGR(JOCK)) GO TO 228
  511 CONTINUE
      DO 229 I=ISTART,IEND
      K=(I-ISTART)+1
      EXOG(I,KOD)= AA (K)
      IF(KOD.EQ.143) DUM(I,1)=AA(K)
      IF(KOD.EQ.144) DUM(I,4)=AA(K)
```

```
      IF(KOD.EQ.145) DUM(I,5)=AA(K)
      IF(KOD.EQ.146) DUM(I,6)=AA(K)
      IF(KOD.EQ.33) DUM(I,2)= AA(K)
      IF(KOD.EQ.34) DUM(I,3)= AA(K)
      IF(KOD.EQ.13) DUM(I,7)=AA(K)
      IF(IHOLD1.GT.1) OLDEXO(I,KOD)=AA(K)
      IDATA(3,JOCK)=ISTART
      IDATA(4,JOCK)=IEND
  229 CONTINUE
      GO TO 800
C-----     READ POLICY    CHANGES--ENDOGENEOUS ---
  610 NSHOOT=NSHOOT+1
      J=NSHOOT
      DO 170 K=1,NUMYRS
  170 CDATA(K,J)=AA(K)
      JACK=1
  601 IF(JACK.GE.NSUZY) GO TO 2301
      IF(KOD.EQ.KPAR(JACK)) INDE6(JACK)=JACK
      IF(KOD.EQ.KPAR(JACK)) GO TO 602
      JICK=JACK
      JACK=JACK+1
      IF(KOD.NE.KPAR(JICK)) GO TO 601
  602 CONTINUE
      DO 525 I = ISTART,IEND
      K = (I - ISTART) + 1
      R(I,KOD)=CDATA(K,J)
      C(I,KOD)=CDATA(K,J)
      IF(KOD.EQ.8)R(I,008)=R(I,008)/480.0
      IF(KOD.EQ.39) NBAR(1)=2
      IF(KOD.EQ.39) R(I,KOD)=CDATA(K,J)
      IF(KOD.EQ.239) NBAR(2)=2
      IF(KOD.EQ.239) R(I,KOD)=CDATA(K,J)
      IF(KOD.EQ.38) NBAR(3)=2
      IF(KOD.EQ.38) R(I,KOD)=CDATA(K,J)
      IF(KOD.EQ.243) NBAR(4)=2
      IF(KOD.EQ.243) R(I,KOD)=CDATA(K,J)
      IF(KOD.EQ.247) NBAR(5)=2
      IF(KOD.EQ.247) R(I,KOD)=CDATA(K,J)
      IF(KOD.EQ.251) NBAR(6)=2
      IF(KOD.EQ.251) R(I,KOD)=CDATA(K,J)
      IF(KOD.EQ.40) NBAR(7)=2
      IF(KOD.EQ.40) R(I,KOD)=CDATA(K,J)
      IDATA(1,JACK)=ISTART
      IDATA(2,JACK)=IEND
  525 CONTINUE
      GO TO 800
  690 IEN =IEN +1
  700 CONTINUE
C-----     CALCULATE LONG RUN ELASTICITY- IF READ NEW ELASTICITIES
      IF(NERD.EQ.0) GO TO 305
      DO 300 I=1,NE
      IF(INDE3(I).EQ.0) GO TO 300
      IF(ADJ(INDE4(I)).EQ.1.0) GO TO 295
      EE(INDE3(I))=(E(INDE3(I))/(1.0D0-ADJ(INDE4(I))))
      GO TO 300
  295 EE(INDE3(I))=E(INDE3(I))
  300 CONTINUE
  305 CONTINUE
```

```
      CALL OPTION
      RETURN
C=THE FOLLOWING ARE EMBEDDED ERROR MESSAGES
 2306 WRITE(6,80) NERD,KOD
      GO TO 30010
   80 FORMAT('0',10X,'THE',I4,'ELASTICITY CARD DEFINES AN ELASTICITY WIT
     1H CODE',I4,'THIS CODE IS NOT DEFINED')
 2300 WRITE(6,65)
      WRITE(6,66) KOD,IGOOF
      WRITE(6,67)
      GO TO 30010
 2301 WRITE(6,68)
      WRITE(6,66) KOD,IGOOF
      WRITE(6,67)
      GO TO 30010
 2400 WRITE(6,62) KOD,IYEAR,IFSTYR
      GO TO 30010
 2500 WRITE (6,63) KOD
      GO TO 30010
 3000 WRITE(6,77)  KOD
      GO TO 30010
30010 WRITE(6,30012)
30020 IF(IEN .NE.0) GO TO 40000
      READ(5,10002,END=40000) ICHEC, (SIMNAM(II), II=1,19)
      IF(ICHEC.EQ.1) GO TO 35000
      WRITE(6,30022) ICHEC, SIMNAM
      GO TO 30020
35000 IFLAG = 5
      RETURN
C     WRITE  FINAL  OUTPUT PAGE
40000 CONTINUE
      CALL POLSIM
      STOP 40002
      END
```

```
      SUBROUTINE STORE1
      COMMON /BLK1/ C(14,421),B(14,350),EXOG(14,220),C1(14,350),R(14,421
     1),NGAUSS(14,3),NF1(40),NBAR(7),OLDEXO(14,220)
      COMMON /BLK4/ KPAR(350),KRAY(350),KGR(200),KOR(200),INDE1(200)
     1,INDE2(200),INDE3(200),INDE4(200),INDE5(350),INDE6(350),NYEAR(10)
      COMMON/BLK8/  LFM,NPRB,IEN,IFSTYR,ISINND,IMONTH,IDAY,IBASYR,NPRF,
     1NESTOR,KING,NPROB,IDROP,IFLAG,NFSTST,NSANDY,NSUZY,IHOLD1,NSANDI
     3,NRPB,INDXX
      COMMON /BLK11/ I,J,NOBS,NOB,NSHOOT,NUEX,NERD
      COMMON /BLK13/ KROP(7,14),J37
      COMMON /BLK14/ IDATA(4,350),CDATA(14,100),INTER,NTER
      COMMON /BLK16/ IFI(202),IEND1,IEND2,IST1,KLQ,KLN
      DIMENSION NO(7)
      DIMENSION NGAU(14,3)
      DOUBLE PRECISION D1(14,7)
      DIMENSION D(7,548)
      DOUBLE PRECISION D
      DATA NO/42,43,44,227,228,229,230/
      IF ( NTER. NE . 1)  GO TO 20
      DO 120 I1=1,14
      DO 120 J1=1,3
  120 NGAU(I1,J1)=0
      DO 121 I1=1,14
      DO 121 J2=1,7
  121 D1(I1,J2)=0.0D0
      DO 10 I=1,548
      DO 10 J=1,7
   10 D(J,I)=0.0D0
      READ(10'996) IEND1,IEND2
      READ(10'990) (IFI(JJ),JJ=1,90)
      READ(10'991) (IFI(JJ),JJ=91,180)
      READ(10'992) (IFI(JJ),JJ=181,202)
      IST1= IEND1+1
   20 CONTINUE
C///// WRITE THE SELECTED FILES ON DISK
      WRITE(12'NTER) (( C(I,IFI(J)),J=1,IEND1),(EXOG(I,IFI(J)),J=
     1 IST1,IEND2),I=3,NOBS)
      DO 130 J1=1,3
      DO 130 I=3,NOBS
  130 NGAU(I,J1)=NGAU(I,J1)+NGAUSS(I,J1)
      DO 131 J1=1,7
      DO 131 I=3,NOBS
  131 D1(I,J1)=D1(I,J1)+R(I,KROP(J1,2))
      DO 30 I=3,NOBS
      DO 30 J=1,322
   30 D(I,J)=D(I,J)+C(I,KPAR(J))
      J7=323
      J6=351
      DO 31 J=1,71
      DO 32 I=3,NOBS
   32 D(I,J7)=D(I,J7)+C(I,J6)
      J7=J7+1
      J6=J6+1
   31 CONTINUE
      J8=394
      DO 35 J=1,155
      DO 36 I=3,NOBS
   36 D(I,J8)=D(I,J8)+EXOG(I,KOR(J))
```

```
      J8=J8+1
   35 CONTINUE
C
C/////CHECK RESULTS FOR INCREASING OR DECREASING STOCK LEVELS.
C
      I=NOBS
      DO 2000 JK = 1,7
      IF(C(I,NQ(JK)).LT.C((I-1),NQ(JK))) GO TO 201
      GO TO 210
  201 IF(C((I-1),NQ(JK)).LT.C((I-2),NQ(JK))) GO TO 202
      GO TO 210
  202 IF(C((I-2),NQ(JK)).LT.C((I-3),NQ(JK))) GO TO 203
      GO TO 210
  203 IF(C((I-3),NQ(JK)).LT.C((I-4),NQ(JK))) GO TO 204
      GO TO 210
  204 IF (C((I-4),NQ(JK)).LT.C((I-5),NQ(JK))) GO TO 2000
      GO TO 210
 2000 CONTINUE
      KLN = KLN + 1
      WRITE(6,250) NTER
  250 FORMAT(' ','DECREASING STOCKS OCCURRED ITERATION NUMBER',I4)
      IF (KLN.EQ.1) CALL DUMPER
  210 DO 2001 JK = 1,7
      IF(C(I,NQ(JK)).GT.C((I-1),NQ(JK)))  GO TO 211
      GO TO 220
  211 IF(C((I-1),NQ(JK)).GT.C((I-2),NQ(JK))) GO TO 212
      GO TO 220
  212 IF(C((I-2),NQ(JK)).GT.C((I-3),NQ(JK))) GO TO 213
      GO TO 220
  213 IF(C((I-3),NQ(JK)).GT.C((I-4),NQ(JK))) GO TO 214
      GO TO 220
  214 IF(C((I-4),NQ(JK)).GT.C((I-5),NQ(JK))) GO TO 2001
      GO TO 220
 2001 CONTINUE
      KLU = KLU + 1
      WRITE(6,251) NTER
  251 FORMAT(' ','INCREASING STOCKS OCCURRED ITERATION NUMBER',I4)
      IF(KLU.EQ.1) CALL DUMPER
C///// LAST ITERATION PUT THE DATA INTO C & EXOG MATRICES FOR PRINTING.
  220 IF(NTER.LT.IHOLD1) GO TO 70
      DO 140 I=3,NOBS
      DO 140 J1=1,3
  140 NGAUSS(I,J1)=NGAU(I,J1)/IHOLD1
      DO 141 I=3,NOBS
      DO 141 J1=1,7
  141 R(I,KROP(J1,2))=D1(I,J1)/FLOAT(IHOLD1)
      DO 60 J=1,322
      DO 60 I=3,NOBS
   60 C(I,KPAR(J))=D(I,J)/FLOAT(IHOLD1)
      J7=323
      J6=351
      DO 61 J=1,71
      DO 62 I=3,NOBS
   62 C(I,J6)=D(I,J7)/FLOAT(IHOLD1)
      J7=J7+1
      J6=J6+1
   61 CONTINUE
      J8=394
```

```
      DO 63 J=1,155
      DO 64 I=3,NOBS
   64 EXOG(I,KGR(J) )=D(I,J8)/FLOAT(IHOLD1)
      J8=J8+1
   63 CONTINUE
   70 CONTINUE
      IF ( NTER.EQ.IHOLD1) GO TO 100
      IF(NSHOUT.EQ.0) GO TO 81
      J10=1
   79 IF(J10.GT.NSUZY) GO TO 78
      IF(INDE6(J10).EQ.0) GO TO 77
      ISTART=IDATA(1,J10)
      IEND=IDATA(2,J10)
      DO 76 J1=ISTART,IEND
   76 C(J1,KPAR(INDE5(J10)))=C(J1,KPAR(INDE6(J10)))
   77 J10=J10+1
      GO TO 79
   78 CONTINUE
   81 CONTINUE
      DO 90 J=1,NSANDY
      DO 85 I=3,NOBS
   85 EXOG(I,KGR(J))=OLDEXO(I,KGR(J))
   90 CONTINUE
  100 RETURN
      END
```

```
      SUBROUTINE YAEXCN
      COMMON /BLK1/ C(14,421),B(14,350),EXOG(14,220),C1(14,350),R(14,421
     1),NGAUSS(14,3),NF1(40),NBAR(7),OLDEXO(14,220)
      COMMON/BLK8/  LFM,NPRB,IEN,IFSTYR,ISIMND,IMONTH,IDAY,IBASYR,NPRE,
     1NESTOR,KING,NPRDM,IDROP,IFLAG,NFSTST,NSANDY,NSUZY,IHOLD1,NSANDI
     3,NRPB,INDXX
      COMMON /BLK11/ I,J,NOBS,NOB,NSHOOT,NOEX,NERD
      COMMON /BLK14/ IDATA(4,350),CDATA(14,100),INTER,NTER
      COMMON /BLK15/ S(14,421), WGHT2(7),PR1(7),JRUN,MDL,WWX,DDEV1,
     1DDEV2,WGHT1,WGHT4(7),KLM
      DIMENSION DM(7)
      DIMENSION MGJ(14)
      DIMENSION ZVECT(21)
      DIMENSION G(14,14)
      DIMENSION C2(7)
      DIMENSION UP(7)
      DOUBLE PRECISION U,U0,RNORN,U1,U2,Y,CONS,TEST
      DOUBLE PRECISION RANDOM,R1,RF
      DOUBLE PRECISION DUMMY
      DOUBLE PRECISION DMOD
      DOUBLE PRECISION DLOG,DEXP
      DOUBLE PRECISION XX,ZVECT
      DOUBLE PRECISION EXPCOR(49)
      DATA MGJ/6,7,8,219,220,221,222,38,39,40,239,243,247,251/
      DATA EXPCOR/1.0D0,.05D0,.11D0,.09D0,.19D0,-.10D0,-.25D0,.05D0,1.D0
     1,.44D0,.72D0,-.49D0,-.29D0,.07D0,.11D0,.44D0,1.0D0,.61D0,.32D0,
     2.48D0,.58D0,.09D0,.72D0,.61D0,1.0D0,-.10D0,.14D0,.34D0,.19D0,-.49
     3D0,.32D0,-.10D0,1.0D0,.65D0,.71D0,-.10D0,-.29D0,.48D0,.14D0,.65D0,
     41.0D0,.65D0,-.25D0,.07D0,.58D0,.34D0,.71D0,.65D0,1.0D0/
      DATA UP/35.0,33.0,1.1,105.0,63.0,55.0,51.0/
CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC
C     THIS SUBROUTINE GENRATES A SAMPLE FROM CORRELATED NORMAL PROB-
C     ILITY DISTRIBUTION, IT USES THE MULTIPLICATIVE CONGRUENTIAL PRO-
C     CEDURE.
C
C                                                   GREGG L. PARVIN
CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC
      IF(INTER.GT.1) GO TO 500
      IF(I.GT.3) GO TO 500
CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC
C     IF FIRST SIMULATION, INTIALIZE THE UNIFORM GENERATOR
CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC
      XXX=SNGL(RANDOM(DUMMY))
CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC
C     READ LOWER TRIANGULAR MATRIX OFF UNIT 10 RECORD 960
CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC
      READ(10' 962)  ((G(I1,J1),I1=1,14),J1=1,14)
      KLAM=0
  500 CONTINUE
      DO 174 K=1,7
  174 DM(K)=0.0
C    READ PRELIMINARY EXPORTS FOR WHEAT,SOYBEANS, COTTON, CORN, GRAIN
C        SORGHUM, OATS, AND BARLEY, IN THAT ORDER.****MUST READ IN
C            FINAL EXPORT VALUES IN USUAL MANNER.
      NQ=0
      IF(KLAM.EQ.1) GO TO 177
      IF(IHOLD1.EQ.1) READ (5,200, END=175 ) (DM(K),K=1,7)
  200 FORMAT(7(3X,F8.3))
      GO TO 178
```

```
  175 KLAM=1
  178 DO 176 K=1,7
      IF(DM(K).EQ.0.0 ) GO TO 176
      L=K+7
      NQ=1
      C(I,MGJ(L))=DM(K)
  176 CONTINUE
  177 CONTINUE
CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC
C
C     DRAW THE STANDARD NORMAL DEVIATES
C
CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC
      DO 1000 J99=1,21
      XX=RNORN(DUMMY)
      ZVECT(J99)=XX
 1000 CONTINUE
CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC
C     ORDER OF DRAW
C     YIELDS ARE FIRST, THEN EXPORTS
C     THE ORDERING OF THE CROPS FOR BOTH YIELDS
C     AND EXPORTS ARE:
C     1. WHEAT
C     2. SOYBEANS
C     3. COTTON
C     4. CORN
C     5. GRAIN SORGHUM
C     6. OATS
C     7. BARLEY
CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC
      DO 21 J36=1,14
      IF(C(I,MGJ(J36)).NE.0.0) GO TO 21
      C(I,MGJ(J36))=0.0
      DO 22 J35=1,J36
      C(I,MGJ(J36))=C(I,MGJ(J36))+G(J36,J35)*ZVECT(J35)
   22 CONTINUE
      C(I,MGJ(J36))=C(I,MGJ(J36))+B(I,MGJ(J36))
      IF(C(I,MGJ(J36)).LT.0.0) C(I,MGJ(J36))=0.0
   21 CONTINUE
      C(I,008)=C(I,008)/480.0
      DO 23 J36=1,7
      IF(R(I,MGJ(J36)).NE.0.) GO TO 23
      R(I,MGJ(J36))=C(I,MGJ(J36))
   23 CONTINUE
      DO 24 J38=1,7
   24 NBAR(J38)=1
      WRITE(8,100) (C(I,MGJ(J38)),J38=1,7)
      WRITE(8,100) (R(I,MGJ(J38)),J38=1,7)
      DO 25 J36=1,7
   25 C(I,MGJ(J36))=0.0
  100 FORMAT('0',7F10.3)
      DO 27 J39=1,7
      IF(R(I,MGJ(J39)).GT.UP(J39)) R(I,MGJ(J39))=UP(J39)
   27 CONTINUE
      WRITE(8,100) (R(I,MGJ(J38)),J38=1,7)
C     STORE FINAL EXPORTS SOMEWHERE ELSE
      J38=415
      DO 26 J36=8,14
```

```
      IF(R(I,MGJ(J36)).NE.0.0) GO TO 201
      R(I,J38)=C(I,MGJ(J36))
      C(I,MGJ(J36))=0.0
      GO TO 202
  201 R(I,J38) = R(I,MGJ(J36))
      R(I,MGJ(J36))=0.0
  202 CONTINUE
      J38=J38+1
   26 CONTINUE
      WRITE(8,100) (R(I,J38),J38=415,421)
      II=1
      WRITE(8,100) DDEV1,DDEV2
      DO 60 L=1,7
      C2(L)=0.0
      DO 55 K=1,7
      C2(L)=C2(L)+SNGL(EXPCOR(II)*ZVECT(K+14))
      II=II+1
   55 CONTINUE
   60 CONTINUE
      WRITE(8,100) (C2(L),L=1,7)
      K2=415
      DO 99 L=1,7
      IF( [illegible] .NQ.EQ.1) GO TO 61
      FEXDEV=((DDEV2*R(I,K2))/DDEV1)
      R(I,MGJ(L+7))=R(I,K2)+FEXDEV*C2(L)
      GO TO 62
   61 R(I,MGJ(L+7))=C(I,MGJ(L+7))
      C(I,MGJ(L+7))=0.0
   62 CONTINUE
      K2=K2+1
   99 CONTINUE
      WRITE(8,100) (R(I,MGJ(J1)),J1=8,14)
      RETURN
      END
```

APPENDIX E

STATISTICAL COMPUTATIONS

STATISTICAL COMPUTATIONS

Under the assumption of normally distributed variables, the test to determine the significance of a difference between two means is used. The basic computational formula fot the t-test of a difference between two independent means is

$$t = \frac{(\overline{X}_1 - \overline{X}_2)}{\text{sq.rt.}((((N_1 - 1)S_1^2 + (N_2 - 1)S_2^2)/(N_1 + N_2 - 2))(1/N_1 + 1/N_2))}$$

where $\overline{X}_1$ = the mean of the first group of values

$\overline{X}_2$ = the mean of the second group of values

S_1^2 = the variance of the first group of values

S_2^2 = the variance of the second group of values

N_1 = the number of observations in the first group

N_2 = the number of observation in the second group.

If the data is not independent as assumed, the the resulting t test will be a conservative measure. That is, if the hypothesis that two means are equal is rejected with this t-test, then the t-statistic for the related variables will include a correlation term in the denominator and will also reject the hypothesis, but with a higher level of significance.

A disadvantage is the "grey area" between the acceptance of the equal mean hypothesis using the t-test for independent variables and the rejection of the hypothesis using the t-test for related variables. This is referred to as a Type II error. With the large number of observations in this study (300 iterations for each variable), the probability of committing this type of error is significantly reduced.

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