REPORT TO THE CONGRESS

BY THE COMPTROLLER GENERAL OF THE UNITED STATES

What The Department Of Agriculture Has Done And Needs To Do To Improve Agricultural Commodity Forecasting And Reports

Department of Agriculture forecasts of wheat and corn acres harvested, yields, domestic demands, exports, carryovers, and prices have not been sufficiently accurate in recent years. Cases cited in this report show how off-target forecasts and misjudgments of farmers' responses to cropland set-aside programs contributed to decisions which resulted in (1) higher price-support payments than would have been incurred otherwise and (2) land held out of production that should have been planted to meet full production needs.

The Department has taken some actions to improve its forecasting and GAO proposes others.

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COMPTROLLER GENERAL OF THE UNITED STATES
WASHINGTON, D.C. 20548

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To the President of the Senate and the
Speaker of the House of Representatives

This report discusses the Department of Agriculture's performance and difficulty in the past few years in forecasting the outlook for wheat and corn supplies, demands, and prices. It shows the effects that off-target forecasts have had on production and price-support payments and summarizes what the Department has done and needs to do to improve agricultural forecasting and reports.

We made our review pursuant to the Budget and Accounting Act, 1921 (31 U.S.C. 53), and the Accounting and Auditing Act of 1950 (31 U.S.C. 67).

We are sending copies of this report to the Director, Office of Management and Budget, and to the Secretary of Agriculture.

Acting Comptroller General
of the United States

Contents

Agr. industr. food supp. post. Exporting

ABBREVIATIONS

ASCS	Agricultural Stabilization and Conservation Service
ERS	Economic Research Service
FAS	Foreign Agricultural Service
GAO	General Accounting Office
SRS	Statistical Reporting Service

COMPTROLLER GENERAL'S REPORT TO THE CONGRESS

WHAT THE DEPARTMENT OF AGRICULTURE HAS DONE AND NEEDS TO DO TO IMPROVE AGRICULTURAL COMMODITY FORECASTING AND REPORTS

D I G E S T

Department of Agriculture forecasts for the 1971-72 to 1974-75 marketing years for wheat and corn supplies, demands, and prices often were greatly different from actual amounts. (See p. 6.)

Production forecasts were off target because of difficulties in estimating yields and acres harvested. (See p. 7.)

Domestic demand forecasts missed the mark because of difficulties in estimating the quantity needed for livestock feed. (See p. 11.)

Exports and prices were greatly underestimated because the Department did not foresee the extent to which unusual overseas agricultural and economic developments would increase demand for U.S. commodities or that prices would increase sharply as grain stocks fell to record low levels. (See pp. 12 and 17.)

Off-target forecasts contributed to unsound decisions in 1973:

--Wheat price-support payments totaling about $375 million were paid on the basis of greatly underestimated prices. (See p. 23.)

--A voluntary wheat set-aside program was continued on the basis of underestimated demand. About $98.8 million was paid to producers who held about 7.4 million acres of cropland out of production at a time when full production was needed. (See p. 24.)

--About $1.2 billion was paid to producers who complied with unneeded set-aside programs on corn and other feed grains. (See p. 25.)

The Department has noted that forecasting is particularly difficult in times of economic

changes and turbulence. It agreed, however, that the accuracy of agricultural commodity forecasts can and should be improved. (See pp. 19 and 22.)

In recent years, the Department has reorganized the Economic Research Service, a primary agency in agricultural forecasting, and established committees to improve the forecasting data base. It also made changes to obtain better, more timely data on worldwide supply and demand conditions and to strengthen its capabilities to analyze overseas developments and their potential effects on U.S. exports. (See p. 30.)

But more needs to be done to improve commodity forecasting and reporting. The Secretary of Agriculture should:

--Activate a committee to establish documentation requirements for forecasts and for forecasting methodologies, procedures, and assumptions; to systematically and periodically evaluate the accuracy of forecasts, identifying major forecasting errors and their causes; and to recommend changes in data requirements and improvements in methodologies, procedures, and assumptions.

--Require that all official forecasts made before the beginning of the marketing year be published.

--Require that forecast reports provide, for important items and where practicable, a point estimate of the most likely outcome when forecast amounts are stated in ranges.

--Require disclosing in forecast reports, or by reference to other published documents, important assumptions and procedures underlying forecast amounts, including factors that could cause the eventual outcome to be near the extremes of a range.

--Require that a periodic evaluation be made of forecast users' information needs and, where practicable, change forecast reporting to accommodate these needs. (See pp. 22 and 39.)

The Department agreed in principle with the GAO recommendations and is acting or planning to take action to implement some of them. It is reluctant, however, to publish its early official forecasts and to include point estimates of the most likely outcome in forecast ranges. This information should be published to make the Department's forecasts more useful to the public. (See pp. 22 and 39.)

CHAPTER 1

INTRODUCTION

Department of Agriculture reports and publications containing forecasts of supplies, demands, and prices of agricultural commodities are important sources of data for agricultural and economic decisionmaking. Government officials use them for formulating, implementing, and modifying national agricultural policy and commodity programs. The Congress uses forecast information when considering legislation affecting agriculture.

Agricultural specialists analyze forecast information and use the analyses in providing information and advice to farmers and others. The news media and agricultural newsletters often refer to and comment on the Department's published forecasts. One such newsletter is distributed to about 40,000 farmers. Farmers and businessmen plan crop production and make marketing decisions using the forecast information and analyses.

In the last several years, many of the Department's forecast reports and publications contained forecast amounts that differed greatly from actual amounts, particularly for farm exports and prices. During this time serious shortages or tight supplies of some major agricultural commodities occurred and prices and export demand for farm products rose to record levels. This situation has led to increased demand and concern for reliable agricultural forecasts.

We reviewed the Department's short-range forecasting of supplies, demands, and prices of wheat and corn--two major commodities. We reviewed the forecasting performance for the 1971-72 to 1974-75 marketing years, the difficulties experienced in making forecasts, the effects that forecasts had on production and price-support payments, and the Department's plans and actions for improving its forecasting.

Differences between forecast amounts and final estimates or actual amounts are sometimes referred to by the Department and in this report as forecast errors. Such errors can be caused by many factors. Forecast errors cannot be eliminated, but the usefulness of forecast information as a basis for making decisions is enhanced to the extent the errors are reduced to an acceptable level.

RESPONSIBILITY FOR AGRICULTURAL COMMODITY FORECASTS

The Economic Research Service (ERS), the Statistical Reporting Service (SRS), and the Foreign Agricultural Service (FAS) are the principal Department agencies that forecast and provide information and reports on supplies, demands, and prices of agricultural commodities. Two types of interagency groups--Interagency Commodity Estimates Committees and the Outlook and Situation Board--coordinate the Department's forecasting efforts.

An Interagency Commodity Estimates Committee for each major price-supported agricultural commodity appraises and reviews information provided by the agencies and forecasts supplies, demands, and prices. The committees' forecasts are the Department's official estimates and are used for budgeting and for developing, administering, and appraising programs. They are also the basis for published statements and information furnished to the Congress. Each committee is chaired by a representative of the Department's Agricultural Stabilization and Conservation Service (ASCS) and includes commodity specialists from ERS and FAS.

ERS provides the committees with basic data and economic analyses relating to supplies, domestic demand, foreign trade, and prices. FAS provides estimates of exports and imports. SRS, which is not represented on the committees, provides information on farmers' planting intentions, acres planted and harvested, yields, production, prices, and stocks on hand.

The Outlook and Situation Board is responsible for review and approval of the committees' forecasts and ERS's outlook and situation reports before they are published. The board is chaired by ERS's Outlook and Situation Officer; the membership generally consists of specialists from ERS, FAS, SRS, ASCS, and other Department agencies, as appropriate. Board membership changes, depending on the commodity or agricultural situation being analyzed.

TIMING OF SHORT-RANGE FORECASTS

Short-range forecasts cover the 12-month periods July through June for wheat and October through September for corn. These periods are called marketing years or crop years. The bulk of the wheat crop is harvested and available for marketing in July and August and the bulk of the corn crop, in October and November.

The earliest wheat forecast is usually made about 1 year before the marketing year begins, and the earliest

corn forecast is usually made in December or January for the marketing year which will begin the following October. These forecasts are based on trend analysis, economic and statistical relationships, and various assumptions about the general economic setting and the variables which affect the components of supply and demand. Forecasts are revised many times as additional information becomes available from SRS and other sources.

FACTORS CONSIDERED IN SHORT-RANGE FORECASTING

Agricultural policies for wheat and corn focus on insuring adequate supplies in relationship to demand with an adequate yearend stock carryover. Carryover is an important determinant of price. When forecasting the yearend carryover, the Interagency Commodity Estimates Committees use a balance sheet approach. Production--based on yield and acres harvested--and imports are added to the previous marketing year's carryover to estimate total available supplies. Domestic demand and exports are subtracted from supplies to estimate yearend carryover.

Early yield forecasts, for which the committees assume normal weather conditions and adequate fertilizer supplies, are based on trend analysis of yields and consider technological advances and changes in farm management practices. Yield forecasts made during the growing season are based on information SRS obtains from producer mail surveys and from physical assessments of the condition and productivity of crop samples. SRS forecasts the winter wheat yield in December and makes monthly revisions beginning in May. It also makes monthly forecasts for spring wheat beginning in July and for corn beginning in August.

In forecasting planted and harvested acreage, the committees consider such factors as farm prices, availability of labor and other production inputs, and how farmers have responded historically to commodity programs. Revised forecasts are based on SRS's mail surveys and physical assessments of crop acreage conditions. SRS makes its earliest estimate of winter wheat acreage in December after the crop is planted. Estimates of corn and spring wheat acreage are made in January and March on the basis of mail surveys of producers' planting intentions.

Forecasts of domestic demand for wheat and corn for food, livestock feed, and seed consider trends and other indicators of prices, population growth, livestock on feed, and acres to be seeded. Revisions in amounts of wheat used as food are based on monthly

information on millings from the Bureau of the Census, Department of Commerce. Changes in inventories of grain stocks on farms and at other domestic locations, together with information on exports and other uses, are the basis for revising amounts of wheat and corn used as livestock feed.

Export forecasts are based on trend analysis of foreign countries' production and trade, adjusted for expected changes. The forecasts are revised on the basis of information from U.S. agricultural attaches and other data on each country's crop production, stock levels, exports, and imports. In estimating U.S. exports to each country, the committees consider the country's agricultural trade policies, expected imports, and other supplying countries' prices, credit programs, and agricultural trade policies. Commercial exporters provide information on export shipments and commitments weekly to FAS. This information is also considered in forecasting exports during the marketing year.

Projected yearend carryover is an important factor used in forecasting season average farm prices. An inverse relationship exists between yearend carryover and season average farm price--as stocks decline, prices rise. This relationship has become particularly important in recent years and was emphasized in the 1972-73 and 1973-74 marketing years when farm prices soared as stocks fell to abnormally low levels. Before 1972 yearend carryovers were fairly large and farm prices did not fluctuate much as a result of changes in stock levels.

TYPES OF FORECAST REPORTS

The Department publishes numerous reports containing short-range forecasts of agricultural commodity supplies, demands, and prices.

SRS's Crop Production reports summarize farmers' planting intentions for different crops and project yields and acres planted and harvested. Some SRS reports also project production and prices. SRS's quarterly Grain Stocks reports estimate the quantities of various types of grain on farms; at mills, elevators, warehouses, terminals, and processors; and in Government-owned bins.

The day after SRS crop and stock reports are released, ERS publishes Agricultural Supply and Demand Estimates containing the Interagency Commodity Estimates Committees' official forecasts of the supply, demand, and

yearend carryover for selected crops. Other ERS agricultural outlook and situation reports analyze these forecasts and their implications. The Wheat Situation report and the Feed Situation report (for feed grains including corn) are published quarterly. Some of the situation reports forecast season average farm prices. A monthly Agricultural Outlook Digest summarizes and updates the commodity situation reports.

About seven times a year, FAS publishes Foreign Agricultural Circulars containing historical data and forecasts of world production, stocks, consumption, and trade for wheat and feed grains. Much of the data is tabulated by major countries or groups of countries, including the United States.

The characteristics of these and other selected forecast reports are shown in appendix I.

CHAPTER 2

SOURCES OF FORECASTING ERRORS NEED TO BE IDENTIFIED AND ANALYZED TO MAKE FORECASTS MORE ACCURATE

The Department's forecasts of the outlook for wheat and corn supplies, demands, and prices generally were off target for the 4 marketing years we reviewed. Production forecasts varied greatly from actual production in some marketing years because of difficulties in estimating yields and acres harvested. Errors in forecasting yields generally were attributed to differences between actual weather conditions and normal weather conditions--the assumption on which the forecasts were based. Forecasts of acres harvested were not accurate because of difficulties in forecasting various factors, including farmers' responses to farm program provisions.

Forecasts of domestic demand for wheat and corn differed from actual demand primarily because of difficulties in estimating the quantity needed for livestock feed. Exports and farm prices were underestimated by large amounts for 1972-73 and 1973-74 because the Department did not anticipate the increased foreign demand for U.S. wheat and corn and the sharp reductions in stock levels which resulted from worldwide adverse weather conditions and other unusual overseas agricultural and economic developments. The Department attributed farm price forecast errors to difficulties in understanding price adjustments in periods of excessive demand relative to supplies and to a deficiency in knowledge about factors which affect crop supplies.

Demand forecasts for wheat and corn can also vary from actual because of difficulties in forecasting production and carryovers. For example, bumper crops were forecasted for 1974-75, but adverse weather conditions during the growing season that year severely damaged the grain crops in the Midwestern States and reduced supplies available for domestic uses and exports considerably below the amounts forecasted.

Although the Department has acted in recent years to improve its forecasting capability (see ch. 4), we believe it needs to make further improvements. The Department has not evaluated its forecasts periodically to determine the magnitude and causes of errors and the changes needed to overcome forecasting difficulties. Such evaluations are essential to determine whether errors have resulted from inadequate data or from weaknesses in assumptions, methodologies, and procedures.

ERS recently reviewed the accuracy of quarterly farm price forecasts but could not identify the sources of errors. Forecasts need to be documented in a manner that will allow the data, assumptions, and other factors underlying the forecasts to be identified and analyzed.

PRODUCTION FORECAST ERRORS

Wheat and corn production forecasts were not very accurate in some of the marketing years we reviewed. The following table compares the number of bushels initially forecasted and the number of bushels produced.

Marketing year	Wheat			Corn		
	Initial forecast	Actual production	Difference over or under(-)	Initial forecast	Actual production	Difference over or under(-)
	(million bushels)					
1971-72	1,500	1,618	-118	4,835	5,641	-806
1972-73	1,550	1,545	5	4,530	5,573	-1,043
1973-74	1,394	1,705	-311	5,451	5,647	-196
1974-75	1,894	1,793	101	6,354	4,651	1,703

Wheat and corn production forecasts are calculated by multiplying the estimated acres to be harvested by the estimated average yield per acre. When estimates of either of these two components differ from actual, estimates of total production will also be different from actual production.

Differences between actual and initially forecasted production, yields, and acres harvested, expressed as percentages of the actual amounts, are shown in the following table.

Marketing year	Percent of initial forecast error over or under(-)					
	Acres harvested		Yield per acre		Total production	
	Wheat	Corn	Wheat	Corn	Wheat	Corn
1971-72	6	(a)	-12	(a)	-7	-14
1972-73	8	-7	-8	-12	(b)	-19
1973-74	-20	-3	3	(b)	-18	-3
1974-75	-11	(b)	19	36	6	37

a/Data not available.
b/Less than 1 percent.

Errors in forecasting yields and acres harvested can be wholly or partially compensating in their effect on forecasts of total production. For example, wheat production in 1971-72 would have been underestimated by more than 7 percent if the overestimate of acres harvested had not partially offset the underestimate of yield per acre.

When comparing forecasted and actual acres harvested, what may appear to be either on-target or off-target forecasting may be the result of program changes, such as changes in set-aside acreage provisions to bring crop production into line with the Department's original or revised goals. For example, because of expectations of a high yield and large carryover, the Department announced a voluntary additional set-aside program in January 1972 to reduce wheat acreage for the 1972-73 marketing year and bring total production into line with anticipated wheat demand. (See p. 46.) Wheat acres harvested in 1972-73 were overestimated partly because this program change led to reduced harvested acres.

A chronology of wheat and corn production forecasts for each of the 1971-72 through 1974-75 marketing years is discussed in appendix II.

Difficulties in forecasting yields

Initial and revised yield forecasts were overestimated or underestimated by more than 5 percent for each marketing year up to about the time the crops were harvested, except for 1973-74 when the errors were less than 5 percent. The errors were greatest for 1974-75, ranging from 9 to 36 percent for corn and 10 to 22 percent for wheat. Some of the revised yield forecasts were less accurate than preceding forecasts.

Early forecasts of wheat and corn yields made before the crops were planted were based on the upward trend of yields during the past two decades. The upward trend reflects improvements in technology and farm management practices. The actual yields for wheat and corn generally did not follow an upward trend in the years we reviewed, as shown in the table below.

Marketing year	Bushels per acre	
	Wheat	Corn
1971-72	33.9	88.1
1972-73	32.7	97.1
1973-74	31.7	91.2
1974-75	27.4	71.3

Revised yield forecasts after crops are planted are based on SRS's (1) sample surveys of farmers who report on the condition of the crops and yield expectations at the time of the forecast and (2) physical assessments of the condition and productivity of crop samples. Each forecast considers the effects of actual weather conditions, plant diseases, and insect infestations on the crops to date and assumes that

normal weather conditions will prevail the remainder of the growing season.

The Department does not use long-term weather forecasts in preparing its production forecasts. According to Department officials, near-term and long-term weather forecasts are not sufficiently reliable or detailed enough to be used in yield forecast models. Without reliable weather forecasts, the Department assumes normal weather in its crop forecasts.

Because of a drought in July and early August and other adverse weather conditions, corn production in 1974 was much lower than had been forecasted up to July 1974 (see p. 49), and the yield (71.3 bushels an acre) was the lowest in several years. Unusually wet weather during May and early June hampered corn planting throughout much of the Corn Belt and resulted in an unusually large late acreage that was damaged by an early killing freeze.

The Department estimated, before the drought began, that the corn yield for the 1974-75 marketing year would be 97 bushels an acre based on a continuation of the yield trend since 1950. According to meteorologists in the Department of Commerce's National Oceanic and Atmospheric Administration, projecting yield on the basis of a trend analysis of the preceding two decades produces an upward bias in yield estimates because there was relatively little weather variability in that period compared to the weather variability over a much longer time span. Our discussions with the meteorologists and Department of Agriculture officials indicated that they did not generally agree on the best approach to use when projecting and reporting expected future weather conditions.

Difficulties in forecasting acres harvested

Initial forecasts of acreage to be harvested varied from actual acreage harvested by 8 percent over to 20 percent under for wheat and less than 1 percent over to 7 percent under for corn for the years we reviewed. The Department attributed difficulties in forecasting harvested acres to such factors as abnormal weather conditions, unusual damage from insects and diseases, and difficulty in forecasting acres to be planted.

Early forecasts of acres to be harvested were set at about 89 percent of the acres expected to be planted in wheat and at about 86 percent of the acres expected to be planted in corn. These percentages were reasonably accurate, varying from actual by less than 4 percent for the years we reviewed. The Department had greater difficulty in forecasting the acres that would be planted, as shown in the following table.

Marketing year	Percent error in initial forecast of number of planted acres over or under (-)	
	Wheat	Corn
1971-72	7	(a)
1972-73	4	-6
1973-74	-17	-3
1974-75	-7	-3

a/Data not available.

When making early forecasts of acres to be planted, the Department considers the previous year's production and how farmers respond to commodity programs. The Department also considers the availability and costs of production inputs, such as labor, machinery, and supplies, and the outlook for commodity prices. Changes in these factors can cause early forecasts of planted acres to vary from actual planted acres. Changes in set-aside provisions of commodity programs can also cause variances between projected and actual acreage planted, as they did in the 1972-73 and 1973-74 marketing years when wheat program revisions were announced after early forecasts had been made.

Forecasts of planted and harvested acres are revised on the basis of SRS mail sample surveys made in January and March of each year. The surveys determine farmers' intentions for planting corn and spring wheat. Actual acres planted in spring wheat varied from the January forecasts by 22 percent over to 14 percent under for the years we reviewed and also varied considerably from the March forecasts for 1971-72 (14 percent over). Forecasts based on surveys of corn planting intentions were fairly accurate, except for 1971-72 when the forecast based on the January survey understated corn acreage planted by 6 percent.

Several factors could cause actual planted acreage to differ from forecasts based on surveys of farmers' intentions. Farmers can change their planting decisions because of changes in farm program provisions; changes in weather, economic conditions, labor supply or prices; and reaction to the Department's planting intentions reports.

The Department also had difficulty in accurately forecasting how changes in acreage set-aside programs would affect planted and harvested acres. For example, the Department anticipated that a voluntary additional cropland set-aside program, announced in January 1972, would reduce the wheat acreage that would be harvested by 7 million to 8 million acres. Farmers did not react as anticipated, and the actual reduction was only 4 million harvested acres.

ERRORS IN FORECASTING DOMESTIC DEMAND

Forecasts of the amount of wheat to be used for domestic food purposes were fairly accurate for the years we reviewed because about the same amount (526 million to 530 million bushels) was consumed each year. Forecasts of the amount of wheat used as seed also were on target except for the 1973-74 marketing year when early forecasts indicated that 60 million to 66 million bushels would be used and 83 million bushels were actually used and the 1974-75 marketing year when early forecasts understated seed use by about 11 million bushels. The errors resulted from underestimating the acreage that would be planted. In both years the early forecasts of wheat acreage to be seeded were made before programs had been formulated to encourage full production.

Forecasts of wheat used for livestock feed fluctuated frequently and have not been very accurate, as shown below.

Marketing year	Initial forecast	Lowest forecast	Highest forecast	Actual
	(million bushels)			
1971-72	225	190	285	266
1972-73	175	175	250	193
1973-74	225	150	225	140
1974-75	185	75	200	a/ 100

a/Estimate as of June 11, 1975.

The use of wheat as livestock feed is confined mostly to the Southern Plains and Western States where it competes primarily with the use of grain sorghum. The demand for wheat as feed is affected by wheat prices, compared to the prices of competing feed grains, and by changes in the number of cattle on feed in these States. The Department's forecasts for feed are based on projected relationships of these factors.

About 3,900 million to 4,700 million bushels of corn have been used for domestic purposes each year since 1971. More than 90 percent of this consumption has been for livestock feed.

Early projections of domestic demand for corn were much lower than the actual domestic demand for the 1972-73 marketing year. Forecasts made between January and December 1972 understated domestic consumption by 238 million to 458 million bushels because the Department did not anticipate that (1) cattle would be fed to heavier weights than usual in an

effort to provide more meat per animal, (2) more corn would be used in place of high-protein feeds which were in tight supply, and (3) the corn crop quality would be low.

Early forecasts of domestic demand for the 1973-74 corn crop overestimated actual demand by as much as 317 million bushels. The high estimates were revised downward in July 1973 when the Department began to consider the potential effects of the livestock expansion slowdown and the longer-than-usual feeding of cattle on grass because of high feed costs.

Forecasts of domestic demand for corn during the 1974-75 marketing year were revised downward considerably in August 1974 in anticipation of lower supplies of feed grains caused by the summer drought and of higher feed prices. Many cattle producers were beginning to feed their livestock on the range longer and to send animals to slaughter bypassing feed lots. The August forecast indicated that 4,155 million to 4,285 million bushels of corn would be consumed domestically--715 million to 845 million bushels less than initially forecasted and 525 million to 575 million bushels less than forecasted in July 1974. As of March 1975, the Department had further reduced the forecast to about 3,700 million bushels.

ERRORS IN EXPORT FORECASTS

The Department considerably underestimated U.S. wheat and corn exports for the 1972-73 and 1973-74 marketing years because it did not adequately assess the impact of unusual overseas developments on increased demand for U.S. agricultural commodities. The forecast of 1974-75 corn exports was greatly reduced in August 1974 after the effects of the summer drought on domestic corn production were assessed.

Unusual events affecting U.S. agricultural exports

In fiscal year 1973 U.S. agricultural commodity exports increased to a record $12.9 billion, 60 percent higher than the $8 billion recorded in fiscal year 1972. Increased volume accounted for 60 percent of the $4.9 billion increase, and higher prices accounted for 40 percent. Agricultural exports increased even more in fiscal year 1974 to $21.3 billion. About 20 percent of the $8.4 billion increase was due to higher volume, and 80 percent was due to higher prices.

A combination of unusual agricultural and economic events caused agricultural exports to rise sharply.

--Devaluations of the U.S. dollar in December 1971 and February 1973 and further depreciation with floating

exchange rates made U.S. agricultural commodities less expensive for foreign buyers in terms of their currencies. Rapid economic growth in the developed countries and strong foreign exchange reserve positions in a number of developing countries also boosted the demand for U.S. agricultural commodities.

--In 1972 adverse weather caused sharp declines in wheat, corn, and other crop production throughout the world. Several countries turned to the United States to help meet their grain requirements. The Soviet Union, which had historically reduced domestic consumption by killing livestock during poor crop years, instead imported vast amounts of wheat and corn from the United States. Also the People's Republic of China entered the U.S. market for the first time in many years because its regular trading countries were unable to meet its demand.

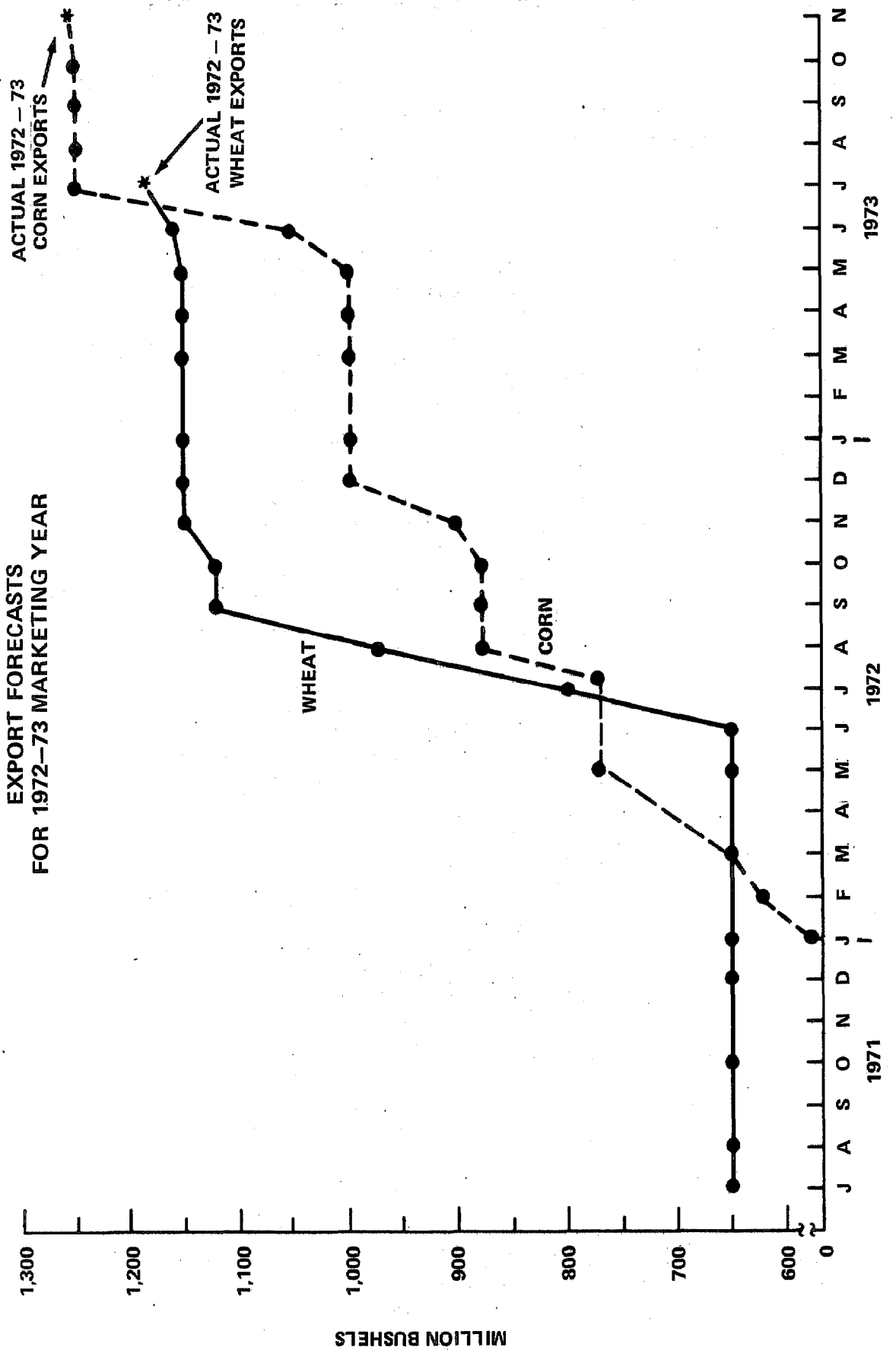
--A falloff in the production of Peruvian fishmeal, Indian and Senegalese peanut meal, and Russian sunflower seed meal increased worldwide demand for soybean meal as a substitute for these high-protein products for use in livestock feed. The shortage of anchovies forced prices upward for soybeans and feed grains.

--As affluence has grown in foreign countries, people have demanded diets higher in animal protein. The result has been unprecedented long-term growth in demand and accelerated world trade in feed grains and oilseeds.

Exports underestimated

During the 1972-73 marketing year, the United States exported 1,186 million bushels of wheat and 1,258 million bushels of corn--almost double the amounts initially forecasted. Initial forecasts understated wheat exports by 536 million bushels and corn exports by 683 million bushels. These forecasts were revised upward a number of times but continued to understate exports considerably until late in the marketing year, as shown in the graph on the following page.

The initial 1972-73 wheat and corn export forecasts were based on expected 1971-72 export levels. During the summer of 1972, the wheat forecast was revised upward from 650 million to 1,125 million bushels to reflect increased sales of wheat to the Soviet Union. The Department did not act in a timely manner to determine the magnitude and impact of these unprecedented sales of more than 400 million bushels, as discussed in our report to the Congress entitled "Russian Wheat

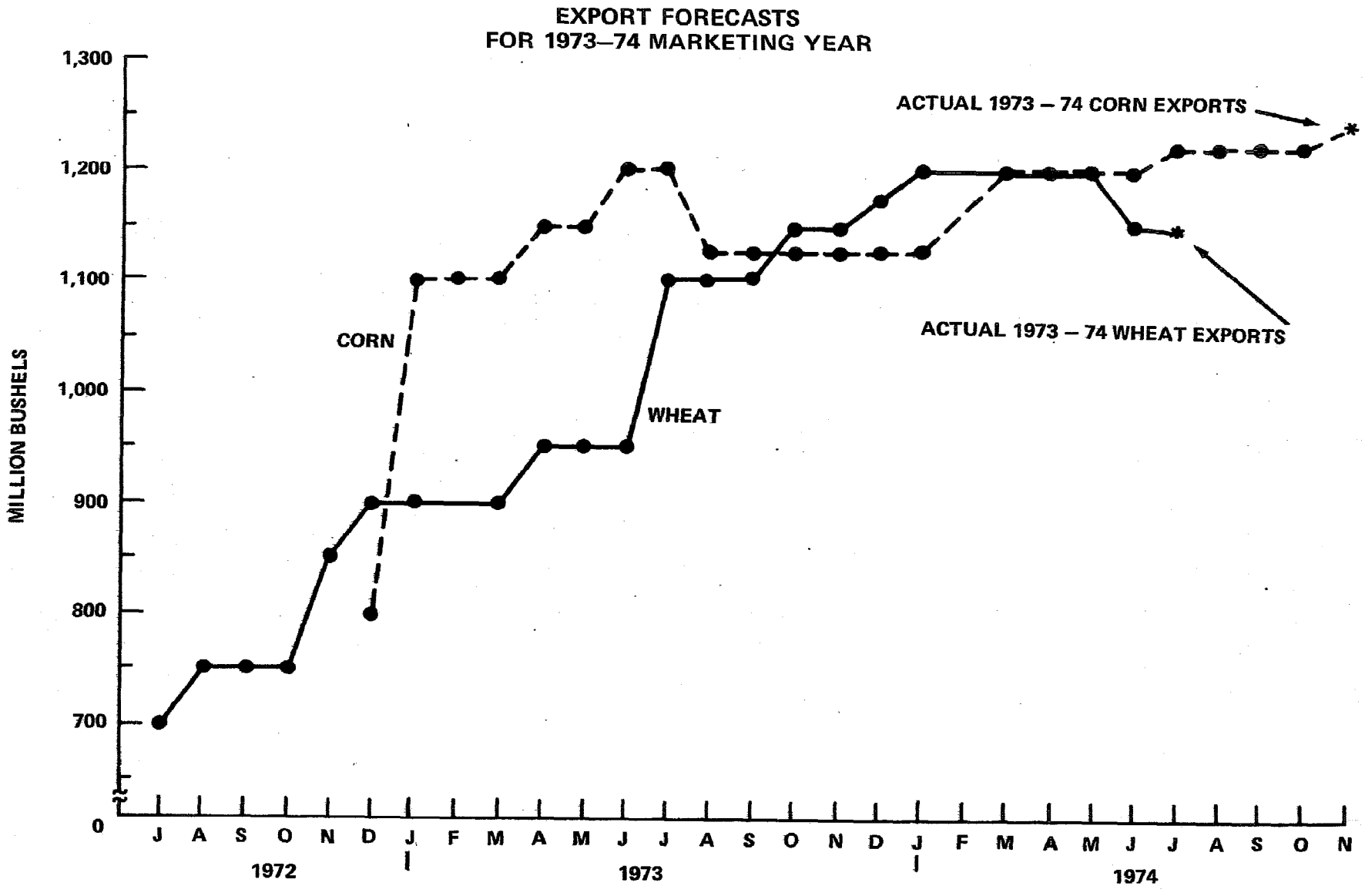

EXPORT FORECASTS
FOR 1972–73 MARKETING YEAR
ACTUAL 1972 – 73
CORN EXPORTS
ACTUAL 1972 – 73
WHEAT EXPORTS
WHEAT
CORN
MILLION BUSHELS
1,300
1,200
1,100
1,000
900
800
700
600
0
J A S O N D J F M A M J J A S O N D J F M A M J J A S O N
1971
1972
1973

Sales and Weaknesses in Agriculture's Management of Wheat Export Subsidy Program" (B-176943, July 9, 1973).

U.S. corn exports in 1972-73 surged to a record 1,258 million bushels, far surpassing the previous peak of 796 million bushels in 1971-72. The initial forecast indicated that only 575 million bushels would be exported. The Department did not expect the Soviet Union to continue its policy of increasing meat production and did not anticipate that the reduced grain supplies in many countries would place such an extraordinary demand on the U.S. and world exportable supplies of feed grains. Revised forecasts reflected increased sales to the Soviet Union, the People's Republic of China, Japan, and Europe but still understated exports by about 260 million bushels late in the marketing year.

During the 1973-74 marketing year, the United States exported 1,148 million bushels of wheat and 1,243 million bushels of corn--about the same volume as in 1972-73. The initial forecasts understated wheat and corn exports by 448 million and 443 million bushels, respectively. The early forecasts did not anticipate the strong demand for U.S. wheat exports because of the prospects for a record world wheat crop.

Forecasts of wheat exports were revised upward gradually but still understated demand by about 200 million bushels until the beginning of the marketing year, as shown in the graph on the following page. Revised forecasts for corn exports fluctuated, ranging from 43 million to 143 million bushels lower than actual.


EXPORT FORECASTS
FOR 1973–74 MARKETING YEAR
ACTUAL 1973 – 74 CORN EXPORTS
ACTUAL 1973 – 74 WHEAT EXPORTS
CORN
WHEAT
MILLION BUSHELS
1,300
1,200
1,100
1,000
900
800
700
0
J A S O N D J F M A M J J A S O N D J F M A M J J A S O N
1972
1973
1974

Exports overestimated

Early forecasts of corn exports for 1974-75 assumed that there would be a strong foreign demand and a larger-than-normal U.S. corn crop. The forecast was revised downward sharply in August 1974, as shown below, after the summer drought severely limited U.S. corn production.

Forecast date	Projected exports
	(million bushels)
September 1973	1,050
March 1974	1,200
June 1974	1,200
July 1974	1,150
August 1974	a/ 750 to 900
October 1974	a/ 875 to 925
January 1975	975
March 1975	1,075
June 1975	1,075

a/The Department began using forecast ranges in July 1974. (See p. 36.)

FARM PRICES GREATLY UNDERESTIMATED

During the 1972-73 and 1973-74 marketing years, farm prices increased to record levels because heavy export demand for grains caused a substantial drawdown in U.S. grain stocks. Forecasts greatly understated farm prices for wheat, corn, and other agricultural commodities because they did not reflect the strong export demand and stock reduction.

In making early forecasts of the season average farm prices for wheat and corn, the Department considers, among other factors, the estimated yearend carryover. As a marketing year progresses, the Department also considers commodity futures prices and actual farm prices to date.

In general the price forecasts were fairly accurate when there were large yearend carryovers. For example, projected season average farm prices for 1971-72 were only a few cents a bushel higher or lower than actual prices. Wheat and corn stocks at the end of that marketing year were large--863 million bushels of wheat and 1,126 million bushels of corn.

Forecasts understated season average wheat prices for 1972-73 and 1973-74 by as much as $0.51 and $2.62 a bushel, respectively. Corn prices were underestimated by as much as $0.49 in 1972-73 and $1.42 in 1973-74. As shown in the following tabulation, price forecasts were revised upward as reductions were made in yearend carryover forecasts.

Comparison of Wheat and Corn Carryover and Price Forecasts

Forecast date	1972-73 Yearend carryover	1972-73 Season average price per bushel	1973-74 Yearend carryover	1973-74 Season average price per bushel
	(million bushels)		(million bushels)	
Wheat:				
July 1971	985	$1.25		
October 1971	1,071	1.30		
January 1972	1,022	1.30		
May 1972	1,046	1.30		
July 1972	812	1.32	702	$1.34
October 1972	508	1.57	627	1.45
January 1973	441	1.75	571	1.65
April 1973	417	1.75	452	1.65
July 1973	448	1.80	318	2.50
October 1973	430	1.80	253	3.75
January 1974	a/ 438	a/ 1.76	178	3.90
April 1974			180	4.00
July 1974			249	4.00
October 1974			249	4.00
January 1975			a/ 247	a/ 3.96
Corn:				
January 1972	981	1.16		
March 1972	1,250	1.08		
July 1972	1,050	1.15		
October 1972	1,057	1.15		
January 1973	900	1.29	775	1.35
April 1973	875	1.29	935	1.23
July 1973	775	1.45	650	2.00
October 1973	775	1.60	657	2.25
January 1974	a/ 709	a/ 1.57	606	2.37
April 1974			453	2.50
July 1974			428	2.38
October 1974			481	a/ 2.55
January 1975			a/ 483	a/ 2.55

a/Actual.

In testimony before the Subcommittee on Agriculture-Environmental and Consumer Protection, House Committee on Appropriations, in March 1974, the ERS Administrator discussed the factors which contributed to export and price forecasting errors in 1972 and 1973. He said that the major factors were lack of (1) timely information on worldwide supply-demand conditions and agricultural policies and (2) a comprehensive and analytical framework for determining the effects of this type of information on U.S. exports and farm prices.

The Administrator pointed out that forecasting was particularly difficult because of the economic changes and turbulence. He said that the forecasting coefficients and other economic relationships that had proved generally reliable in more stable periods proved inadequate for predicting the extreme conditions which transpired after mid-1972.

ERS study of price forecasts and forecasting procedures

In an October 1974 staff report, an ERS task force reported on its study of ERS's forecasting capability and procedures and the magnitude of errors made in forecasting commodity prices.

The task force compared projected and actual average prices received by farmers for each calendar quarter from 1966 through 1973 using price data compiled from internal quarterly situation and outlook memorandums. The comparison covered four forecasts of farm prices for each calendar quarter. The first forecast was made three quarters in advance of the forecast period, the second forecast was made two quarters in advance, the third forecast was made one quarter in advance, and the fourth forecast was made in the actual forecast period.

The study showed that forecasts understated farm prices for agricultural commodities over the 8-year period about two-thirds of the time. Prices of wheat, corn, and other major crops generally were underestimated; prices of less important crops were overestimated as often as they were underestimated.

The study also showed that more than two-thirds of the revised price forecasts were more accurate than earlier forecasts. A comparison of the average percent by which original and revised price forecasts over the 8-year period differed from actual prices, by being either too high or too low, is shown below. The average percent error decreased as forecasts were revised or updated.

	Average percent error during 1966-73			
	First forecasts	Second forecasts	Third forecasts	Fourth forecasts
All crops	9.2	7.5	5.8	3.3
Wheat	16.4	13.2	10.2	5.7
Corn	13.9	13.0	10.0	4.7

Larger-than-normal price forecast errors were made during the 18-month period July 1972 through December 1973, as

shown in the following table which we compiled from the ERS study.

	Average percent error from July 1972 to December 1973			
	First forecasts	Second forecasts	Third forecasts	Fourth forecasts
All crops	25.7	23.0	18.0	7.8
Wheat	45.1	41.0	34.0	16.3
Corn	29.5	27.6	22.2	11.7

During this 18-month period the quarterly average farm price of wheat increased from $1.52 to $4.40 a bushel and the quarterly average farm price of corn increased from $1.17 to $2.25 a bushel. The following table shows the range of the amounts by which forecasted prices for wheat and corn were underestimated.

	Range of amount of forecasting error from July 1972 to December 1973			
	First forecasts	Second forecasts	Third forecasts	Fourth forecasts
Wheat	$0.30 to $2.77	$0.25 to $2.80	$0.25 to $2.15	a/ $0.06 to $1.35
Corn	.09 to 1.14	.07 to 1.10	.05 to 1.01	.03 to .49

a/The fourth forecast for the January to March 1973 calendar quarter overstated the price of a bushel of wheat by $0.06. All other forecasts for the July 1972 to December 1973 period understated prices for wheat and corn.

The task force concluded that the larger-than-normal forecast errors in many farm commodity prices late in 1972 and 1973 could not be totally attributed to forecast errors in other information used as a basis for the price forecasts. It added that the Department not only had inadequate knowledge about economic relationships of foreign markets or factors which affect crop supplies but also did not understand the relationships of price adjustments for many commodities in periods of excessive demand relative to supplies.

FORECASTS NEED TO BE ADEQUATELY DOCUMENTED AND PERIODICALLY EVALUATED

In carrying out its forecasting functions, the Department uses many kinds and sources of data and numerous assumptions, procedures, and methodologies. Inadequacies in any of these can cause forecasts to differ from actual results.

The Department has not thoroughly reviewed its short-range commodity forecasts periodically to determine the magnitude and kinds of forecast errors and to identify and evaluate the specific factors which cause the errors. Periodic evaluations would enable the Department to monitor its forecasting capability, accuracy, and reliability in a timely manner.

The ERS task force, whose study is discussed in the preceding section, concluded that a lack of documentation prevented the complete identification of (1) methods and procedures used by analysts when forecasting, (2) factors which influenced the choice of particular methods, and (3) sources of forecast errors.

To thoroughly evaluate its future forecasts, the Department needs to improve forecast documentation. For example, the Interagency Commodity Estimates Committees' forecasts are based on a consensus of committee members. Each member uses data and assumptions about economic and policy considerations derived through a variety of sources and procedures ranging from scientific methods to informed opinions. The committees do not keep records of how they reach a consensus to allow for a review of the assumptions, methodologies, and procedures underlying the forecast amounts.

Because of the complexity of the Department's forecasting efforts and the numerous persons directly and indirectly involved in formulating the forecasts, routine development within the Department of adequate documentation is particularly important. Thorough evaluation of the Department's future forecasts will be possible only if adequate documentation is developed and maintained.

CONCLUSIONS

Forecasts of wheat and corn acres harvested, yields, domestic demands, exports, carryovers, and prices have not been very accurate in recent years. Because adequate documentation supporting the forecasts has not been maintained within the Department, identification and evaluation of all of the sources of past forecast errors is not possible.

The Department needs to establish requirements for documenting forecast development. It also needs to develop procedures for systematic and periodic evaluations of forecasting performance, methodologies, procedures, assumptions, data requirements, and documentation practices. Such evaluations should be directed toward identifying the sources of forecasting errors and modifying the procedures or data needed to make forecasts more accurate.

A committee should be established to make the evaluations and to recommend improvements in the Department's forecasting capability. To enhance objectivity, thoroughness, and comprehensiveness in its evaluations, such a committee might be composed of both Department and non-Department personnel.

AGENCY COMMENTS AND OUR EVALUATION

The Department said that it basically agreed with our major findings and believed that the accuracy of agricultural commodity forecasts can and should be improved. (See app. III.) It noted that evaluating forecasts is an extremely complicated task because forecasts can miss the mark for a variety of reasons. It said that errors most often develop because underlying assumptions do not materialize as anticipated, and that basic analytical systems sometimes break down under changing conditions. Also, published forecasts can provide signals to farmers, processors, and distributors, as well as policymakers, that their plans should be modified. If the plans are changed, the outcome may differ materially from the forecast.

The Department agreed that a comprehensive evaluation effort is needed. It pointed out that a group of ERS technicians had recently been assembled to evaluate ERS's system and to document, where possible, its forecasting process. The Department said that it would like to see the results of this work before adopting the committee evaluation approach.

We recognize that the Department's effort to evaluate ERS's system is an important move in the right direction but believe it needs to be expanded to include the forecasting activities of SRS, FAS, and the Interagency Commodity Estimates Committees. The committee approach would seem to be a logical and effective means of insuring objectivity in making such an evaluation and in identifying useful alternative approaches and methodologies to improve forecasting.

RECOMMENDATIONS

We recommend that, to improve commodity forecasting, the Secretary of Agriculture activate a committee to

--establish documentation requirements for forecasts and for forecasting methodologies, procedures, and assumptions;

--systematically and periodically evaluate the accuracy of forecasts, identifying major forecasting errors and their causes; and

--recommend changes in data requirements and improvements in methodologies, procedures, and assumptions.

CHAPTER 3

EFFECTS OF FORECASTING ERRORS

Forecasts that are far off target can lead to unsound agricultural and economic decisions. Adverse effects of such forecasts on the operations and costs of Government programs are illustrated by events related to the 1973-74 wheat and feed grain programs.

WHEAT PRICE-SUPPORT PAYMENTS MADE ON BASIS OF UNDERESTIMATED PRICES

The Agricultural Act of 1970 (Public Law 91-524, 84 Stat. 1362) authorized price support to wheat producers for the 1971-73 marketing years. The act required the Secretary of Agriculture to issue wheat marketing certificates which would guarantee producers a fair price for their wheat. The face value of the certificates for a marketing year was to be the difference between the parity price 1/ for a bushel of wheat as of the beginning of the marketing year (July 1) and the national average market price received by farmers from July through November.

The Secretary was required to advance to producers, as soon as practicable after July 1, an amount equal to 75 percent of the estimated face value of the certificates, with the remainder to be paid, if necessary, after December 1. The law provided that, if the face value of the certificates as finally determined were less than the advance, producers would not be required to repay the difference.

To estimate the face value of the certificates for each marketing year, the Department estimated the parity price at the beginning of the marketing year (July 1) and forecasted the 5-month (July to November) national average farm price. The parity price was estimated in May each year using professional judgment and the latest data available on prices.

To forecast average farm prices for the first 5 months of each marketing year, the Department analyzed prices in May on the Kansas City, Missouri, wheat futures market for July, September, and December contracts. The Department's estimates and actual results of the 3 years are summarized below.

1/A price designed to keep the purchasing power of the farmer at the level of the period January 1910 to December 1914, inclusive.

Marketing year	Forecasted				Actual			
	Parity	5-month average price	Value of certificate	Advance payment	Parity	5-month average price	Value of certificate	Final payment
	(per bushel)							
1971-72	$2.92	$1.32	$1.60	$1.20	$2.93	$1.30	$1.63	$0.43
1972-73	2.99	1.29	1.70	1.28	3.02	1.68	1.34	.06
1973-74	3.30	2.40	.90	.68	3.39	3.99	.00	.00

The Department estimated parity prices fairly accurately for each of the 3 years but considerably underestimated average farm prices for the 1972-73 and 1973-74 marketing years.

After the Department had estimated the face value of the certificates for 1972-73 and made the advance payments, prices increased considerably because of a larger-than-normal foreign demand for U.S. wheat. The Department's 5-month average farm price forecast did not consider the possibility of a larger-than-normal foreign demand and the implications of such a demand on price increases. An overpayment nearly resulted because the advance payment was only 6 cents a bushel less than the actual value of the certificates.

A more extreme situation resulted in 1973. The Department estimated the face value of the 1973 certificates in May and made advance payments starting July 1 totaling about $375 million. About 97 percent of the advance payments were disbursed by July 6. On July 18 a steady upward trend in prices began due to extremely heavy foreign demand. This time the average farm price for July through November was about 66 percent more than the Department had forecast; and, as finally determined, the certificates did not have any value because the actual price exceeded the parity price. As provided by the law, however, none of the advance payments could be recovered.

The Agriculture and Consumer Protection Act of 1973 (Public Law 93-86, 87 Stat. 226) suspended the wheat marketing certificate program for the 1974-77 wheat crops.

WHEAT SET-ASIDE PROGRAM CONTINUED ON BASIS OF UNDERESTIMATED DEMAND

In July 1972 the Department announced the 1973-74 wheat program which included provisions for both mandatory and voluntary set-aside of cropland. On the basis of historical farmer participation rates, the Department forecasted that 23 million to 25 million acres would be held out of production under the program. The Department also forecasted that total

domestic and export demand would exceed production in 1973-74 and would reduce yearend carryover stocks to 700 million bushels--a more desirable level, in the Department's opinion, than the 800 million bushels estimated to be carried over from the 1972-73 crop.

The Department revised downward its forecast of 800 million bushels of 1972-73 wheat carryover stocks in August and September 1972. It expected the drawdown to result from increased demand, primarily from the Soviet Union.

In January 1973 the Department eliminated the mandatory set-aside provision for the 1973-74 wheat program except for producers participating under the voluntary set-aside provision which was continued. This action was an effort to increase production and, consequently, the 1973-74 yearend carryover. At that time the Department forecasted that total supplies in 1973-74 would be about 2,210 million bushels; total demand, about 1,640 million bushels; and yearend carryover stocks, about 570 million bushels. The supply forecast was fairly accurate, but exports were underestimated by about 250 million bushels and yearend stock carryover was overestimated by about 320 million bushels.

If the Department's January 1973 forecasts had more accurately predicted the 1973-74 stock carryover--an extremely low 247 million bushels--the voluntary set-aside program could have been discontinued. Because it was continued, however, about $98.8 million was paid to participating producers who held about 7.4 million acres of cropland out of production.

POOR FORECASTS LED TO UNSOUND PROGRAM DECISIONS ON CORN AND OTHER FEED GRAINS

The Agricultural Act of 1970 also authorized a voluntary price-support program for corn and other feed grains for the 1971-73 marketing years. Among the price supports authorized were direct payments available to participating producers on half their feed grain base.

For corn, the payments were to be at a rate not less than the difference between the average market price for the first 5 months of the marketing year and the higher of (1) $1.35 a bushel or (2) 70 percent of the parity price at the beginning of the marketing year. The payments on grain sorghum and, if designated by the Secretary, barley were to be at rates fair and reasonable in relation to the rate on corn.

The program also included a provision under which, if the Secretary determined it necessary to control feed grain production, participating producers could be required to set aside feed grain acreage or other cropland. If set-aside requirements were in effect, producers had to comply with them in order to become eligible for the price-support payments.

The act directed the Secretary to make a preliminary payment to producers as soon as practicable after July 1 of the year in which the crop was harvested at a rate equal to 32 cents a bushel for corn, with comparable rates for grain sorghum and, if designated, barley. The preliminary payment rate was to be reduced proportionately, however, if the acreage required to be set aside was less than 20 percent of the feed grain base.

If the payment rate was finally determined to be more than the preliminary rate, an additional payment was to be made as soon as practicable after the following March 1; if it was less, no refund was required.

In formulating the 1973-74 feed grain program, the Department determined that cropland set-aside provisions were needed to keep feed grain production at a level that would not cause a large buildup in carryover stocks, depress prices, and increase Federal outlays for loans and inventory. The 1973-74 program, as first announced in mid-December 1972, provided for two set-aside levels: 30 percent--full compliance--and 15 percent--partial compliance. The signup period for producers who wished to participate was set for February 5 through March 16, 1973.

For fully complying producers, the payment rates were initially set at 35 cents a bushel for corn, 33 cents a bushel for grain sorghum, and 28 cents a bushel for barley. For partially complying producers, the payment rates were set at 24 cents a bushel for corn, 23 cents a bushel for grain sorghum, and 20 cents a bushel for barley. To be eligible for this lower payment, however, a producer had to limit the feed grain acreage planted in 1973 to that of 1972.

Late in January 1973 just before the signup period started, the Department announced that, to encourage the planting of additional acreage, the set-aside requirement for full compliance was being reduced from 30 to 25 percent and for partial compliance, from 15 percent to zero, provided that the producers choosing partial compliance did not increase their feed grain acreage above that of 1972. This

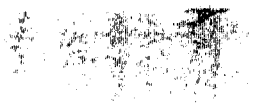
program change was made after an analysis of SRS's January Crop Production report indicated that producers planned to plant less corn and other feed grain acreage than the Department believed was needed to meet a higher domestic and export demand than was initially anticipated. The payment rates for corn, grain sorghum, and barley were also reduced to 32, 30, and 26 cents a bushel, respectively, for full compliance and to 15, 14, and 12 cents a bushel, respectively, for partial compliance.

Late in March 1973 after the producers had signed up for the program, the Department reduced the set-aside requirement for full compliance from 25 to 10 percent with no reduction in payment rates. This action was taken after an analysis of SRS's March Crop Production report showed that producers did not plan to increase their feed grain plantings to the extent that the Department had anticipated in making the first reduction. The second reduction also had little success in encouraging additional plantings.

For the 1973-74 program, the Department's preliminary payments to fully complying corn producers who held 6 million acres of cropland out of production totaled about $784 million. About $125 million was paid to partially complying producers. For grain sorghum and barley, preliminary payments to fully complying producers totaled about $253 million and to partially complying producers, about $9 million. Because the market prices as finally determined for corn, grain sorghum, and barley were 103, 99, and 126 percent of their parity prices, respectively, no additional payments were made.

The preliminary payments to the fully complying producers were made at the rates announced when the set-aside requirement was changed to 25 percent. The lowering of the full-compliance requirement to 10 percent in March 1973 did not affect the payment rates because the producers had signed up when the 25-percent provision was in effect. If the Department had better assessed the probable effects of the set-aside program and reduced the set-aside requirement to 10 percent (rather than 25 percent) in January 1973, the preliminary payment rates would have been reduced proportionately as required by the 1970 act and about half of the payments to fully complying producers could have been avoided.

One of the Department's main objectives in establishing and revising the feed grain set-aside provisions was to keep corn production at a level that would insure a corn carryover of about 900 million to 1,000 million bushels. The Department greatly underestimated the 1972-73 and 1973-74



demands for corn, however, and yearend stock carryovers were much lower than anticipated. Only 483 million bushels of corn were available for carryover to 1974-75.

If the Department had better forecasted corn demand and carryover stocks, a set-aside program would not have been needed in 1973-74 and enough corn could have been grown on the set-aside cropland (assuming that it was all put into production) to achieve a carryover of 900 million to 1,000 million bushels. If there had been no set-aside requirements and if the Department had better forecasted feed grain market prices, the total preliminary payments of about $1.2 billion to all fully and partially complying feed grain producers could have been avoided.

The Agriculture and Consumer Protection Act of 1973 continued the Secretary's authority through the 1977 marketing year to establish feed grain set-aside requirements if he determined them necessary. The Department formulated the 1974-75 feed grain program without any set-aside requirements in an effort to achieve a 1,000 million-bushel carryover for corn.

CONCLUSIONS

These cases demonstrate the importance of the use of agricultural forecast data in formulating, implementing, and modifying agricultural policies for commodity programs. They point out how poor forecasts of wheat and corn supplies, demands, prices, and carryovers and misjudgments of farmers' responses to cropland set-aside programs contributed to decisions which resulted in (1) higher program costs than would have been incurred if the forecasts had been more accurate and (2) land held out of production that should have been planted to help insure an adequate carryover.

AGENCY COMMENTS AND OUR EVALUATION

The Department (see app. III) agreed that the forecasting errors associated with the extreme uncertainties in the past several years contributed to some unfortunate policy decisions but pointed out that economic intelligence was only one of the factors involved in the complex decision-making process. According to Department officials, executive branch policy objectives are also considered. The Department said that, in view of the large swings in economic events in recent years, it would be interesting to speculate on how policymakers would have responded if forecasts had been on target.

We recognize that factors other than the Department's forecasts are involved in the decisionmaking process. That does not lessen, however, the need for more accurate forecasts. With better forecasts, the policymakers would be better able to weigh the various factors involved in the decisionmaking process and the possible effects of their decisions.

CHAPTER 4

ACTIONS TO IMPROVE SHORT-TERM COMMODITY FORECASTS AND FORECAST REPORTS

The Department has acted in recent years to improve its short-range commodity forecasting capability and reports. These actions and our recommendations for further improvements in reporting are discussed below. Further actions needed to improve the Department's forecasting capability are discussed in chapter 2. The effectiveness of the Department's actions will be reflected in future forecasts.

ERS ACTIONS TO IMPROVE FORECASTS

In May 1972 the ERS Administrator appointed a committee of Government, industry, and university representatives to review ERS programs. The committee reported in November 1972 that the quality of ERS's outlook and situation work was seriously threatened by inadequate data, staff, and supporting research.

After forecasting errors became particularly acute and visible in late 1972 and early 1973, an ERS task force studied ERS's forecasting capability and procedures and identified some of the agency's forecasting difficulties. Some of the task force's conclusions are discussed on pages 19 and 21.

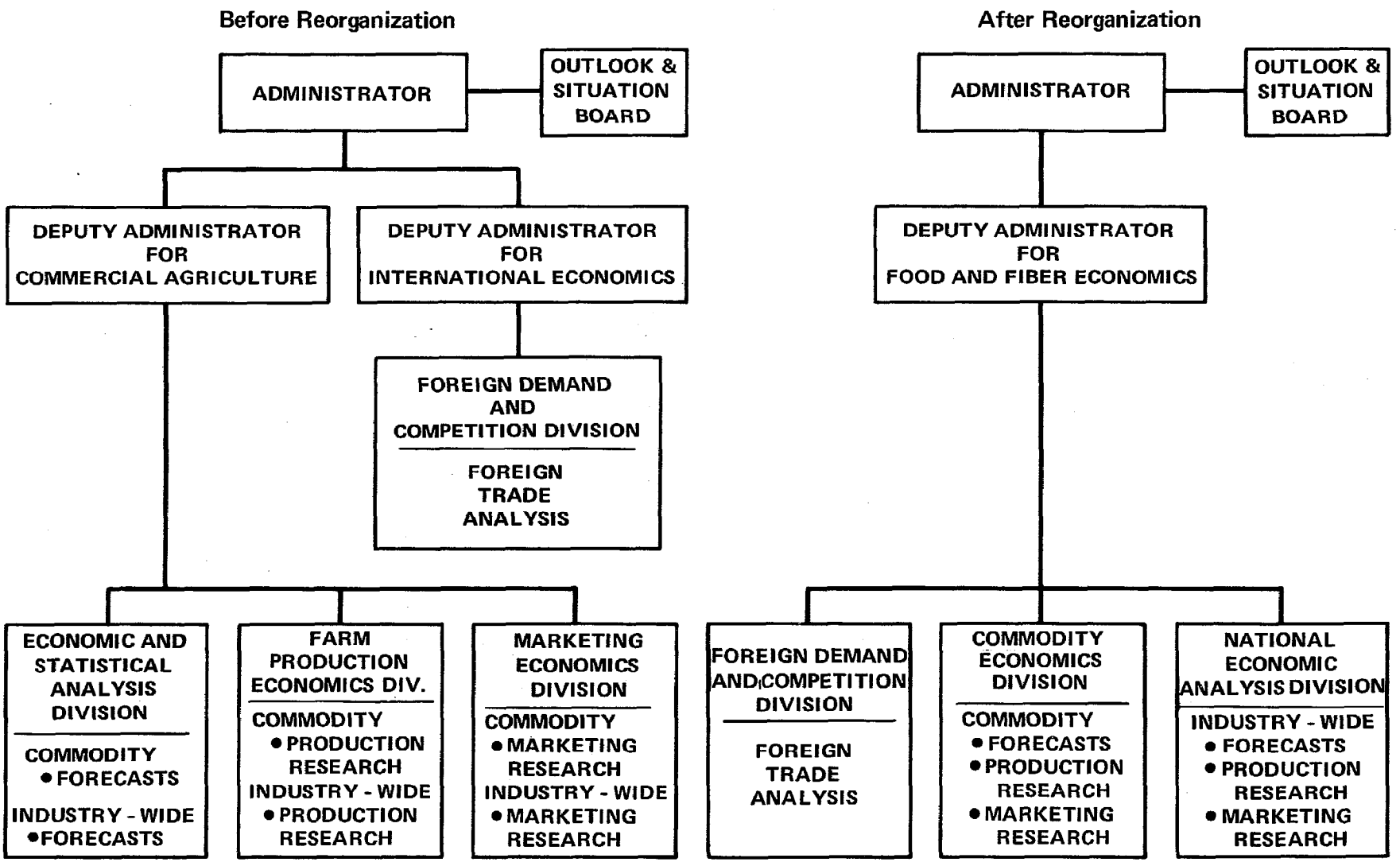
The actions discussed below relate to some of the problem areas which the committee and task force identified.

ERS reorganization

Early in 1974 ERS completed a staff reorganization in an attempt to improve its commodity forecasting capabilities. (See organization chart, p. 31.) Currently three divisions under the Deputy Administrator for Food and Fiber Economics monitor and forecast agricultural commodity data. This work was formerly under two deputy administrators and divided according to commodity situation and outlook, farm production economics, marketing economics, and foreign trade analysis.

ERS officials believe that the new organization will strengthen analytical support of outlook work and will improve forecasts by bringing research and outlook capabilities together. They said that the communication and coordination between researchers who analyze and measure the impact of

ECONOMIC RESEARCH SERVICE'S FORECASTING ORGANIZATION



factors affecting commodity supply, demand, and prices and outlook specialists who make forecasts for these factors should improve as a result of the reorganization.

All research on factors affecting specific commodities was assigned to subunits of the new Commodity Economics Division. These subunits also are responsible for all situation and outlook work associated with their specific commodities. Under the old organization, all outlook work, both industrywide and specific commodities, was done by the Economic and Statistical Analysis Division whereas other divisions did production and marketing research. ERS officials claimed these groupings hampered efforts to analyze interrelated problems affecting all aspects of a commodity.

The National Economic Analysis Division is now solely responsible for industrywide forecasts and research dealing with such things as aggregate farm income and production inputs and long-term projections. This division focuses on economic and policy issues and developments that affect the entire agricultural industry and commodity subsectors and provides Commodity Economics Division analysts with the overall economic setting for their commodity forecasts. Prior to the reorganization, industrywide research and forecasts for marketing and for production were in separate divisions.

Another organizational change placed the Foreign Demand and Competition Division, which studies worldwide supply and demand conditions for U.S. commodities and foreign government policies on trade, under the same deputy administrator as the other two new divisions. According to ERS officials, this change will make possible closer coordination between ERS foreign trade analysts and commodity and industrywide analysts.

Increase in number of analysts

ERS appropriations were increased by $375,000 in fiscal year 1975 to strengthen the agency's forecasting capability, primarily through the hiring of additional staff. As of May 1975 ERS had employed 12 additional analysts.

Consistency of agricultural forecasts with outlook for the general economy

Since 1972 ERS has been using, as part of its data base for making forecasts of the domestic demand and prices for specific agricultural commodities, various general economic data produced by an econometric model developed and operated

at a university. To help insure that its forecasts are consistent with the general economic outlook, ERS compares the aggregate of its demand and price forecasts for all commodities with the model's forecasts of prices and food and beverage consumption.

In January 1974 ERS began meeting quarterly with representatives from the Council of Economic Advisors, the Office of Management and Budget, and the Treasury Department to discuss the outlook for agriculture and food. ERS officials believe these meetings provide a better insight into economic and other factors which may have an impact on agriculture and food forecasts. ERS is also communicating with commodity analysts from industry more frequently.

Changes in data development and management within ERS

Two committees have been established within ERS to improve the data base used in forecasting. One committee has been studying the data available to ERS analysts for use in forecasting and identifying additional information needed to improve supply, demand, and price forecasts for major commodities. The data requirements will be coordinated to minimize the collection of new data. ERS requested additional funds in fiscal year 1976 for data gathering.

The second committee is developing an automated data information system for cataloging, storing, retrieving, and analyzing the data. Some portions of the system have become operational. ERS believes that a readily accessible and comprehensive data base will result in greater efficiency in using data for analytical and forecasting purposes.

Changes in grain yield models

According to Department officials, the models used in making early forecasts of domestic grain yields have been improved. Departmental yield projections teams, consisting of ERS, ASCS, and SRS representatives, recently began emphasizing causal relationships between yield forecasts and fertilizer supplies and acreage planted. In the past, yield forecasting placed heavy reliance on trends. The officials said that efforts were being planned to revise forecasts by incorporating into the models information concerning actual weather and soil moisture conditions obtained from the National Oceanic and Atmospheric Administration.

ACTIONS TO IMPROVE EXPORT FORECASTING

The Department has also acted in recent years to improve its capabilities for forecasting U.S. agricultural exports. These actions have been aimed at obtaining better and more timely data on worldwide supply and demand conditions and at strengthening departmental capabilities to analyze and interpret overseas developments in terms of their potential effects on U.S. exports.

Changes in agricultural attache reports and FAS data management

Agricultural attaches report to FAS about every 3 months on the grain supply, distribution, and trade situation of the country in which they are located. The reports generally contain data on the previous year, the current year, and the outlook for the following year.

FAS officials told us that, before 1973, attache reports often varied in the amount and kind of forecast data they contained. They said that the reports had improved in recent years after FAS began requiring its attaches to provide more uniform and quantitative data on the outlook for a country's grain situation than in the past. Attaches have also been instructed to report important changes in a country's grain outlook as soon as such information becomes available rather than to report the changes in the next regularly scheduled report.

Early in 1973 FAS developed an automated system for compiling and categorizing data on the world supply and demand for each major grain crop. FAS standardized the supply and distribution data that it had accumulated over a number of years to provide a common historical data base for the system. This data was coded into the system and summarized on printouts to show historical trends for individual countries, regions, and the world.

FAS is currently using the system to forecast production, imports, consumption, stocks, and exports of major grains in about 100 countries. As forecast and other data become available through agricultural attache reports and other sources, it is evaluated by an FAS-ERS statistical review committee, coded into the system, and summarized on monthly printouts. Information from these printouts is summarized about seven times a year and published in FAS's Foreign Agriculture Circular for grains.

Agreement to exchange agricultural data with the Soviet Union

On June 19, 1973, the United States and the Soviet Union entered into an agricultural agreement--a major objective of which was to exchange agricultural economic data on a more timely and detailed basis than in the past. Under the terms of the agreement, meetings between the two countries are to be held to exchange information on the commodity supply and demand situation, including production plans and programs, foreign trade data, and utilization data for major agricultural commodities in the current year and the outlook for the next marketing year.

To implement the agreement, the two countries established the Joint Committee on Agricultural Cooperation to meet once a year alternately in the two countries and two joint working groups to meet more often and operate within the framework of the Joint Committee.

As a result of meetings through December 1974, the Soviet Union provided certain types of historical data, such as statistics relating to the production of a wide range of crops, the total volume of concentrated feeds consumed by animals on collective and state farms, and the per capita consumption for all grains combined. However, little progress had been made in acquiring more current data that would enable the United States to more accurately assess the outlook for Soviet Union grain production, stocks, and trade.

Departmental task forces to analyze grain situation in two countries

Departmental task forces were established in 1973 to monitor the grain situations in the Soviet Union and the People's Republic of China. These task forces periodically review and analyze the latest information available from agricultural attaches and other sources on grain crop prospects, utilization, and trade developments of the two countries and their potential effects on U.S. grain exports. An objective of the task forces is to insure that timely information is provided to the public on the two countries' grain situations. Such information is generally published in departmental news releases and articles in FAS's weekly Foreign Agriculture magazine.

PUBLICATION OF DEPARTMENT'S EARLY FORECASTS

The Department generally makes crop supply and demand forecasts for internal use as much as a year in advance of

the marketing year covered. Before 1973 the Department released its early forecasts for total wheat and corn production to the public about 2 to 6 months before the beginning of the marketing year. Earliest demand forecasts were published shortly before or after the marketing year began. Revised supply and demand forecasts were published about four or five times a year.

The Department published its 1974-75 early supply and demand forecasts for wheat and corn in September 1973, about 9 and 12 months, respectively, in advance of the commodities' marketing years. The early forecasts and revisions were disseminated in a new monthly report called Agricultural Supply and Demand Estimates. The Department explained in the report that the new reporting procedure was the result of an effort to provide the public with the timeliest analytical information officially available. The Department cautioned that the 1974-75 projections were rough approximations based on available data and thus subject to change as additional information became available.

The Department did not publish its official supply and demand forecasts for the 1975-76 wheat and corn marketing years until mid-March 1975. Department officials told us that they had reverted to the practice of not releasing forecasts to the public until shortly before the beginning of the marketing year because there was too much uncertainty surrounding early forecasts and that this uncertainty was reflected in the poor forecasting record for 1974-75.

Users of the Department's forecasts, including representatives of farmer groups, equipment manufacturers, feed companies, and commodity brokerage firms told us that publication of the early forecasts would be useful to them. For example, a farm equipment manufacturer said that, because of the long leadtime for getting materials--from about 4 to 52 weeks, he would like to have early forecasts to help him plan his company's production.

USE OF RANGES IN PUBLISHED FORECASTS

The Department began in July 1974 to report forecast amounts for 1974-75 in ranges, rather than as single number (point) estimates, to indicate the uncertainty surrounding forecasts and to reflect the possibility of alternative outcomes. In referring to this change, the July 1974 Agricultural Supply and Demand Estimates report noted that the range amounts were not derived statistically. The report explained that in previous publications the forecast

amounts had been approximations based on the latest available data and had been representative of fairly wide ranges rather than precise estimates.

We discussed forecast ranges with representatives of various farm associations, publishers of agricultural newsletters, feed and seed producers, farm equipment manufacturers, and grain companies that used the Department's forecast reports. They generally said that forecast ranges were helpful.

The discussions indicated, however, that forecast ranges can be confusing because some users assumed that the upper and lower ends of a range had the same probability of occurrence. Department officials told us that such an assumption was generally inappropriate. For example, in its March 1975 forecast of corn yield for 1975-76, the Department reported a range of 88 to 98 bushels an acre. Department officials told us that there was a greater likelihood that the actual yield would be nearer the low end of this range than the high end.

Most of the forecast users told us that the Department's reports would be more useful if they contained point estimates of the most likely outcomes within ranges and disclosed the important assumptions and procedures underlying projections. For example, some users said that they would like to know what is meant by normal weather and what the Department assumes as a rate of fertilizer application. Some Department officials involved in forecasting also agreed that the reports could be improved if they disclosed or clarified some of the important assumptions underlying the forecast amounts.

INFORMATION NEEDS OF FORECAST USERS

Except for a few cases, the Department has not formally asked forecast users about the usefulness and adequacy of reported commodity forecast information nor solicited suggestions for improving the manner in which forecasts are reported. The exceptions were in 1966 and 1967 when the Department asked for users' comments on the Demand and Price Situation report and the situation reports for fats and oils and for livestock and meat. Our discussions with some users of the Wheat Situation, the Feed Situation, and the Agricultural Supply and Demand Estimates reports indicated that users could offer suggestions for improving such reports and would welcome the opportunity to do so.

The Department should periodically survey farmers, commodity brokers, analysts, processors, grain companies,

and other types of enterprises about their specific commodity forecast information needs and discuss with them the Department's capability of providing such information. If the Department does this in a formal and planned manner, it would have assurance that the information reported meets the needs of as many persons as possible.

The Department could, for example, request written comments from report recipients and others on specific proposals for changes in reporting forecast information and in report format and frequency. Discussions could be held with a sample of forecast users to clarify the comments received and to obtain additional comments and suggestions.

CONCLUSIONS

The Department has taken some actions to improve its forecasting capability. ERS has been reorganized, additional analysts have been hired, data bases are being improved and managed better, agreements to exchange data have been made with the Soviet Union, and departmental task forces have been established to monitor and analyze the grain situations in the Soviet Union and the People's Republic of China. Other actions have been directed to improving approaches to forecasting. The Department is trying to correlate agricultural forecasts with forecasts for the general economy, and forecasting models are being changed. The effect of the Department's actions will be reflected in future forecasts.

The Department should resume publishing early official forecasts. Although early forecasts cannot be expected to have the same degree of certainty as later forecasts, publication of early forecasts, with appropriate cautions as to their degree of reliability, can be useful to farmers, their suppliers, and others who need timely agricultural outlook data in making production, purchasing, and marketing decisions.

The Department should continue using reasonable forecast ranges, where practicable, to provide more useful outlook data to farmers and others who need such information for making planting and marketing decisions.

The Department's forecast reports would be more useful and less likely to be misunderstood if they discussed the important assumptions and procedures underlying forecast amounts, including the factors that could cause the eventual outcome to be near one end or the other of a range. The reports should also state when the Department believes there is a greater likelihood that the actual results will be near

one end or the other of a range. To further enhance the usefulness of forecast reports, a point estimate should be included in each range to indicate the most likely outcome.

Periodic evaluations of the forecast information needs of farmers, agriculture-related enterprises, and other forecast users are needed to insure that the Department's forecasts are of optimum usefulness.

RECOMMENDATIONS

We recommend that, to enhance the usefulness of commodity supply and demand forecasts, the Secretary of Agriculture require the Department to

- --publish all official forecasts made before the beginning of the marketing year;
- --provide, for important items and where practicable, a point estimate of the most likely outcome when forecast amounts are stated in ranges;
- --disclose in forecast reports, or by reference to other published documents, important assumptions and procedures underlying forecast amounts, including factors that could cause the eventual outcome to be near the extremes of a range; and
- --evaluate periodically forecast users' information needs and, where practicable, change forecast reporting to accommodate these needs.

AGENCY COMMENTS AND OUR EVALUATION

The Department generally agreed with our findings and recommendations. (See app. III.) It said that it would consider disclosing the important assumptions and procedures underlying its forecasts, particularly where ranges are employed, and assessing the information needs of forecast report users. The Department said that it recognized the desirability of early published forecasts and agreed in principle with including point estimates of the most likely outcome within forecast ranges but that it feared such changes would imply a larger degree of certainty than actually exists.

We believe that the Department is being overly cautious in withholding official forecasts from the public until March planting intentions information becomes available. This practice may help to minimize forecast errors in published reports, but it precludes farmers and others who need

timely agricultural outlook data in making their early production and marketing decisions and commitments from having the benefit of the Department's early analyses. The Department, as a public agency, should make its early official forecasts available to the public. The forecasts should be clearly marked as to their uncertainty and degree of reliability so that report users can consider these cautions in making their decisions.

In discussing forecast ranges with Department officials, we were told that, because ranges had only been in effect for about a year, the Department wanted more time to study their usefulness before considering the practicality and benefits of including point estimates of the most likely outcome within ranges.

CHAPTER 5

SCOPE OF REVIEW

We made our review at the Department of Agriculture in Washington, D.C. We reviewed pertinent policies, procedures, reports, and records of ASCS, ERS, FAS, and SRS relating to short-range commodity forecasting, studies made of forecasting problems, and legislation concerning wheat and feed grain programs.

We developed a record of the Department's short-range forecasts of wheat and corn supplies, demands, and prices for the 1971-72 through 1974-75 marketing years from data provided by the Interagency Commodity Estimates Committees and data included in various departmental publications. We interviewed members of the committees and other responsible Department officials concerning forecasting difficulties, errors, procedures, and methodologies, and wheat and feed grain program policies and provisions.

We also discussed the Department's forecast reports with agricultural specialists and other users of the reports, and we discussed weather forecasting and the effects of weather on crop yields with university meteorologists and meteorologists and other officials of the National Oceanic and Atmospheric Administration.

APPENDIX I

DEPARTMENT OF AGRICULTURE

PUBLICATIONS WHICH PROVIDE OUTLOOK INFORMATION

FOR WHEAT AND CORN

Title	Agency	Frequency in 1974	Description of outlook information
Crop Production	SRS	Monthly	Statistical estimates of acreage, yield, and production, by State, during wheat and corn growing and harvesting seasons.
Crop Production; Prospective Plantings	SRS	January and March	Statistical estimates of acreage to be planted in corn and spring wheat, by State, based on projections of farmers' intentions.
Crop Production; Highlights of Winter Wheat	SRS	December	Statistical estimates of seeded acreage and indicated production of winter wheat, by State.
Agricultural Supply and Demand Estimates	ERS	Monthly, except February (note a)	Tabular forecasts updating total wheat and corn production, supply, domestic demand, exports, and yearend carryover estimates.
Wheat Situation	ERS	February, May, August, and November	Forecasts and analyses of total wheat production, supply, domestic demand, exports, yearend carryover, and season average price received by farmers. (See note b.)

Title	Agency	Frequency in 1974	Description of outlook information
Feed Situation	ERS	February, May, September, and November	Forecasts and analyses of total corn production, supply, domestic demand, exports, year-end carryover, and season average price received by farmers. (See note b.)
Crop Values	SRS	January	Season average prices received by farmers and value of production of principal crops.
Demand and Price Situation	ERS	February, May, August, and November	Reviews factors affecting the domestic and foreign demand for farm products and general trends in supply, demand, and prices of major farm products.
Other Situation Reports	ERS	From 1 to 6 issues	Series of reports that keep up with the current supplies, prices, and outlook for a number of farm commodity groups, and review developments in farm income, farm finance, farm real estate, fertilizers, food marketing, and retailing.
Agricultural Outlook Digest	ERS	Monthly except January	Brief commentaries on the outlook and changes in the situation for specific commodities, the economics of the agriculture sector and the Nation, and foreign agricultural production and trade as published in other reports.

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Title	Agency	Frequency in 1974	Description of outlook information
World Agricultural Situation	ERS	September and December	Appraises world wheat and grains production, consumption, trade, and U.S. exports.
Outlook for U.S. Agricultural Exports	ERS/ FAS	February and December	Highlights the outlook for volume and value of grain exports by regional destination.
Foreign Agriculture Circular for grains	FAS	Periodically	Tabular forecasts of wheat and feed grain production, imports, and exports by major countries, U.S. exports, and world consumption and stocks were published seven times in 1974.
Foreign Agriculture	FAS	Weekly	Articles discussing various agricultural subjects including the outlook and changes in production, consumption, trade, and price patterns of foreign countries. They sometimes provide outlook data for U.S. exports.

a/Issued after release of SRS Crop Production and Stocks reports; issued three times in January 1974 and twice in July and October 1974.

b/Season average prices first published in February of the marketing year.

CHRONOLOGY OF WHEAT AND CORN PRODUCTION FORECASTS FOR THE 1971-72 TO 1974-75 MARKETING YEARS

1971-72 crops

In December 1970 the Department announced the set-aside plans for the 1971-72 wheat crop and made its initial production forecast. The forecast was revised downward in February 1971, after the set-aside program was finalized and SRS had published Crop Production reports containing information on winter wheat acreage planted, yield estimates, and farmers' intentions for planting spring wheat. The forecast was changed several more times between March and December 1971, as shown below, to agree with revised production forecasts published in SRS's Crop Production reports.

Forecast date	Wheat production (million bushels)
December 1970	1,500
February 1971	1,411
March 1971	1,407
May 1971	1,388
June 1971	1,415
July 1971	1,548
October 1971	1,628
December 1971	1,640
Actual	1,618

The first forecast was closer to the actual production than some of the revised forecasts. The first forecast underestimated production by 118 million bushels as a result of overstating acres harvested by 2.8 million acres and underestimating yield by 4.2 bushels an acre. The revised forecasts through May 1971 decreased in accuracy because acres harvested were underestimated by 0.5 million to 1.6 million acres and yield continued to be underestimated by about 4 bushels an acre. The May production forecast was the most inaccurate--230 million bushels less than actual.

The 1971-72 corn crop was much larger than forecasted because weather conditions were better than expected and blight damage was unusually light. As a result, yield was higher than anticipated. The following table shows some of the changes in corn production forecasts for 1971-72.

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Forecast date	Corn production (million bushels)
December 1970	4,835
September 1971	5,265
October 1971	5,399
December 1971	5,552
January 1972	5,540
Actual	5,641

1972-73 crops

The Department announced the set-aside program for the 1972-73 wheat crop in July 1971 and forecasted that 1,550 million bushels would be produced. The forecast was revised downward to 1,510 million bushels in October 1971 and did not change until SRS released a Crop Production report late in December containing estimates of the number of acres of winter wheat planted, expected acreage yield, and expected production. Because SRS projected a record yield for winter wheat, the Department increased the estimate for total wheat to 1,669 million bushels--119 million bushels higher than the initial forecast.

Department decisionmakers decided that the estimated production would build up carryover stocks to an undesirable level, and in mid-January 1972 the Secretary of Agriculture authorized a voluntary additional set-aside program in an effort to reduce wheat acreage by 7 million to 8 million acres and production by 200 million to 250 million bushels. The Department estimated that production under the revised program would be 1,418 million bushels.

The forecast was changed to 1,485 million bushels late in January 1972, and to 1,554 million bushels early in May 1972, after SRS released Crop Production reports containing information on the number of acres farmers planned to plant in spring wheat. The revised forecasts fluctuated between 1,518 million and 1,560 million bushels from May to November 1972, on the basis of estimates contained in SRS's Crop Production reports. SRS determined actual production to be 1,545 million bushels in December 1972.

The first forecast under the revised wheat program (mid-January 1972) underestimated production by 127 million bushels as a result of underestimating acres harvested by about

APPENDIX II

4 million acres. The second forecast underestimated production by 60 million bushels, also as a result of underestimating acres harvested. The revised forecasts that were made after farmers' intentions for planting spring wheat were known were more accurate, ranging from 27 million bushels too low to 16 million bushels too high.

Corn production for 1972-73 was about 1 billion bushels more than initially forecasted because both yield and acres harvested were underestimated. The yield of 97 bushels an acre was much greater than the 85 bushels forecasted because the weather conditions were better than expected. The 57.4 million acres harvested exceeded the initial forecast by 4.1 million acres. The production forecast was revised upward numerous times as follows.

Forecast date	Corn production (million bushels)
January 1972	4,530
February 1972	4,884
May 1972	5,042
August 1972	4,948
September 1972	5,124
October 1972	5,266
November 1972	5,400
January 1973	5,474
March 1973	5,553
Actual	5,573

1973-74 crops

The 1973-74 wheat program included a mandatory set-aside requirement and a voluntary set-aside provision to encourage retirement of land and to prevent excessive production. When the program was announced in July 1972, the Department estimated that 1,394 million bushels would be produced. The forecast was revised upward several times as shown below.

Forecast date	Wheat production (million bushels)
July 1972	1,394
August 1972	1,546
September 1972	1,648
October 1972	1,658
December 1972	1,678

The July and August forecasts were 284 million and 132 million bushels, respectively, less than the December forecast primarily because the Department had anticipated greater producer participation in the voluntary set-aside program. The initial forecast indicated that 43 million acres would be harvested, and the December forecast indicated 52 million acres.

The Department eliminated the mandatory set-aside program requirement in January 1973 to help insure an adequate supply of wheat to meet an increased demand by other countries after worldwide crop failures. The Department estimated that the revised program would increase acres harvested to 55 million acres and production to 1,770 million bushels. The revised forecast overestimated acres harvested by 1 million acres and production by 65 million bushels.

The set-aside provisions of the 1973-74 corn program were announced in December 1972 and were revised in January and March 1973. The revisions were made to encourage additional production because analyses of information on farmers' planting intentions indicated that production would not be sufficient to meet an increasing demand for corn. The forecasts were revised numerous times, as shown below, to reflect expected production changes resulting from program revisions and farmers' planting intentions. The Department overestimated farmers' responses to the program changes.

Forecast date	Acres harvested	Yield per acre	Corn production
	(millions)	(bushels)	(million bushels)
December 1972	59.9	91.0	5,451
January 1973 (note a)	62.4	94.0	5,866
February 1973 (note b)	64.0	94.0	6,016
March 1973 (note a)	61.4	94.0	5,772
March 1973 (note b)	64.6	94.0	6,072
July 1973	62.5	94.0	5,880
August 1973	61.5	92.1	5,661
Actual	61.9	91.2	5,647

a/Forecasts based on farmers' planting intentions.

b/Forecasts based on program revision to increase production.

1974-75 crops

The 1974-75 wheat program did not have set-aside provisions. Shortly after the program was announced in July 1973, the Department forecasted a bumper crop of 1,894 million bushels. The estimate was increased as follows after SRS published Crop Production reports containing information on winter wheat acreage planted, yield estimates, and farmers' intentions for planting spring wheat.

Forecast date	Wheat production (million bushels)
August 1973	1,894
December 1973	2,000
January 1974	2,060
March 1974	2,073
May 1974	2,172

The revised forecasts through May 1974 ranged from 106 million to 278 million bushels higher than the initial forecast because the acreage expected to be harvested increased from 58 million to 65 million acres.

The Department revised its production forecast downward during the summer of 1974, as shown below, to reflect the effects of a severe drought in the Midwestern States. The actual production was 379 million bushels lower than the May forecast, and the actual yield was 6 bushels an acre less than forecasted.

Forecast date	Wheat production (million bushels)
June 1974	2,074
July 1974	1,925
August 1974	1,840
October 1974	1,781
Actual	1,793

A bumper corn crop was also forecasted for 1974-75 on the basis of a program with no set-aside provisions and the expectation of a high yield of 97 bushels. The forecast was revised downward sharply in July and August 1974, as shown below, as the effects of the summer drought became known. The actual yield was 25.7 bushels an acres less than anticipated, and corn production was 1,703 million bushels less than expected.

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Forecast date	Acres harvested	Yield per acre	Corn production
	(millions)	(bushels)	(million bushels)
August 1973	65.5	97.0	6,354
January 1974	68.8	97.0	6,674
June 1974	68.0	94.0	6,392
July 1974	67.6	88 to 92	5,950 to 6,220
August 1974	63.8	77.8	4,966
November 1974	63.7	72.5	4,621
Actual	65.2	71.3	4,651

DEPARTMENT OF AGRICULTURE
OFFICE OF THE SECRETARY
WASHINGTON, D. C. 20250

Mr. Henry Eschwege
Director, Resources and
Economic Development Division
General Accounting Office
441 G Street, N. W.
Washington, D. C. 20548

JUN 20 1975

Dear Mr. Eschwege:

The Department has reviewed your draft report on improving agricultural commodity forecasting and reporting, and in general concurs with the major findings. We agree that the accuracy of agricultural commodity forecasts can and should be improved. However, we believe that the benefits from such efforts should be carefully viewed in light of needs and costs.

Two aspects of the report give us some concern. One is the treatment of the evaluation of forecasts, and the other is the impression that forecasting errors were the sole cause of several unsound program decisions.

Our experience in evaluating forecasts is that at best it is an extremely complicated task. Forecasts can miss the mark for a variety of reasons. Most often, errors develop because the underlying assumptions do not materialize as anticipated. Sometimes the basic analytical systems turn out to be incomplete or breakdown under changing conditions. Also, once a forecast is released, producers and others may respond by adjusting their activities to the prospective situation. This development illustrates one of the fundamental reasons for outlook and appraisal work. It can provide signals to farmers, processors, and distributors, as well as policymakers, that plans should be modified. But if plans are changed, the outcome may differ materially from the forecast. In this regard, an evaluation process that compares alternative forecasts from various sources with those of the Department may be a useful technique.

With respect to the role of forecasts in program decisionmaking, we agree that the forecasting errors associated with the extreme uncertainties in the past several years contributed to some unfortunate policy decisions. But economic intelligence is only one of many factors that are involved in the complex decisionmaking process. Moreover, it can be misleading to compare the actual results of a decision with that which could have occurred with perfect hindsight. In view of the large swings in economic events during the recent past, it is interesting to speculate on how policymakers would have responded if forecasts had been on target.

APPENDIX III

In regard to the recommendations on pages vi and vii of the draft, we again are in general agreement with the report, although we differ on implementation in several specific areas. Our reactions are summarized below:

1. Appoint a committee to systematically review and appraise the Department's forecasting work.

   We agree that a comprehensive evaluation effort is necessary. As the report indicates, ERS, which has the technical expertise, has already done some useful work in this area. More recently they have assembled a group of technicians to specifically broaden and improve the forecasting system. This effort will include evaluation and documentation where possible of the forecasting process. We would like to see further results of this work before adopting the recommended committee approach.

2. Publish all official forecasts made before the beginning of the marketing year.

   Early forecasts are desirable. But farmers are no longer constrained by acreage limitations. Hence, we do not have solid information to develop supply and demand forecasts for public release in an upcoming crop year until farmers have been surveyed as to how they plan to respond to relative prices and costs. Department policy this year was to release forecasts for 1975/76 after the March planting intentions became available. To do otherwise would imply a degree of accuracy that goes beyond the quality of the information available to the analyst.

3. Require that forecasted ranges include, where practicable, a point estimate of the most likely outcome.

   We agree in principle with this recommendation, but fear that including a point estimate would defeat the purpose of the range and imply a larger degree of certainty than actually exists.

4. Require disclosure of significant assumptions and procedures that underlie forecasts.

   This is a good suggestion particularly where ranges are employed. Generally assumptions are included in ERS situation reports. This may be cumbersome for the Agricultural Supply and Demand Estimates, but we will make an effort to move in this direction.

APPENDIX III

5. Evaluate periodically the forecast information needs of agricultural related enterprises and where practicable, make changes to accommodate these needs.

   This is a good recommendation but difficult to adequately implement. The Department has tried to assess user needs of various reports in the past, though often the results have been suspect. We will, however, take this recommendation into consideration in our overall effort to upgrade and improve this work.

Our comments on technical details in the draft report were discussed with GAO officials. We understand that based on these comments appropriate changes will be made in the report. The Department urges that the lines of communication with GAO officials remain open on commodity forecasting and economic intelligence in an effort to provide the best information feasible to policymakers and the public.

Sincerely,

for J. Dawson Ahalt

DON PAARLBERG
Director of Agricultural Economics

PRINCIPAL OFFICIALS OF THE DEPARTMENT OF AGRICULTURE RESPONSIBLE FOR ADMINISTERING ACTIVITIES DISCUSSED IN THIS REPORT

	Tenure of office	
	From	To
SECRETARY OF AGRICULTURE:		
Earl L. Butz	Dec. 1971	Present
DIRECTOR OF AGRICULTURAL ECONOMICS:		
Don A. Paarlberg	Mar. 1969	Present
ASSISTANT SECRETARY FOR INTERNATIONAL AFFAIRS AND COMMODITY PROGRAMS:		
Richard E. Bell	July 1975	Present
Clayton K. Yeutter	Mar. 1974	June 1975
Carroll G. Brunthaver	June 1972	Jan. 1974
Clarence D. Palmby	Jan. 1969	June 1972
ADMINISTRATOR, ECONOMIC RESEARCH SERVICE:		
Quentin M. West	Jan. 1972	Present
Melvin Upchurch	Sept. 1965	Jan. 1972
ADMINISTRATOR, STATISTICAL REPORTING SERVICE:		
Harry C. Trelogan	Nov. 1962	Present
ADMINISTRATOR, AGRICULTURAL STABILIZATION AND CONSERVATION SERVICE:		
Kenneth E. Frick	Mar. 1969	Present
ADMINISTRATOR, FOREIGN AGRICULTURAL SERVICE:		
David L. Hume	Sept. 1973	Present
Raymond A. Ioanes	Apr. 1962	Sept. 1973

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