OASIS – AN OVERVIEW*

- The assembly, processing, and dissemination of economic intelligence concerning agriculture is a complex process in which the U.S. Department of Agriculture and its subdivisions are greatly involved. The role of the Economics, Statistics, and Cooperatives Service in the information process is described and how recent enhancements in its internal information management help the agency to do a more effective job. The process of generating and disseminating forecasts and other economic information in ESCS is detailed. In addition, the motivation for improvements to the information system and the vehicle by which they were designed and implemented is presented.

- Keywords: Information management, forecasting, data bases, computers.

A major function of the Economics, Statistics, and Cooperatives Service (ESCS) is to provide economic intelligence on the agricultural sector to public and private decisionmakers. In this article, we describe the development of an effective, efficient process for analyzing and reporting this information—OASIS: Outlook and Situation Information System.

THE NEED FOR A COMPREHENSIVE SYSTEM

> **Behold, I set before you this day a blessing and a curse: the blessing, if ye shall hearken unto the commandments . . . which I command you this day; and the curse, if ye shall not hearken unto the commandments . . . but turn aside out of the way which I command you this day.**
> **Deuteronomy Ch. 11:26-28.**

While much of the operational structure needed already existed in ESCS, the information flow was fragmented before OASIS and no uniform format existed. This situation resulted, in part, because of the size and diversity of the staff and the distribution of functions in the food and fiber divisions. Further, conflicts occur between conducting basic research and performing such staff functions as special analyses, outlook and situation work, and providing current economic intelligence. Finally, no common research and information system with a strong data base existed through which researchers, analysts, and policymakers could interact.

Up to 1977, the Economic Research Service (ERS, now part of ESCS) had been establishing the roots of a strong, common research system and data base, but progress moved slowly because support was informal and vested in an ad hoc group of researchers, modelers, and computer specialists drawn together by common interests. Then, in 1977, a multitude of events in the agricultural sector intensified the demand for quick and comprehensive analysis. The existing system could not keep up with the flow of analysis and information required, and ERS Acting Administrator Kenneth Farrell formed the OASIS task force which began work in October 1977.

THE DEVELOPMENT OF OASIS

Formation of the Task Force

The makeup and operational license of the task force were somewhat unique. A number of ESCS staff members were selected, and were asked to work in a large room; they were charged (commanded) with analyzing and recommending a completely integrated, quick-turnaround information retrieval, analysis, and display system. They were relieved of their normal duties as much as possible so that they could attend the task force meetings. These were held in a different building from the members' office building to minimize distractions. The task force was established with no designated chairperson; no one was charged with maintaining order, or with keeping a cool head amidst the ensuing discussions.

Thus unconstrained, most of the members dredged up from the depths of their knowledge and/or biases, any points that they felt would have relevance to the task at hand. Members often emphasized their ideas by delivering them eyeball to eyeball at maximum volume: they uttered dire, prophetic warnings of bureaucratic retribution; hurled exquisite insults and heroic metaphors; used ways to attract attention or pose precise alternatives and ways to ease tension and cope with the objections of people who were not on the task force; and they knew when and where to adjourn at the end of a hard day. Despite the outward appearance of total chaos, it was a

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Special acknowledgment goes to Martin W. Schwartz for coordinating preparation of this and the following article.

strikingly successful exercise in group dynamics. The task force produced a set of problem statements and recommendations and presented them to Agency management in late 1977 and early 1978.

Recommendations of the Task Force

The task force recommended that a computer-based system be developed which was capable of the quick turnaround necessary to support the outlook and situation process. In brief, the recommended system would consist of a well-maintained data base of historical and forecasted data, the software to effectively analyze and report this data, and a staff within a workable organizational arrangement.

The recommendations of the task force were accepted by the management team, and the task force was instructed to develop (1) an information presentation subsystem for displaying text, tables, and graphs, and (2) an improved data base and data maintenance procedures.

The starting point for OASIS proved to be the decision to combine Speakeasy, a user-oriented, interactive computer language, and T-DAM (Time-series Data Access Method), the ESCS/Economics time-series data management system. High-priority data for OASIS reports are currently maintained in T-DAM. The OASIS operating system is Speakeasy with a few additional routines.

THE FORECASTING PROCESS IN ESCS

An expert is a person who avoids the small errors while sweeping on to the grand fallacy.
—Weinberg's Corollary

Staffs of the three divisions in ESCS make economic forecasts, and each staff stresses a different aspect of the agricultural economy. Commodity, country, and aggregate analysts in these divisions have central forecasting responsibility. While aided by a variety of econometric models, they rely primarily on their own judgment. Activities of this large, diversified group must be coordinated during the forecasting process. Also, the three divisions often use a common set of variables; each division's assumptions and resulting forecasts must be checked with each of the other's for consistency. When an inconsistency is found, assumptions must be revised and a new forecast constructed. Many iterations of the entire process may be required. Thus, successful coordination and speed of consistency checks greatly affect quality and timeliness of the final Agency-wide forecast.

Foreign Demand and Competition Division

Analysis of domestic agriculture in a world context is essential for the policymaker. To meet this need, Foreign Demand and Competition Division (FDCD) analysts consider primarily the world economy and its relationship with the U.S. agricultural sector. Staff members provide country-specific forecasts for world production, consumption, and imports of the major grains, vegetable oils, and meals. These forecasts can be aggregated according to standard regional definitions and, once combined with the domestic outlook, a world perspective is attained for each commodity. The impact of changes abroad on U.S. export sales and the overall U.S. agricultural trade balance is also analyzed. As a result, stress situations, both shortages and surpluses, can be anticipated earlier than otherwise.

Commodity Economics Division

Commodity Economics Division (CED) analysts work with commodity-by-commodity detail within the domestic agricultural economy. The staff provides forecasts of supply, domestic use, stocks, and prices for the principal crop and livestock commodities. They consider the interrelationships between the feed and livestock sectors, other cross-commodity relationships, and Government policy variables and programs.

National Economic Analysis Division

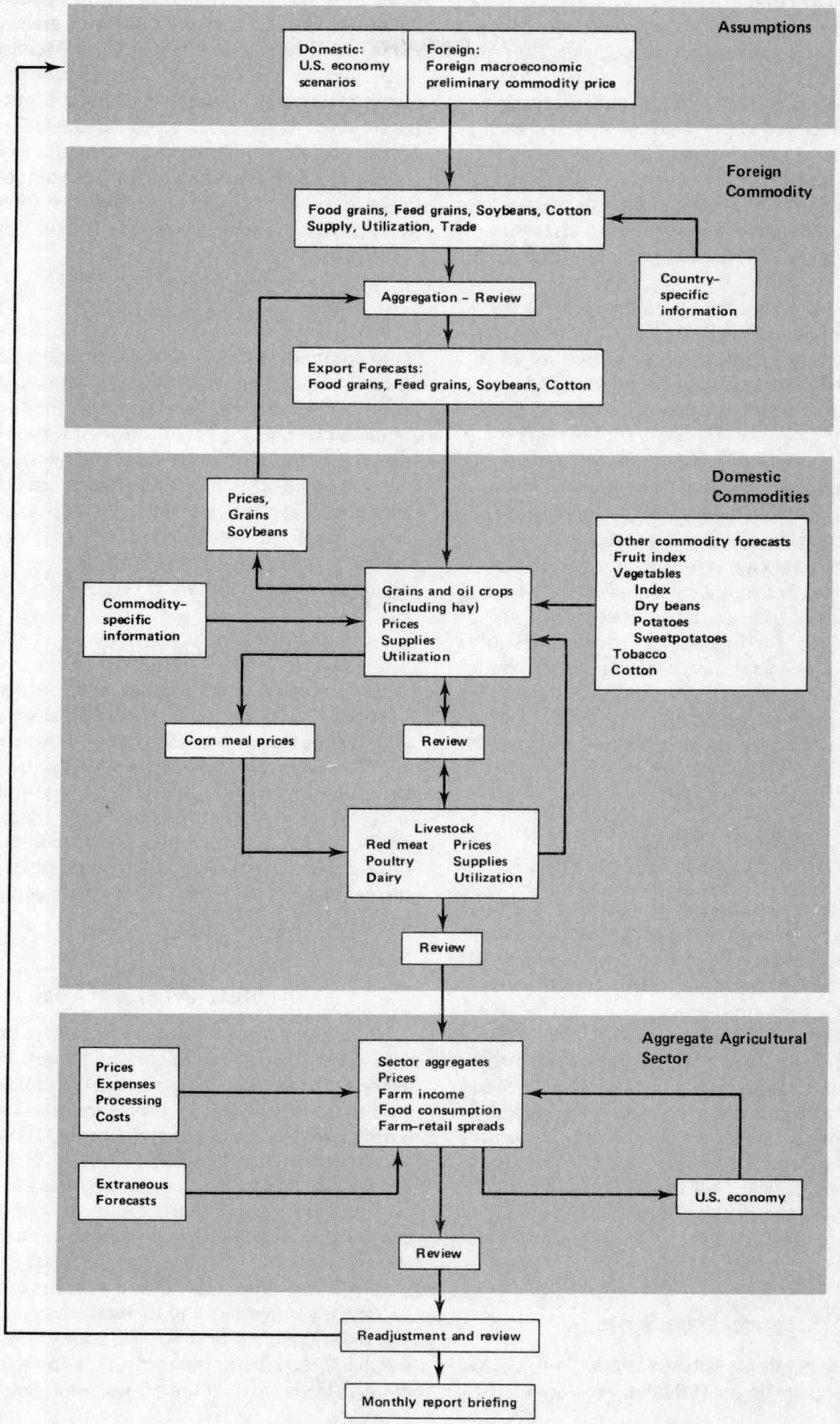
Measurements of the total or aggregate performance of the domestic agricultural economy provide a quick assessment of the health of the farm sector and also how other sectors, such as processors and consumers, are affected. The National Economics Analysis Division (NEAD) analyzes the relationship between the agricultural sector and the rest of the domestic economy. Farm income, farm prices received and paid, and the farm value of the market basket provide valuable information. Retail food prices, farm-to-retail market basket spreads, the marketing bill, and food consumption levels allow a quick appraisal of the agricultural situation from the farm to the consumer.

HOW THE PROCESS WORKS

The forecasting process begins with selected macroeconomic assumptions and preliminary commodity price forecasts (fig. 1). Next, FDCD country analysts forecast supply-utilization balances by country and commodity, and they aggregate these, according to standard regional defintions, to provide a preliminary world outlook for each commodity. Foreign commodity analysts and the FDCD outlook coordinator then review the results and reach a consensus on the U.S. export outlook.

Following these steps, key modelers and analysts from CED and FDCD meet together. FDCD analysts have the latest country-by-country information pertinent to the determination of U.S. exports, while CED analysts have data on the domestic side of the market.

FIGURE 1
Forecasting Process, ESCS, 1978



The two divisions' staffs establish a first-round equilibrium for each major domestic crop, and its relationship with the rest of the world.

As a second major part of the forecasting, CED staff members begin to analyze the livestock sector. Based on the grain and meal price forecasts, domestic supply and disposition information, and appropriate cross-commodity effects, CED and NEAD analysts reach a first-round equilibrium for the livestock and feed grain sectors. In a "round table" review, analysts check for compatibility between these sectors, and, if discrepancies exist, reconcile them. Forecasts are also prepared for the other commodities for which little simultaneous interaction occurs with the export-grains-livestock complex.

Forecasting the aggregate agricultural sector by NEAD analysts begins as the third phase. Items such as prices paid, farm production, expenses, and some retail prices are forecast. The results are combined and processed to yield indexes of prices received and paid, consumer price indexes and forecasts for the market basket statistics—farm value, retail costs, and farm-retail spreads. Supply and disposition, prices, exports, marketings, and loan activity are used to forecast cash receipts, from which farm income is forecast. The commodity and export data along with aggregate forecasts are used to forecast per capita consumption indexes and aggregate supply and utilization indexes.

The final phase of the forecasting process is devoted to reviewing the final forecasts, drafting reports and briefings, and integration of the process into the current dissemination vehicles—particularly, *Agricultural Outlook*, various outlook reports, and *Supply and Demand Estimates*.

AGENCY NEEDS IN INFORMATION MANAGEMENT

Economic intelligence useful for situation and outlook work must be current, accurate, and accessible. In addition, the information flow must be tailored to fit the organizational framework in which it exists and the requirements of information users.

The developers of T-DAM realized that program areas and other small ESCS units had to control read/write access to their data. Therefore, T-DAM data are divided into "logical groups". Because most of these program area data are more detailed than those needed for outlook and situation work, a central OASIS logical group was created to retain the data for this purpose. Little data duplication was involved. Similarly, OASIS logical groups were created to contain the analysts', model, and official forecasts.

Historical Data Series

Forecasting depends on historical data. Thus, OASIS contains many data series or variables, each with a particular function. As the OASIS task force was selecting and enhancing the operating and data base management systems, it was identifying and defining relevant data items in terms of output from the system. While the initial definition of system output contained approximately 600 data series, the task force found that other variables were necessary as it identified the required data manipulations. From the base of 600 output variables, the need for about 3,000 variables evolved.

The overall evaluation of the variables to be used in OASIS pointed immediately to three problem areas: selection of a basic file structure, the forecast and historical data series, and consistent data identification for the entire system.

Accessibility

Accessibility to data has several implications for information management. Foremost, information must be accessible for its multiple uses, which implies both that standard routines for data retrieval must exist, and also that derived data must be stored. Accessibility further implies easy identification. Therefore, standard naming conventions are mandatory. Accessibility also implies cost-efficient and timely access. Finally, data must be able to be manipulated, and the system must have the capability of storing derived results in the data bank.

Data Maintenance

Data must be current to be useful. Hence, means must exist to assure timely updating. Data must also be accurate; thus, verification procedures are necessary. In ESCS, commodity supply and utilization data are easily checked as each quarter and year must balance in the sense that supply equals use. Data are also verified easily if both annual and quarterly data are entered into the system independently; annual data are generally a sum or average of the quarterly numbers.

Data Types and Uses

A basic concept of T-DAM is that data be stored and retrieved in specific logical groups, frequencies, and time periods. For OASIS, the historical data (1960 to date) are maintained in logical groups named OSS. Because OASIS uses annual and quarterly data, T-DAM contains two historical logical groups for OASIS—OSSA for annual data and OSSQ for quarterly data.

The conceptual differences concerning annual and quarterly time frames create problems in the research areas. Commodity-oriented research staff most frequently view a year and its associated quarters in terms of a particular commodity and its marketing year. For example, the wheat year begins in June and ends in May of the next year. Thus, quarterly data for wheat are not defined in terms of standard calendar year quarters.

Analysts of the aggregate agricultural economy prefer data based on the standard calendar year because the quarterly and annual time periods correspond to those used to measure general economic movements.

USES OF OASIS

First and foremost, the purpose of OASIS is to provide information. After content, the most important aspect is the manner of presentation. OASIS contains an effective subsystem for displaying tabular, textual, and graphical information. Standard tables, graphs, and text can be intermixed with ad hoc displays in a multitude of formats to provide full-scale reports or briefs. Changes can be made at the last minute and a polished product will still be provided. Consequently, standard or highly tailored reports can be produced to support outlook and situation work as well as special analyses.

Forecasting

OASIS improves the overall ESCS forecasting procedure by providing better coordination and consistency checks.

Aggregation Routines

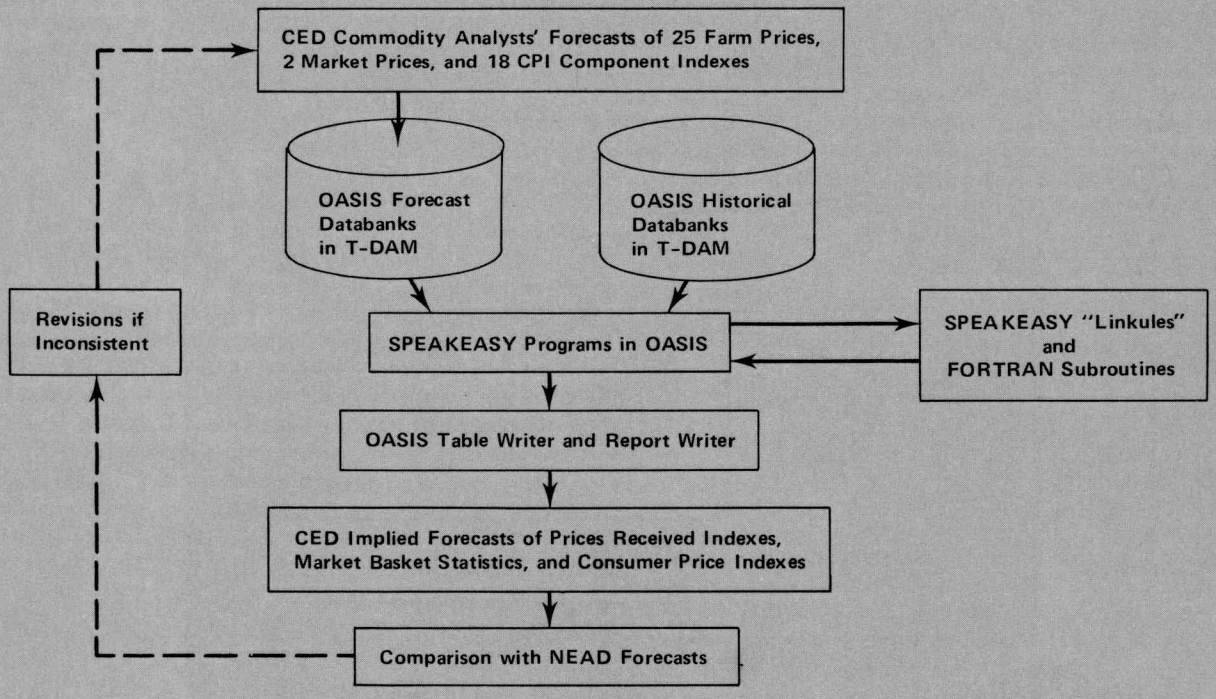
The outlook and situation process begins when FDCD analysts make trade forecasts. CED analysts make supply, utilization, and price forecasts for crop and livestock products. The price information is fed into OASIS, which constructs estimates for market basket items, farm prices received, and consumer price indexes. NEAD analysts use these forecasts (fig. 2).

The Farm Income Calculator

Information is also transferred from CED to NEAD to calculate the farm income. Besides CED forecast data, NEAD forecast data for some variables are also retrieved from the OASIS forecast databanks. The NEAD forecast data include marketing percentages and patterns, and Commodity Credit Corporation loan activity. This information is combined with CED price and production forecasts in the farm income calculator, which estimates both cash receipts from livestock and crop products and also overall farm income.

In this activity, the OASIS operating system coordinates the activities of more persons and, thus, more sources of data than in the aggregation routines, but the

FIGURE 2
Aggregation Routines



structure is essentially the same. In both cases, analysts are quickly provided the means for making consistency checks on data from different sources.

Impact Analysis

The entire forecasting process in ESCS requires approximately 15 days to complete. On occasion, however, a much faster turnaround time is necessary. Throughout any given month, there is a continuous flow of new information related to the agricultural economy, and it may become necessary to reevaluate the current forecasts. In addition, ESCS economists are often called upon to answer questions related to changes in Government policy. Here, again, OASIS is useful. It will become more useful after the models proposed for use in short-run impact analysis have been incorporated.

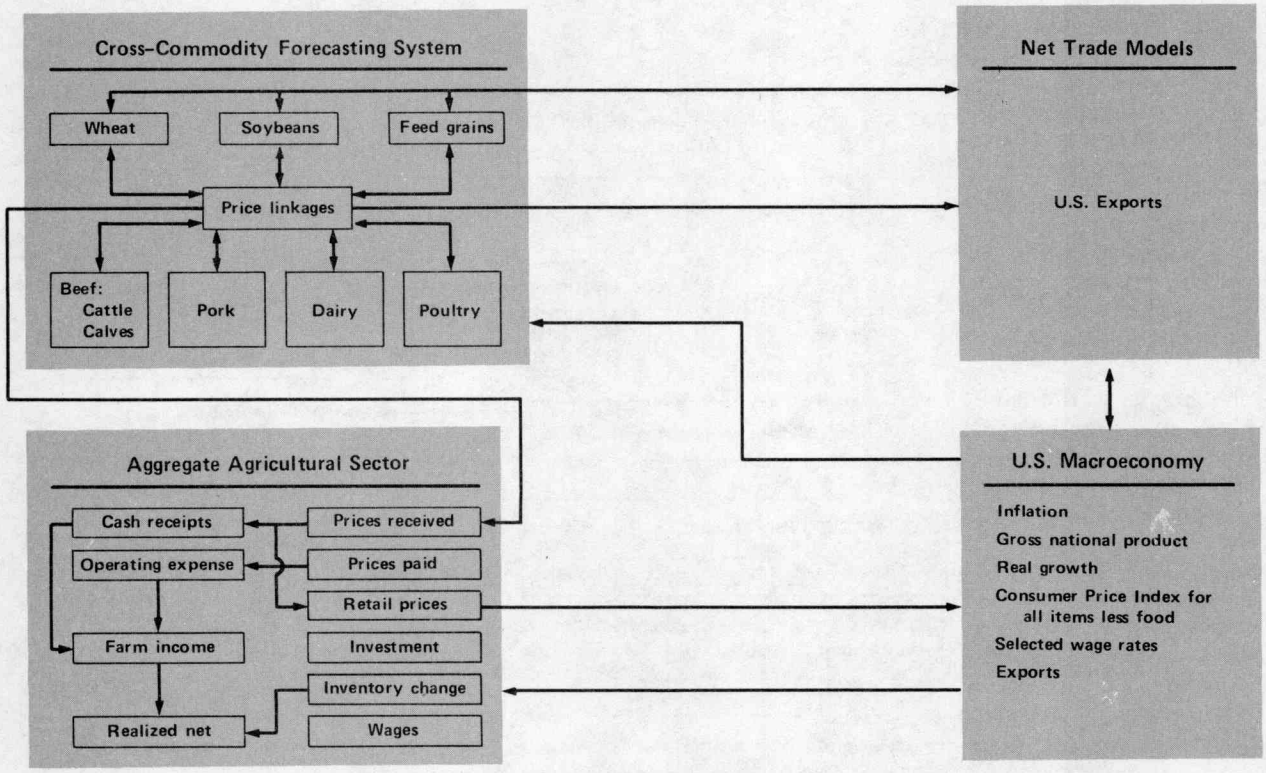
Although most changes in economic conditions or Government policies can be analysed through changes in a few key exogenous variables, the analysis will often cut across ESCS division lines. For example, analysts may be concerned with the impact on the consumer price index of a change emanating from a major international commodity market. Such a change might be the result of unforeseen shifts in economic conditions within that market or of new policy initiatives by a foreign government.

This type of impact analysis usually must be completed much faster than must the normal forecasts. To expedite this type of work, it has been recommended that a smaller group of ESCS staff be formed, to consist of the outlook and modeling coordinators and key policy and outlook analysts. Essentially, this group would respond to questions requiring quick turnaround and cutting across two or more divisions within ESCS.

Models

Such a staff would use three sets of short- to medium-term forecasting models currently housed in the divisions responsible for them. They pertain to world trade, domestic commodity markets, and U.S. aggregates. Figure 3 shows the required feedback mechanisms necessary to integrate these modeling systems. Some of the

FIGURE 3
Proposed Linkages Among Forecasting Models



integration problems have yet to be resolved. (See the April 1976 issue of this Journal for more information on these models.)

Additional work needs to be done to incorporate these models into OASIS and the models themselves need to be linked together. However, some of them are now available for use in forecasting and in impact analysis.

Use of Models

During the review process, the FDCD outlook coordinator and commodity analysts receive an alternative set of forecasts generated by the net trade models for wheat and coarse grains. These models take as exogenous the foreign production forecasts of the FDCD country analysts and the measures of macroeconomic activity abroad, and the models solve for a consistent set of trade forecasts. Because the models also generate price forecasts, there is an additional check on the accuracy of the preliminary commodity price assumptions. The models can therefore provide additional information useful for any iterative review process that occurs in or involves FDCD.

The process need not stop with FDCD, however. Suppose that a change in one of the net trade model's exogenous assumptions leads to a change in both the world demand for a commodity and also the U.S. exports of that commodity. One effect would be price changes in the cross commodity system and, eventually, a change in the consumer price index.

Once the models are integrated, the process can be carried further, and second-round effects can be analyzed. For example, a change in the consumer price index will affect the macroeconomy and, in turn, U.S. agriculture and trade. These second-round effects would thus work their way back through the entire model system. Once an equilibrium is attained, the total impact of the exogenous change could be assessed.

CONCLUSIONS

The first 90 percent of the task takes 90 percent of the time, and the last 10 percent takes the other 90 percent.[1]
—The 90-90 Rule of Project Schedules

This description of the need for and development of OASIS and of the ESCS forecasting system demonstrates both OASIS' usefulness now and greater usefulness later as new capabilities such as the ESCS forecasting models are incorporated into OASIS. It provides the nonexpert user with comprehensive up-to-date, reliable information. Data can be readily retrieved, for use in calculations, equation estimation, and model simulation.

The software design allows inexperienced users to produce readable tables, graphs, and text output in standard formats. The system tolerates errors in the sense that mistakes rarely destroy previous work. Because it will provide instructions when queried, OASIS acts partly as a teaching machine to its users.

The flow of information between the analysts and modelers and among the three ESCS divisions occurs through OASIS data banks. The banks function as an assembly line, storing the partially assembled reports between the various operations.

Currently, the small OASIS staff has two functions: maintenance of the data banks and development of computer systems. Only the first phase has been completed.

OASIS includes not only the data on major domestic commodities, foreign production, U.S. and foreign trade, and aggregate agricultural indicators, but also means of assessing and weighing the interactions between the U.S. and foreign agricultural sectors, between the various agricultural commodities, and between the agricultural and nonagricultural sectors of the domestic economy.

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[1] Totals may not add due to rounding.

Note: For references, see end of next article.

In Earlier Issues

"Among those who work in the fields of social psychology and applied psychology, the research on attitudes conducted by the Bureau of Agricultural Economics is well known. This research falls into three periods. . . . The three periods reflect the nature of the basic problems of their times—depression, war, and now the threat of agricultural surpluses . . . One of the major features of the present program of analysis of consumer preferences is its direction toward classes of products rather than toward specific brands . . . The outstanding findings have been those showing the importance of quality (instead of) price considerations."

James A. Bayton
Vol. 2, No. 4, Oct. 1950
pp. 105 & 111
