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**Agricultural Trade Policy Issues in the Eighties, Current Research  
and Long-Term Forecasting**

Glenn, M. and C. Hanrahan, eds.

Proceedings of a Meeting of the  
International Agricultural Trade Research Consortium  
June, 1983, Ottawa, Ontario, Canada



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#### ABSTRACT

Domestic agricultural policy and trade policy are closely linked. Thus, research, including long-term forecasting activities, must take into account the domestic as well as international implications of trade policy issues. The seventh meeting of the Consortium on Trade Research on June 23-24, 1983, in Ottawa, Ontario, Canada, focused on the problems facing international agricultural trade in the eighties; current research efforts at the U.S. Department of Agriculture, Agriculture Canada, and the Organisation for Economic Co-operation and Development (OECD) Secretariat; and the status, problems, and applications of long-term forecasting models.

Keywords: Trade policy, trade modeling, long-term forecasting, monetary policy, exchange rates.

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\* Agriculture. \*  
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## PREFACE

This report summarizes the papers and discussions at the seventh Consortium on Trade Research held in Ottawa, Ontario, Canada, June 23-24, 1983. The meeting was organized by Marcia Glenn of the International Trade Policy Division of Agriculture Canada. T. Kelley White, Economic Research Service (ERS), Alex F. McCalla, University of California-Davis, and Charles E. Hanrahan, ERS, also contributed suggestions for the program.

The Consortium focused on policy issues in the eighties from an American, Canadian, and Organisation for Economic Co-operation and Development (OECD) perspective. Current research in the ERS, Agriculture Canada, and OECD on the emerging policy issues was discussed. One set of papers examined some of the recent and ongoing efforts at making long-term forecasts. Special attention was accorded the monetary aspects of international trade.

Copies of the papers as presented or in their final published form are available from the authors on request. The appendix lists Trade Consortium contributors and participants.

Marcia Glenn and Charles E. Hanrahan coordinated the preparation of this summary report. Summaries of the papers and the discussants' comments were developed from materials submitted by the contributors to the Consortium.

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## HIGHLIGHTS

Agricultural trade policy measures are a direct result of domestic agricultural policies. High domestic support prices can lead to the imposition of tariff or nontariff barriers to protect domestic producers and to export subsidies when surpluses accumulate. However, the extent and level of support or protection--not the particular policy instrument used--are the important considerations in trade policy. Trade policymakers in Canada, the United States, and elsewhere are aware that the linkage between domestic and trade policy is a source of trade problems. The solutions to trade policy problems, however, are more elusive.

The Organisation for Economic Co-operation and Development (OECD) has identified a number of trade policy issues for the eighties. These include persistent supply/demand imbalances for some commodities, market and price instability, investment choices between agriculture and the wider food and fiber economy, and technical efficiency enhancement in agriculture while preserving the environment.

Dairy policy provides a prime example of both the link between domestic policy goals and trade measures and of the supply/demand imbalances noted by the OECD. Generous domestic support programs and increasing yields have resulted in continually increasing dairy output and considerable protection for dairy producers in the OECD countries.

Current research in the Economic Research Service (ERS) focuses on: (1) trade policies that are used either to protect a country's domestic agriculture or to stimulate exports of agricultural commodities, (2) domestic agricultural policies that influence agricultural trade, (3) the relationships between agricultural development in the developing countries and their ability to participate in commercial trade, and (4) the effects of bilateral and multilateral trade arrangements on world agricultural markets. Two areas of major future emphasis are the linkages between macroeconomic conditions and monetary policies on the performance of agriculture and agricultural trade, and the effects of the broad array of policies and institutional arrangements that cause world markets to deviate from the assumptions about purely competitive markets.

The OECD has a major study underway on agricultural trade which encompasses three parts: (1) an analysis of approaches and methods to achieve a balanced and gradual reduction of protection for agriculture; (2) an examination of the impact of national policies and measures on agricultural trade; and (3) an analysis of the most appropriate methods for improving the functioning of the world agricultural market. The OECD Secretariat expects to conclude the study in the latter part of 1985.

Agriculture Canada in its research program is grappling with the same, or similar policy issues, as are ERS and OECD. A Consortium paper presented by staff of Agriculture Canada reviewed modeling efforts as applied to international and domestic commodity markets. The paper notes that documentation is time consuming but is essential if models are to be used in the future. In analyzing policy issues, the economic analyses may be only a fraction of the input required before the ultimate policy is developed and implemented and its impacts monitored.



The Consortium devoted some attention to long-term forecasting and identified a number of suggestions for improving future quantitative long-term projections or assessments. These included improving the dynamic properties of projection models and incorporating policy variables more fully and realistically into models.

ERS is preparing an assessment of the World Food Situation. The study will describe and analyze food and agricultural trends for 1960-82 and make projections to the year 2000 of supply, demand, and trade of six commodity groups (18 products) in a world divided into 24 separate countries or regions. The centerpiece of the ERS assessment of the World Food Situation will be a set of long-term projections made using the Grains-Oilseeds-Livestock (GOL) model. The GOL model is an annual simulation model designed for policy analysis and medium- to long-term projections. The model consists of country or regional models linked by a world market-clearing mechanism.

One Consortium paper addressed the issue of the effects of exchange rates on agricultural markets. The paper and discussion highlighted two points. First, exchange rate adjustments, at least initially, change the ratio of prices of traded goods to prices of domestically produced goods and do not simply alter domestic prices in proportion to that change. Second, the different possible ways that monetary policy interacts with different exchange-rate regimes are crucial to the determination of the effect of exchange rate changes on prices.

# Consortium on Trade Research

## Agricultural Trade Policy Issues in the Eighties, Current Research, and Long-term Forecasting

### AGRICULTURAL TRADE POLICY ISSUES IN THE EIGHTIES

#### Current Trade Policy Issues: The Canadian Approach

by Michael Gifford

Traditionally, the problems of agricultural trade have been viewed in the context of restricted access to markets, that is, reliance on nontariff barriers such as variable levies and quotas. Although the lack of secure and predictable access remains an important issue, the growing problems caused by export subsidization, particularly in the form of direct export subsidies or subsidized export credit, are increasingly dominating the agricultural trade policy agenda. What is often ignored, however, is the fact that the adverse trade effects resulting from direct export assistance can be duplicated by so-called "domestic subsidies."

Agricultural trade measures, whether they be import or export oriented, are a direct function of domestic agricultural policies. If domestic support prices are high relative to world prices, nontariff import measures are required to protect the domestic market, and exports must be subsidized. What is critical is not so much the technique of support or protection but the extent and level of support.

Policymakers are well aware of the causal elements of agricultural trade problems. The difficulty is to find solutions which are politically acceptable, recognizing that farm programs are extremely difficult to change once they become entwined with the political fabric of a country.

To understand agricultural trade issues, one has to understand domestic politics. The agricultural policymakers in Washington and Ottawa are subject to the same problems and pressures as their colleagues in Brussels or Tokyo or Canberra. There is no black or white, only various shades of grey.

## Issues and Challenges for OECD Agriculture in the Eighties

by Philip Stone for the OECD Secretariat

The Organisation for Economic Co-operation and Development (OECD) published a report with this title in 1984.<sup>1/</sup> It reviews developments in the agricultural sector of OECD member countries, as well as significant agricultural developments worldwide, in order to provide a longer term historical perspective for the present economic and social situations of the agricultural sectors of member countries. Drawing upon studies which project the future state of the food and agriculture sectors in member countries, the report synthesizes the major policy issues facing OECD member governments through the eighties.

The report examines structural, commodity, price, and income issues and their trade implications. The analysis in the report and the conclusions drawn were formulated in the context of the principles of positive adjustment endorsed by the OECD.

Many of the agro-food sector policy issues familiar to policymakers in the seventies will persist throughout the eighties. But, there are several issues which will require initiatives to ensure longer term economic viability. These include resolving persistent supply/demand imbalances for some commodities, ensuring market and price stability, ensuring a framework conducive to investment in both agriculture and the food (processing) sector, and, finally, enhancing the sector's longer term technical efficiency, while preserving the environmental base. A return to more dynamic economic growth in the OECD area would have some positive impact upon the demand for food. Economic prospects suggest, however, that through the mideighties internally derived growth in demand for food products will only remain moderate in the OECD area, while externally derived demand for certain agricultural commodities is expected to grow through 1990. This latter situation underlines the crucial importance of trade for the OECD agricultural sector.

It is imperative that policies directed towards the agro-food sector do not move out of line with the emerging patterns of domestic demand nor, at the international level, ignore or limit the gains to be derived from trade expansion. The short-term gains to sectors benefitting from protection are frequently more persuasive than the less apparent easily identifiable long-term gains from freer trade. The wider integration of agriculture into domestic OECD economies and the interdependence among OECD economies point to the appropriateness of the wider concept of agro-food policy and greater cooperation in agricultural trade policy.

During the next decade, the report suggests that the following areas are expected to command the most attention from policymakers:

- (1) Many OECD countries include pockets of low income farm households, some of which show a regional concentration. The existence of such pockets of poverty requires a much more selective approach to farm incomes, with a case for viewing these households in the broader context of the problem of low incomes in the rest of the economy and, possibly, addressing the problem of low incomes selectively through the social security system.

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<sup>1/</sup> Organisation for Economic Co-operation and Development (OECD). Issues and Challenges for OECD Agriculture in the Eighties. Paris, OECD, 1984.

- (2) The increasing pressures on government budgets from competing claims due to social factors, including changing age structures, shifting social values, and possibly continued high levels of unemployment and poor economic growth, will require a more critical examination of agricultural policy priorities and concomitant levels of support.
- (3) The continuing integration of agriculture into the rest of the economy implies that policies, though directed toward the agricultural sector, can have a wider impact. The agricultural sector is more sensitive to broader, macroeconomic policies. Both of these factors reinforce the necessity of developing a more comprehensive agro-food policy.
- (4) The need to increase OECD agricultural production to meet higher worldwide food demands focuses attention on policies for, and the cost of, research and development to improve agricultural productivity; however, the more intensive use of natural resources to meet higher production targets draws attention to the dangers of environmental degradation. Policies will need to balance the promotion of increased output in the short term with the preservation of the natural resource base for future production.
- (5) A corollary concern, in view of the expected role of the OECD area as residual supplier in the context of world food demand, is the longer term economic environment for the agro-food sector, particularly with regard to investment. Policies will need to ensure a balance among different demands for capital investment in the economy and among different agricultural commodities. But the existence and potential for persistent surplus capacity for certain agricultural commodities in the longer term, in part due to the policy framework, may well lead to suboptimal resource and investment decisions and lowered general economic well-being. To ensure that the investment climate in the longer term is conducive to investment in the farm and related food sectors, adjustments in existing policies may be necessary.
- (6) There will need to be increasing awareness of the effects of domestic policies on international markets and, thus, on other countries. These effects involve both the shorter term stability of markets and the longer term direction of the location of production.

#### The International Dairy Market and Canada's Approach to Its Problems

by Richard Tudor Price

World trade in dairy products now amounts to approximately 3.8 million tons, annually, having started from small beginnings in the late 19th or early 20th century, based initially on imports of cheese and butter by the United Kingdom (U.K.).

Under the Ottawa Agreements of 1932, continued duty-free access to the U.K. for Commonwealth supplies allowed expansion of New Zealand exports to the U.K., which continued until the U.K. entered the European Community (EC) in 1973.

In the last 30 years, international dairy trade has become subject to many limitations, particularly of trade among developed countries. The formation of the Common Market at 6 countries, its expansion to 10, the limitation by Section 22 quotas of U.S. imports of most dairy products, and Canadian cheese import quotas are examples of this trend toward protectionism for heavily supported dairy industries in many developed countries. As a consequence, dairy trade between developed countries is now largely limited to historical volumes.

Imports of dairy products by developing countries have, however, continued to grow, and recombining industries have been developed in some developing countries. Canada is roughly self-sufficient in butterfat, with about 100,000 tons per annum of exportable skimmed-milk powder. Open-ended and generous support programs and increasing yields have resulted in continuing increases in EC output and, since 1980, in U.S. output. This has led to a serious imbalance in the world dairy market despite increased sales to Eastern Europe and oil-rich countries; this imbalance may persist for much of this decade.

Canada's response has been to reduce and to make more predictable its exposure to world dairy markets and to export more to markets that are specialized and less subject to the surplus disposal activities of competitors. Butterfat exchange has been used to achieve this; future Canadian involvement in dairy exports may be increasingly oriented towards such specialized or protected markets.

## Discussion

by Ralph Lattimore

The three preceding papers in this section offer a refreshing "negotiator's" viewpoint of agricultural trade policy issues for the eighties. Two comments are in order. First, research in the area of agricultural trade policy issues has been biased towards the impact of unilateral trade adjustments. The number of multilateral adjustment studies can be numbered on one hand. In adopting this stance we have compounded the "black and white" view of the world referred to by Gifford. This approach has distracted the attention of researchers away from work which would focus on multilateral tradeoffs and national tradeoffs between sectors.

Researchers are well acquainted with the point made in these papers that indices of protection are the important concepts to focus on rather than the specific instruments used, and perhaps there is a move in this direction in negotiating fora like the General Agreement on Tariffs and Trade (GATT). However, I wonder if much of our work loses some of its impact in the public domain because the policy instruments are general indicators rather than specific, identifiable levers used by governments. In this regard, the differences in specification between domestic models on the one hand and trade models on the other in the United States are quite striking.

The second comment also concerns balance. The "black and white" syndrome has led us to devote much more effort to the analysis of trade policy adjustments in food-importing countries with (I would guess) over 90 percent of the effort concentrated on the EC. Japan has also received notable attention, as will the Soviet Union in the future, as soon as we have a good estimate of the

overvaluation of the ruble. On balance, however, very little attention has been focused on export subsidies in agricultural exporting countries. As a result, we are not as well prepared as we might be to piece together global-adjustment scenarios, and that is precisely what the OECD and the GATT are currently requesting.

## CURRENT RESEARCH: USDA, AGRICULTURE CANADA, AND THE OECD

### Current Research Program in ERS

by T. Kelley White

Research focusing on international agricultural trade in ERS is largely conducted within the International Economics Division (IED). To place the Division's research program in perspective, I will briefly present the mission of IED and then a summary of the resources available within the Division and recent trends in resource availability. This is followed by a discussion of organization, the program planning process used to allocate resources, a comment on the nature of the current research program, and a few comments on future directions in IED's research program.

The mission of IED has three components:

1. Analysis of current international agricultural and economic conditions and forecasts of future trends;
2. Special analyses of current issues of importance in agricultural and trade policy formation;
3. Indepth economic research to identify and quantify relationships between U.S. and foreign agricultural systems and their behavior.

The Division accomplishes its mission with a staff of approximately 190 "full-time equivalents" and an annual budget of approximately \$7 million. Personnel ceiling levels have declined from 193 in fiscal year 1981 to 186 in fiscal year 1983. During the same period, appropriated funds have increased slowly in nominal terms but have declined in real terms. In order to maintain program level, the Division has become increasingly dependent upon outside funding through reimbursable agreements, primarily with the U.S. Agency for International Development. While reimbursables have become more important, they still represented less than 10 percent of appropriated funds in fiscal year 1983. Just under 75 percent of the total staff are professionals, primarily economists and agricultural economists, with the remaining 25 percent being support staff. Of the professional staff, just under 33 percent possess Ph.D. degrees with almost all of the remaining staff having at least a master's degree. Forty to forty-five percent of the Division's resources are allocated to current situation-and-outlook work, 45 to 50 percent to longer term research activities, and the remaining 10 to 15 percent to staff analysis.

Program development and resource allocation are accomplished through a continuing process which links program planning and budget development in an annual cycle which looks forward two fiscal years. In the Division, the program planning process involves input from all levels of management as well as individual researchers. The process is both bottom-up and top-down. The objectives of the planning process are to maintain a relevant program, to achieve integration among functions, to ensure that limited resources are allocated to highest priority problem areas, and to bring together diverse components of the program.

The resources and program are managed through a structure organized into nine branches. Six of these branches have multiple country and regional responsibilities across the three functional areas of the Division's mission.

The remaining three branches are global in their responsibility and focus on problem or subject-matter concerns.

The research programs of the six regional branches tend to focus on supply, demand, trade, and policy issues of individual countries or groupings of countries within the particular region of responsibility. Research activities among the six branches may, at any particular time, be very different depending upon conditions existing in different regions of the world and their perceived importance to U.S. agriculture through trade.

The global analysis branches focus research efforts on broader issues and problems which tend to cut across countries and regions, such as trade policies used to protect either a country's domestic agriculture or to stimulate exports of agricultural commodities, domestic agricultural policies that influence agricultural trade, relationships in agricultural development in the poor countries of the world and their ability to enter into commercial agricultural trade, and effects of bilateral and multilateral trading agreements on world agricultural markets.

Two major areas have been selected for additional emphasis in the Division's research program during the next few years. Research has been initiated to provide a better understanding of the linkages between general economic conditions and macroeconomic policy and of the performance of agriculture and agricultural trade. A greater effort will be made to evaluate the broad array of policies and institutional arrangements which cause world markets to deviate from the assumptions about purely competitive markets and to better understand the impact of these deviations on market performance.

#### The OECD Agricultural Trade Mandate

by Philip Stone for the OECD Secretariat

At its meeting of May 10-11, 1982, the Ministerial Council of the OECD endorsed the conclusions of the Study on Problems of Agricultural Trade and invited the Committees for Agriculture and for Trade to undertake jointly a number of actions for the purpose of contributing "to progress in strengthening cooperation on agricultural trade issues and to the development of practical multilateral and other solutions."2/

More specifically, the Council requested that these Committees undertake a three-part study:

- (1) An analysis of the approaches and methods for a balanced and gradual reduction of protection for agriculture, and the fuller integration of agriculture within the open multilateral trading system, while taking into account the specific characteristics and role of agriculture; this analysis would involve consideration of the likely effects of the adjustments which alternative approaches would entail and how best the various objectives of agricultural policies could be achieved in ways compatible with an orderly and improved development of agricultural trade;

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2/ Organisation for Economic Co-operation and Development. Problems of Agricultural Trade. Paris, OECD, 1983.



- (2) An examination of relevant national policies and measures that have a significant impact on agricultural trade with the aim of assisting policymakers in the preparation and implementation of agricultural policies; and
- (3) An analysis of the most appropriate methods for improving the functioning of the world agricultural market. Such a consideration might take as a starting point the experience of various arrangements, either bilateral or multilateral, and seek to determine the best possible approaches for the future.

The Secretariat has since undertaken these analyses, termed collectively the "trade mandate," and expects to complete its study in the latter part of 1985. Part I of the mandate is being implemented on a multicommodity/multicountry basis. The methodology applied is based on an approach developed by Josling for the United Nations Food and Agriculture Organization. The basic concept of producer/consumer subsidy equivalents is, however, modified for use in a static partial-equilibrium framework and in estimating the production, consumption, and trade effects of countries' domestic and trade policies.

Part II of the mandate will comprise the documentation and examination of domestic and trade policies of selected OECD countries. Part III analyzes the function of global commodity markets. The commodities for this and all parts of the study are cereals, dairy products, meats, sugar, and feedstuffs.

#### Canadian Modeling of Commodity Markets in Agriculture Canada

by H. B. Huff and G. C. Robertson

This review describes the various modeling efforts undertaken by the Marketing and Economics Branch of Agriculture Canada; attempts to assess the impact of modeling on policy evaluations, marketing intelligence, and economic research within Agriculture Canada; discusses some of the problems of modeling in a government environment; and attempts to describe what may be ahead for Canadian modeling efforts.

The paper describes four distinct time periods of economic model development in Agriculture Canada and in each period tries to assess the impact of the modeling effort. Some effects are indirect and very difficult to measure. These include staff training and development of a database.

Models may require considerable lead time for development even if a team is involved. Many of the models developed are not currently used. They were not set aside for future use but rather have been permitted to wither away from lack of use. Proper documentation is time-consuming, but it is essential to permit future use of the model. Also, in the case of policy evaluation, the economic analyses may be only a fraction of the total input required before the ultimate policy is developed, implemented, and its impact monitored.

In the future, the Food and Agricultural Regional Model (FARM) and its associated database, FARMBANK, are to be expanded and made available to commodity specialists both within and outside the Canadian Government.

The benefits to Agriculture Canada of having constructed FARM are very difficult to measure but are very real. This makes it very difficult for administrators to make good decisions on resource allocation and staff organization in modeling efforts.

## LONG-TERM FORECASTING

### Long-Term Forecasting: An Assessment of the State of the Art

by Kenneth R. Farrell

The 1981 Food and Agriculture Act requires the Secretary of Agriculture to submit to the Congress in early 1984 an assessment of long-term (the year 2000 and beyond) agricultural research and education needs in the United States.

As part of that assessment, Resources for the Future (RFF) is developing projections of global demand for food, fiber, and forest products and the potential productive capabilities of the United States to respond to such demand in 2000 and, more generally, to 2020. As part of the project, we have reviewed the methods and results of 16 major long-term projection reports published in the period 1967-83. The following suggestions are offered as means of improving the quality of future long-term projections and quantitative assessments.

#### (1) Methodological Improvements:

- o Improve the dynamic properties of models. Most past models have been comparative static models which provide projected values at one or two points but reveal little about the path of expansion from the base into the future.
- o Strengthen and incorporate more fully market-equilibrating mechanisms and linkages among principal variables. Empirical knowledge of relationships between agricultural production technology and environmental variables is primitive; parameters of longrun supply functions for agricultural cropland are highly uncertain; linkages among macroeconomic variables and agricultural investment and production variables are known only crudely.
- o Incorporate policy variables more fully and realistically into the models and develop more "policy user-friendly models." To do so will require modelers who understand policy and policymakers who understand the usefulness and limitation of models.
- o Explicate and improve nonmethodological assumptions in the models. One reason for widely divergent projections and forecasts is the variation among analysts' assumptions concerning key exogenous variables and "how the world works." So far as possible, analysts should identify and convert their normative and implicit assumptions to positive, explicit assumptions if for no other reason than to permit objective assessment and critiques of their results.

#### (2) Improving the Institutional Setting:

The Office of Technology Assessment (OTA) in its 1982 report, Global Models, World Futures, and Public Policy, offers several useful recommendations: 3/

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3/ Congress of the United States. Global Models, World Futures and Public Policy: A Critique. Office of Technology Assessment, 1982.

- o Coordinate the government's current modeling capabilities and activities (develop consistent procedures and protocols for data collection and model documentation and validation; establish a clearinghouse to provide information on location of models and data bases; and link selected existing models).
- o Link government's forecasting capabilities with its policymaking and management activities (create a governmentwide coordinating office; issue periodic reports on government activities; and encourage long-range global assessments). ERS has begun development of detailed models of the United States that are consistent with the International Institute for Applied Systems Analysis (IIASA) framework. That effort should be expanded in ERS and linked to talent in other institutions, particularly the land-grant universities.

### The World Food Situation: Progress Report on an ERS Study

by Charles E. Hanrahan

ERS is preparing an assessment of the world food situation. The study will describe and analyze food and agricultural trends over the period 1960-82 and make projections to the year 2000. The analysis of trends and prospects in IED will be a major input into the research of both the National Economics Division (NED) and the Natural Resource Economics Division (NRED). The analysis focuses on the likely future pressures from foreign demand and other sources on U.S. agricultural resource use and productive capacity.

The country and commodity coverage of the study are broad. Past trends are being analyzed and projections to the year 2000 for supply, demand, and trade are being made for six commodity groups (18 products): grains, oilseeds, livestock, pulses and roots and tubers, sugar, and cotton. The world is being divided into 24 separate countries or regions.

	<u>Country</u>	<u>Region</u>
Developed	United States	EC-10
	Canada	Other Western Europe
	Japan	Oceania (Australia, New Zealand)
	South Africa	
Centrally Planned	USSR	Eastern Europe
	China	
Developing	Mexico	Central America and the Caribbean
	Brazil	
	Argentina	Other South America
	Egypt	Subsaharan Africa
	India	North Africa and Middle East
	Indonesia	
		Other South Asia
		Southeast Asia
		East Asia
		Other Asia

The data for the study are drawn primarily from the Production, Supply and Demand (PSD) system of the Foreign Agricultural Service (FAS). These data will be the basis for the projections. Data from the United Nations trade system will be used to develop matrices to describe trade for the six commodity categories and 24 countries and regions but will not be used to make projections.

The work on the study, underway since the beginning of 1983, is being carried out by three teams, supply, demand, and trade. The supply team has estimated supply equations using a number of functional forms for the six commodity groups (18 products) and the 24 country/regions. The results of these estimations will be used in the supply blocks of the GOL model (see paper presented by Vernon O. Roningen). In addition to the econometric work, the supply team is analyzing the sources of growth in agricultural output and examining both past trends and future prospects for resource use and technology. Resource use and technological developments will be assessed for major regions and countries and will enable us to assess the situation in such troubled spots as Subsaharan Africa and South Asia. The demand team has estimated demand equations for the 18 commodities and the 24 country/regions. The major variables considered are the conventional ones, population, income, prices, and policies. Results of these estimations will be used in the demand blocks of the GOL.

The trade work focuses on longrun trends, changes in patterns of trade, and commodity trade flows by using matrices developed from the UN trade system. We are assessing the economic factors which affected trade and its growth during the 1960-82 period, especially income growth, exchange rate changes, and other macroeconomic factors. We are also making a survey of domestic agricultural and commercial agricultural trade policies for the major exporting and importing countries as they pertain to the major commodities in international trade. We will assess the relationship between domestic agricultural policy and trade policy and examine important trade policy issues, such as agricultural protection, stockholding, stability, and less developing country trade. When the work in IED is completed, we will have at least two products. The first will be input into the previously mentioned NED/NRED assessment of factors affecting domestic agriculture. The second will be a comprehensive assessment of the world food situation which will identify and explain the forces and issues that will critically influence the future of U.S. agriculture in a changing world economic environment.

### The Revised Grains-Oilseeds-Livestock (GOL) Model

by Vernon O. Roningen

The GOL world agricultural model under revision is an annual simulation model designed for policy analysis and medium- to long-term projections. GOL consists of country and/or regional models linked together by a world market clearing mechanism. The country/region models can be versions of standard models or they can be other econometric/simulation models which are stable and conform minimally to GOL nomenclature and structure. The standard models can use coefficients that are estimated or borrowed from other studies. Computer

programs supporting the standard models help the user customize and "fit" them to particular agricultural economies. <sup>4/</sup>

The structures of the two types of standard models are relatively simple. A full-detail standard country model is designed to offer substitution among commodities in production and consumption. Commodity balances and price balances in the domestic currency are maintained. Domestic prices are then linked to foreign, or world, prices by separate linkage equations. The simple standard model offers fewer equations, a simpler commodity balance with far fewer cross-commodity links, and direct uses of world prices in the quantity equations. Functional forms in both standard models are generally of the constant elasticity type. Theoretical constraints on functions and coefficients are imposed if they make sense in a long-term model, help to avoid simulation problems, and facilitate the user's interpretation of results of model simulations.

A simple structure may have a cost in terms of overall "goodness of fit." However, given the approximate nature of much of the data and the parameters needed in a policy oriented model, it is not clear that the complexity involved in a model with a better fit is worth the effort. Acceptable policy analysis is done by comparing alternative solutions to a reasonable baseline. While the standard models were not designed for accurate short-term forecasting (1 to 3 years), the ease with which they can be re-initialized with the latest annual data makes such forecasting an operational possibility.

The GOL world agricultural model is designed for simulation in the Time-shared Reactive On-line Laboratory (TROLL) computer econometric and simulation package. Simulation requires a set of initial price and quantity data for each country/regional component and an appropriate set of coefficients. A set of computer programs of TROLL and other commands can be used to create, update, run, and generally manage standard GOL component models. The computer programs are structured to conform to the economic logic of the models. Component models are linked together into a world system.

The standard models in GOL contain 20 commodity groups which account for a major part of world agricultural trade and U.S. farm income. Equations are included in the detailed standard country model for food and feed demand, stocks, crop and livestock supplies, trade, and supply and demand prices. The detailed standard country model is designed to capture cross-commodity effects on both the supply and demand sides of the GOL complex. It allows both internal prices in a country's own currency and external trade prices to be connected to other countries' trade prices via exchange rates and transportation costs. The simple standard models, in contrast, have a minimal internal structure to allow cross-commodity substitution and rely on world commodity prices. Both types of standard models are organized by groups of similar types of equations. The models can be understood by reading the documented printout from TROLL and by examining matrices of elasticity coefficients for each equation group. Customizing standard models to a

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<sup>4/</sup> For details about the standard models, see: "The World Grain, Oilseeds, and Livestock (GOL) Model--Background and Standard Components," by Vernon Roningen and Karen Liu, ERS-IED Staff Report No. AGES830317, Washington, D.C., 1983. For information about the computer support system for the model, see: "Computer Programs to Support the World Grain, Oilseed, and Livestock (GOL) Model," by Vernon Roningen, Karen Liu, and Francis Garvey, ERS-IED Staff Report No. AGES830330, Washington, D.C., 1983.

particular country or region can be done by adding country/region data and coefficients and by changing equations and/or variables. The commodity coverage and the structure were chosen to be compatible with the ERS-FAS commodity supply and utilization database.

Decisions concerning the design of the GOL market-clearing mechanism and the standard models had to balance many conflicting criteria related to model building and operation, including simplicity, readability, computational accuracy, cross-country comparability of data, solvability in TROLL, data availability, computation cost, and ease of model and data manipulation.

Progress to date is quite good. Twenty-seven simple country/region models have been created, tested, and linked. The linkage system and operating system in TROLL have been tested successfully. Detailed country models have been partially or fully tested for the United States, Canada, Japan, and the EC. In creating the detailed country models, often the most difficult problem is obtaining internal price series. Many of the country/regional researchers in ERS have systematic data gathering programs underway to meet this need.

## Discussion

by Alex McCalla

The three papers address the general question of how one forecasts food and, therefore, agricultural needs into the future, say to 1990 or the year 2000. Yet each is quite different. The RFF study is an attempt to review some existing work and to synthesize (using judgment) a "best guess" scenario. It involves no original empirical work. The ERS World Food Study is a collection of task forces in USDA which will use, in part, the GOL. The third paper by Roningen discusses the new GOL model and is, therefore, the only approach generating model projections. Each paper is commented on, in turn, and I then close with some general comments.

The Farrell paper reports an important attempt at literature synthesis using best judgment. But the selection of which models to evaluate and the models themselves involves copious amounts of judgment as well. Which patterns of judgment one prefers will greatly influence the final outcome. Dr. Farrell identifies crucial needs for dynamic price-endogenous equilibrium models that incorporate policy variables. Yet none of the models he is receiving meet these criteria very well. The crucial question is whether judgment and realistic assumptions can overcome these weaknesses.

The USDA approach also involves synthesis and judgment by USDA experts. The GOL model will be used in some not clearly specified way. Is the GOL to provide the basic projections of the World Food Study, or is it but one approach to be considered in the synthesis? If it is the latter, how will differences between it and the judgment of task groups be reconciled? Finally, how will the efforts of the task groups be integrated? It is an ambitious effort.

The Roningen presentation represents a progress report on the reconstruction of the GOL model. As such there is not much concrete on which to comment. I have, however, several questions: How are people in the regional branches of IED plugged in: not at all, providing qualitative input, or building regional

models? How is the GOL linked to domestic policy models? For example, if finished, could it be used to analyze the impact of the payment-in-kind (PIK) program on world markets? Could it have been used to analyze U.S.-EC trade policy conflicts? I wish them well in putting the pieces together.

Comprehensive global problems and models are highly interesting. Yet, I believe there are different reasons one might turn to models and/or judgmental analysis. These include making long-term projections, doing intermediate-term policy analysis to look at the consequences beyond next year, and analyzing policy issues in the short term. The real question is whether one model can be reasonably expected to do all three. In the first case, perhaps one can safely ignore prices and stocks, for example, but one certainly cannot ignore them for the latter two needs. Second, how do these approaches look at policy linkages, as well as price linkages, among commodities. Third, how are quantitative policy interventions included. Clearly the adding of more richness to models in terms of commodities, countries, and policy variables is potentially desirable, but the possibilities are almost infinite. Therefore judgment must be made in this regard as well as many others. I close with this final, difficult question. How can valuable judgment be integrated into models while still allowing the models to be consistent and convergent?



## MONETARY ASPECTS OF AGRICULTURAL TRADE

### Capital Flows, the Exchange Rate, and Goods Markets in a Neoclassical Trade Model: Toward a Framework for Evaluating Monetary Aspects of Agricultural Trade

by David Orden

Debate about the importance of exchange-rate effects on agriculture has recently focused on constraints which arise from price and quantity elasticities that have been adjusted for exchange-rate changes. These constraints are overly restrictive but not only for reasons related to the number of goods in the model. In particular, the constraint on price response suggested by partial-equilibrium analysis simply does not apply to deflated prices in a general-equilibrium context nor to the purchasing-power-parity theory adjusted for exchange rates.

To prove this, a neoclassical trade model is developed which maintains a distinction between traded and nontraded goods. Money demand is explicitly introduced and several monetary regimes are described. Equilibrium conditions are derived and the welfare and price effects of a trade imbalance, which temporarily shifts disposable income from the surplus to the deficit country, are considered. Such transfers induce prices of nontraded goods to fall in the surplus country relative to traded goods and to rise in the deficit country. Flexible exchange rates may facilitate these price adjustments. Relative prices among traded goods may also respond to such an income transfer. The concept that emerges is that changes in prices of specific goods and changes in the exchange rate occur simultaneously in response to an underlying shift in income. Under some monetary regimes, income transfers and associated shifts in relative prices may be induced by monetary and exchange rate policies.

A partial-equilibrium analysis considers the effect of a change in the exchange rate on a particular market under the implicit assumption that other prices and income are constant. Such an analysis can only be justified in the context of a trade model under very special assumptions about supply and demand functions and the behavior of monetary authorities.

A given transfer of real income has a unique effect on both relative prices and on purchasing power parity, adjusted for real exchange rates, regardless of monetary regime. A real devaluation also induces a unique income transfer in real terms. This type of invariance does not apply to partial equilibrium models. Even in those special cases where the effects of changes in nominal exchange rates on nominal prices may be derived appropriately from a partial equilibrium analysis, the partial equilibrium results do not apply to changes in deflated prices and the real exchange rate. This is not surprising because constant real income, implicit when applying partial equilibrium analysis to price-deflated data, is equivalent in the trade model to no income transfer and no change in relative prices or in real exchange rates.

A simple illustration of the crucial distinction between interpretation of partial equilibrium results in nominal and real terms is based on Cobb-Douglas preferences and fixed supplies. A nominal devaluation induces a trade surplus and a shift in the relative prices of traded goods. Nominal changes in goods prices are correctly determined with a partial-equilibrium model, if it is assumed that monetary authorities stabilize nominal incomes. However, when

changes in price levels are considered, the partial-equilibrium analysis does not associate changes in deflated prices with the changes in the real exchange rate. If the deflated data generated by this example were observed, thoughtless application of partial equilibrium elasticities would lead to the incorrect conclusion that the devaluation explained only a small fraction of the observed price shifts. In fact, all of the observed price movement in the example is induced by the devaluation, which is the only change disturbing the initial equilibrium.

## Discussion

by Philip Abbott

Orden makes an important contribution to our understanding of the role played by exchange rates and by monetary policy in affecting price adjustments for agricultural commodities. He highlights two essential points. The first is that exchange rate adjustments, at least initially, alter the ratio of traded goods prices to home goods prices, and do not simply change domestic prices in proportion to that change, as normally assumed in our partial equilibrium models. This can be easily seen in models simpler than the one proposed by Orden. In the partial-equilibrium framework of supply and demand, the textbook treatment of an exchange rate change is simply to change the units of price in domestic currency and, so, to shift the international price (which is assumed fixed) to the newly determined level. In a two goods, general equilibrium model with no home goods, such as that of Jones, an exchange rate change leaves domestic relative prices unaltered. The missing element in that analysis is home goods whose prices will adjust relative to traded goods. Orden's proposal for econometric analysis and policy simulation is that we must work with general equilibrium models incorporating both prices of home goods and traded goods.

The second point is that monetary policy is crucial to the determination of the impact of exchange rate changes on prices. He demonstrates this by examining two polar cases, fixed and floating exchange rates, and finding very different impacts for these two cases.

Orden criticizes earlier treatments of exchange-rate adjustment in partial equilibrium and offers general equilibrium as an alternative. It is often an impractical alternative, as the demands on the modeler to construct a general equilibrium model often exceed the value of that approach. The earlier treatments of exchange-rate adjustment attempt to offer a way of treating that issue in the partial equilibrium framework. What is needed from Orden's model is an improvement on those proposals derived from this work.

Orden's treatment of monetary policy is also unsatisfactory in that although he recognizes the importance of capital movements in exchange-rate determination, he excludes variables (interest rates and the inflation rate) which are crucial to the determination of capital flows. His treatment of monetary policy is, therefore, also unsatisfactory. A more complete model is needed which relates these factors to capital flows and money demand.

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