Environment and Sustainable Agriculture

Sustainable Agriculture and Innovative Technologies, Ariel Dinar *(University of California and US Department of Agriculture)*

Agriculture is a significant contributor to contamination of soil and water, as well as to other environmental contamination. Some suggest that agricultural pollution can be reduced by lowering the level of inputs used when choosing agricultural practices. However, this may result in food shortages. This paper suggests a different approach by demonstrating the use of two technologies (mobilized orchards and aeroponics). These technologies, which achieve sustainability through a controlled growing environment, use super-intensive inputs, minimize agricultural pollution, dramatically increase yield and quality, and provide more flexibility in supply. However, these technologies are sophisticated and require massive capital investment. Included in this paper is a simple economic analysis that demonstrates the economic superiority of these technologies over conventional agricultural practices, despite the heavy capital investment.

Dynamic Systems and Limit Cycles for Modelling Sustainable Agriculture and Cooperation, L.P. Apedaile *(University of Alberta)*

Concern about sustainable agriculture stems from the growing realization that deficiencies in meeting the social, economic, and ecospheric purposes of agriculture may jeopardize its role in feeding future generations. The problem arises because of the complexity of the agricultural system, which is difficult to model using the strong causality principle so successfully applied to other disciplines. Almost 20 years ago, Samuelson addressed this issue with modifications to the Lotka Voltera "predator-pray" model. More recently, Mandelbrot's discovery of fractal geometry and independent work on the persistence and stability behaviour of nonlinear dynamic systems have generated new hope for modelling the holism of complex systems. This paper examines these developments in the context of sustainable agriculture and the role of cooperative processes. Sustainability emerges as a matter of seeking flexibility and solving problems at the boundaries of systems rather than seeking the correct trajectory or arriving at an equilibrium. The conclusions are that sustainable agriculture is a purpose-related concept, that the domain of attraction about an equilibrium is more important than the equilibrium itself, and that the bifurcation and adjoining of sets of trajectories of system variables at system boundaries is at the centre of development processes for sustainable agriculture and cooperation.

Analysis of Carrying Capacity for Sustainable Development, Amar S. Guleria *(Himachal Pradesh University)*

"Carrying capacity" indicates the number of persons and animals to be supported per unit of land under constant and dynamic technologies without causing degradation of resources/environment. An attempt is made in this paper to estimate the carrying capacity of selected watersheds in Himachal Pradesh (India). The limits of carrying capacity in the study area varied from 190 to 271 persons per sq km. At the same time, around 20 percent of the cattle population was found to be surplus in the study area. It is emphasized that the concept of carrying capacity is more relevant in ecological and environmental studies to ensure sustained economic development. Carrying capacity can be used to determine the boundaries of feasible sustainable development/resource use. Some of the other features of a resource base that are useful in this context are exhaustibility, potential depletability, multifunctionality, stability, private versus public ownership, and whether the resource base is a closed or open system.

Range Management and Rehabilitation through Stochastic Control and Markov Chains, K.M. Wang *(Western Australian Department of Agriculture)*

Rangeland ecology is in essence a dynamic system operating in a stochastic environment and involving very significant intertemporal effects. Combining stochastic control theory with Markov chains, this paper presents an integrated approach to range management and rehabilitation, which allows the optimal policy to be determined explicitly. Also, the concept of ecological sustainability and economic viability can be analysed quantitatively. The optimal grazing policy associated with water ponding treatment was found unable to rehabilitate all degraded range states. In those situations where there is still reasonable vegetation despite moderate degradation, rehabilitation through the optimal grazing policy is possible. In extreme situations where there has been severe depletion of the vegetation coupled with advanced soil erosion, reclamation is unlikely to succeed. Thus, a sustainable range management system should emphasize prevention of degradation through grazing manage-ment in the early stages. Optimal grazing strategies conserve young and old desirable perennial seedlings and exert increasing grazing pressure on the higher level of forage biomass and adult plant populations. Rotational grazing systems apply when range is not resilient to grazing. In the case of a resilient range, set stocking is the preferred strategy. Total destocking is optimal when range is severely defoliated or degraded.

World Pig Production: Tradeoffs for Sustainable Agriculture, Z. Chen, R. Lent, and R. Saint-Louis *(Université Laval)*

Pig production presents a special case in the analysis of sustainable agriculture. An attempt is made to interrelate pig production systems, pigmeat consumption, trade, and externalities. Various production techniques among major pigmeat-producing countries of the world can be classified into a finite number of categories according to certain aspects of production: the low versus high feed cost method, free pasture versus total confinement with various models of low-to-high-investment housing in between, specialized versus integrated systems, etc. Production can generate both positive and negative externalities. In general, however, large-scale production is associated with negative externalities, although not exclusively with industrialized countries. Trade patterns reveal a potential way of "exporting" negative externalities from one country to another. As traditional barriers to trade decrease, more obscure barriers, such as asymmetric environmental regulation across countries, will become crucial variables. The issues involved in pig production externalities and regulation may be conveniently summarized in a Coasian framework.

Implications of Constrained Factor Mobility for Sustainable Economic Development in China's Pastoral Areas, Greg Williamson *(University of Queensland)* and Ron McIver *(South Australia College of Advanced Education)*

A basic tenet of economics is that factors of production should be transferred to those areas where their marginal value product is highest. Any restrictions on such transfers limit the efficiency with which factors can be used and simultaneously increase the pressure on fixed factors such as land. For China, one of the consequences of this pressure has been the extensive degradation and desertification of large areas of its pastoral regions. This paper considers the impact of constrained factor mobility on the sustainable economic development of the pastoral regions of China and their prospects for future development given the above environmental complications.

Biotechnology Development in Sri Lanka: Some Socioeconomic Implications, H.M.G. Herath *(University of Peradeniya)*

Although the use of biotechnology is a recent phenomenon in Sri Lanka, the trends observed indicate that undesirable effects can be generated. It is seen that most biotechnology

work is concentrated in propagation techniques such as tissue culture. There are also ominous signs that the important food crops such as rice are being ignored. Present research appears to negate the benefits of donor-funded projects by simply facilitating the production of plant materials by wealthy entrepreneurs. The adoption of biotechnology products in Sri Lanka also appears contentious.

Use of Chemical Fertilizer for Taro at the Subsistence Farm Level in the Lowlands of Papua New Guinea, R.D. Ghodake and W.L. Akus *(Bubia Agricultural Research Centre)*

Taro (*Colocasia esculenta*) is grown as a semi-subsistence crop in Papua New Guinea, generally on newly cleared forest lands under the shifting cultivation method. The crop is very sensitive to soil fertility conditions. Recently, taro yield has started to decline in some localized areas due to increased intensity of cultivation and shorter fallows as a result of rising population pressure on land. Thus, there appears to be scope for the use of chemical fertilizers. However, inorganic fertilizers are rarely used on semi-subsistence farms for a bulky and staple crop like taro. This paper presents the results of statistical and economic analysis of the data obtained from two fertilizer experiments on taro conducted in a farmer's field in the lowlands of Papua New Guinea. The results, which consider technical response, marketing, farmer perceptions, field level losses, and risk factors, suggest high potential for the use of nitrogenous fertilizer for taro even under conditions of semi-subsistence. Phosphorus does not appear to be a limiting factor for taro production, while the effect of potassium on taro yield is not conclusive. These results further point to the need for more location-specific on-farm trials that involve wider levels and range of nutrients. Emphasis is implicitly placed on the need for the government to design and implement policies that will minimize risk and uncertainty related to the marketing of taro.

Sustainable Land Use and Development in a Changing South Africa, J.M. Erskine *(University of Natal)*

A focus on the consequences of future land reform in the less-developed areas of South Africa shows how remodelling land ownership and use may lead to both land degradation and a redistribution of resources to the disadvantage of the poor. The results of well-intentioned land reform and of equally well-meaning efforts to provide the infrastructure for greater economic development may thus be deleterious both for the land and for many of the people it supports. This conclusion concerning how the link between physical deterioration and socioeconomic differentiation operates in practice emphasizes the need for the evolution of new policies for managing the land simultaneously with the process of land reform; this will inevitably involve fundamental social changes, which in turn will require improved education and information distribution systems.

Economic and Environmental Trade-Offs in Tropical Agriculture: The Case of Highland Milk Production in Costa Rica, Katherine Griffith and Lydia Zepeda *(University of Wisconsin)*

Milk production is important economically and in terms of achieving nutritional goals in Costa Rica. However, cattle are responsible for much of Costa Rica's deforestation and erosion problems. Thus, a linear programming model is constructed to examine the environmental and economic trade-offs of milk production decisions in highland Costa Rica. Primary and secondary data are used to simulate three farm sizes. Seasonal and year-round production are examined, as well as land use regulation and introduction of lucerne as a forage crop to the region. The primary results indicate that credit and subsidies are the most useful tools to improve environmental sustainability and that research on high protein forages and labour-saving devices have the greatest potential for intensifying milk production.

Trade-Offs between Deforestation and Productivity Gains: Implications for Sustainability, Carlos Arnade *(US Department of Agriculture)* and Jorge Torres-Zorrilla *(Instituto Interamericano de Cooperación para la Agricultura)*

Previous research on agricultural sustainability focuses on externalities and social prices, leaving aside estimates of how long an agricultural economy can sustain current growth with existing technology. This study looks at trends in land use, productivity, population and economic growth and relates them to sustainability. The model defines a "food target equation" expressing that per-capita food demand equals per-capita supply, and an "environmental target equation" expressing that per-capita forest land cannot fall beyond a minimum. From these, agricultural land growth rate, deforestation rate, and period of sustainable growth are derived. Application to Brazil illustrates trade-offs between agricultural land expansion and productivity growth. Brazilian agricultural growth implies deforestation: per-capita forest land declined from 7 to 4 ha/person. Alternative simulations are summarized by per-capita forest land projections. At "best," low rates of population growth and high rates of economic growth and agricultural land increase violate the environmental target in 29 years. At "worst," high population growth rates and no economic growth or agricultural land increase violate the environmental target in 14 years. No scenario is sustainable, and, at best, Brazil has 29 years to reach 2 ha forest/person. Further research should consider relative prices, income growth, and non-neutral trade.

Sustainable Agricultural Planning in the Texas Southern High Plains, Eduardo Segarra *(Texas Tech University)* and John R. Abernathy and J. Wayne Keeling *(Texas Agricultural Experiment Station)*

Current sustainable agricultural planning efforts in the Texas Southern High Plains are reviewed and their economic and environmental significance addressed. In particular, stochastic dominance with respect to a function is used to rank irrigated and dryland cotton cropping systems. Results indicate that the cropping systems analysed seem to be a viable alternative to current cotton production practices in the area in terms of both their increased profitability and their environmental impacts.

Environmental Approaches to Farm Support Policy in the EC, T.N. Jenkins *(University College of Wales)*

The possibility of including environmental considerations in continued public support for EC farming is explored in this paper. Farming is an indispensable part of the management of the natural environment, and integrated agricultural and environmental policies are accordingly essential. The paper examines how policy might evolve if such integration is to find practical expression and, given the inefficiencies of the current farm support system, explores to what extent policy can support a farming industry acceptable in environmental terms without necessarily increasing the financial burden of support. It is shown that the integration of agricultural and environmental policy can potentially get the CAP off the hook of increasingly insupportable agricultural price support expenditure. A shift from product price support to environmental management payment to farmers is, at no extra financial cost to taxpayers, capable of simultaneously reducing agricultural output, maintaining farm incomes and farm populations, reducing food prices, and providing unequivocal environmental benefits such as reduced pollution, improved wildlife habitats and landscapes, and improved food quality.

A Global Analysis of Energy Prices and Agriculture, Steve Martinez, Brad McDonald, Miranda Otradovsky, and James V. Stout *(US Department of Agriculture)*

A multi-region computable general equilibrium model was used to assess the long-run impacts of higher energy prices on agricultural production, prices, and trade. An increase in

the price of energy enters farmers' cost functions both through direct energy use and through the indirect influence of energy prices on intermediate inputs, especially fertilizer. The multi-region feature of the model permits inclusion of the effects of energy price shocks on other regions' economies and assessment of price changes in a global context. Because farming is highly energy intensive, agricultural output falls more than output in the manufacturing and services sectors of each region of the model. Real returns to farmland, a good indicator of farm welfare, fall in each of the four regions. The US land price declines by 3.5 percent, a drop comparable to that resulting from a 20-percent multilateral agricultural policy liberalization in a similar model.

Improved Technologies for Latin America's New Economic Reality: Rice-Pasture Systems for the Acid Savannas, Luis R. Sanint and Libardo Rivas *(Centro Internacional de Agricultura Tropical)* and Carlos O. Seré *(IDRC)*

This paper looks at economic trends and policies over the last 30 years in Latin America that led to exploitation of the continent's tropical savannas and rainforests and the ensuing environmental degradation and deforestation. Current preoccupation with these issues has resulted in increased demand for technological solutions in the agricultural sector that rely less on area expansion than in the past and in enhanced productivity while contributing to a sustainable agricultural or land-use system. Crop and legume-based pasture systems and, in particular, the rice-pasture system developed at CIAT for Latin America's acid savannas, are an example of such a technology. Several agronomic and economic advantages of the system are presented.

Sustainable Agricultural Development: Zimbabwe's Smallholder Experience, *1980–90*, Felix M. Masanzu *(Agricultural Marketing Authority, Zimbabwe)* and Brian D'Silva *(US Department of Agriculture)*

Zimbabwe's smallholder strategy since independence in 1980 has enabled the country to achieve its major objectives of food security, wider income distribution, rural development opportunities, and diversification of crops grown. Since 1980, the government has, through a combination of infrastructural development, input delivery facilities, agricultural credit, and pricing policies, provided the necessary incentives for smallholders to increase both their participation and agricultural production. Smallholders now deliver over 50 percent of all maize to the Grain Marketing Board, over 50 percent of all cotton to the Cotton Marketing Board, and over 90 percent of all sunflower. This has enabled Zimbabwe to achieve a high level of food security and near self-sufficiency in oilseeds. The costs to the economy can be seen in increasing deficits of the marketing boards. An analysis of these deficits, however, shows that they could be reduced if synchronization of producer and consumer prices were undertaken, efficiency in operation of the marketing boards enhanced, and greater autonomy given to the marketing boards. Zimbabwe has currently embarked on a structural adjustment programme; the successful implementation of this programme would enhance the sustainability of Zimbabwe's smallholder strategy well into the 21st century.

Alternative Environmental Policies and Input Substitution in the Corn Belt: Single and Multi-Output Nonparametric Approaches, Dan Primont *(Southern Illinois University)* and Richard Nehring and Agapi Somwaru *(US Department of Agriculture)*

This study investigates the impact on input substitution and profitability of production in maize farming of various agricultural chemical regulatory policies. The research evaluates the economic impact of: (1) banning atrazines, (2) banning triazines, and (3) restricting nitrogen use to 135 lbs per acre. Data on maize production from USDA's Farm Costs and Returns Survey are used to estimate a nonparametric model of profit maximization. Frontier specification of the profit function provides a reasonable benchmark from which to compare

alternative policies. The results indicate that the triazine ban causes the greatest decrease in farm profitability.

The Easily Forgotten Half of China: Towards Sustainable Economic Development in the Pastoral Region, Zhang Cungen, Zhou Li, and Xu Ying *(Chinese Academy of Agricultural Sciences)*

The pastoral region of China accounts for 52 percent of the land area of the country. In many respects it is the most strategically important half of China. Yet it attracts little attention both within China and in a global context. There have been great changes in the pastoral region since 1949. As in the rest of China, the pace of change accelerated in the 1980s. While significant economic development has occurred, grassland-based animal husbandry remains the major industry. Major socio-cultural, economic, ecological, and institutional constraints exist that will further restrict sustainable development in this half of China. This paper identifies these constraints and provides some policy suggestions that could help to achieve further sustainable development in the pastoral region of China.

Risk-Reducing Input in US Agricultural Production, Richard Nehring *(US Department of Agriculture)* and Utpal Vasavada *(Université Laval)*

This study investigates the effect of using inputs on both the level and riskiness of agricultural production. Data on maize and wheat production from USDA's Farm Costs and Returns Survey are used to estimate production functions for these crops. The Just-Pope method is used to study how the use of pesticides, and of nitrogen fertilizer and pesticides, while increasing the level of production, also contributes to diminished riskiness of agricultural production. The impact of risk on input demand and implications for environmental policy are evaluated.

International Trade and Policy

Agricultural Trade and Regional Agreements, E. Wesley F. Peterson *(University of Nebraska)* and Fred Boadu *(Texas A&M University)*

The difficulties experienced in reaching agreement on rules for international agricultural trade have led some to suggest that the GATT multilateral approach is no longer appropriate. Regional economic organizations such as customs unions have been proposed as alternatives to the current system. In this paper, the implications for international agricultural trade of moving towards greater reliance on customs unions are analysed using the theory of clubs. This analysis highlights some of the problems with this alternative and suggests that it may not represent an improvement over the current system.

Integration of EFTA Countries with the EC: How Compatible is Agriculture?, Lars Brink *(Agriculture Canada)*

EFTA countries are exploring various forms of integration with the EC. If integration were to include agriculture, differences in level and structure of agricultural policy support and protection (market price support, direct payments, import barriers, and export assistance) would require adjustment in EFTA policies. EFTA countries are very diverse in their agricultural trade with the EC and with other countries. The composition of support (market price support or direct payments) in Austria and Sweden most closely resembles that in the EC. Finland, Norway, and Switzerland provide a larger share of support as direct payments, and the unit PSE tends to be much larger than in the EC. Sweden is the only country using variable import levies to the same extent as the EC. Other countries rely much more on

quantitative restrictions and state trading. In contrast to the EC, where export assistance is government funded, EFTA export assistance is at least partially funded by producers (or consumers). Agricultural policy in Sweden and Austria is most like EC policy, while Norway and Switzerland would require the most significant changes in level and structure of support and protection.

Price Integration in the EC Sheepmeat Market: An Application of the Holmes-Hutton Test, Daniel V. Gordon *(Norwegian School of Economics and Business Administration)*, Jill E. Hobbs *(Scottish Agricultural College)*, and William A. Kerr *(University of Calgary)*

Common markets such as the EC are, in part, organized to reduce barriers to the international movement of commodities. The benefits of trade liberalization will arise from specialization. This has two necessary conditions: market integration and transfer of resources. This paper provides a test for market integration. The integration of three markets is examined—the Paris market for French sheepmeat, the Paris market for British sheepmeat, and the British market for sheepmeat. While these markets exhibit a degree of integration, there are considerable lags, particularly between the Paris market for British sheepmeat and the British market. This suggests that the potential benefits to trade liberalization within the EC will not be fully realized.

The Supply of Agricultural Products: Norwegian Agriculture and the EC, Kyrre Rickertsen *(Agricultural University of Norway)*

The supply of 11 agricultural products is estimated on the basis of Norwegian data. A household utility maximization model is used to identify supply-determining variables. Following recent developments in econometrics, a large array of tests is applied to check the validity of the estimated equations. Short-run supply elasticities are calculated for the various products. The own-price supply elasticities are in the range 0.04–0.78. Furthermore, the estimated supply equations together with demand relations are used in a simulation model to investigate longer run effects on supply. A scenario based on Norwegian membership of the EC is simulated. The area under grains increases slightly in the year 2001 as compared with 1987–89. The (domestic) supply of milk, beef, pigmeat, carrots, and tomatoes is reduced in the simulations. The reductions are in the 5–45 percent interval. The supply of sheepmeat, eggs, and strawberries is increased. However, these results are uncertain, and 95-percent prediction intervals are presented.

A North America Trading Bloc: The Relationship of CUSTA to MUSTA, Carol Goodloe and John Link *(US Department of Agriculture)*

The vast differences in the economies of Canada and Mexico render much of the Canada-US Trade Agreement (CUSTA) inappropriate for a Mexican-US Trade Agreement (MUSTA), especially in agriculture. Canada is less worried than the USA about direct employment and trade competition from Mexico and more concerned about maintaining its preferred status in the large US market and displacement of its exports to the USA by Mexican exports. The differences between US-Mexico and US-Canada trade will dictate a MUSTA that differs from the CUSTA, although the CUSTA could serve as a model in areas such as tariff reduction and technical regulations. The potential for "unfair" competition as a result of differential treatment of the USA's northern and southern borders argues for eventual harmonization of at least some aspects of the CUSTA with a MUSTA to avoid trade diversion and reduce bureaucratic problems.

Agriculture in a US-Mexico Free Trade Agreement, Mary Burfisher *(US Department of Agriculture)*

This paper analyses current tariff and non-tariff barriers to US-Mexican agricultural trade. Its objective is to identify the types of barriers that present the most important impediments to trade and the commodities in which protection is highest. The paper then considers the potential for liberalizing bilateral agricultural trade, given the nature of current trade barriers and the treatment of agriculture in other free trade agreements, particularly the 1988 US-Canadian Free Trade Agreement, which is expected to provide a model for a US-Mexican Free Trade Agreement.

Interaction between the New Hungarian Agricultural Policy and International Trade: Closer to a New Europe?, László Kárpáti and András Nábrádi *(Agricultural University of Debrecen)*

Hungary was traditionally one of the food suppliers of Western Europe, a tradition stopped by World War II. The changing political situation in Eastern Europe and Hungary have made it possible to renew this tradition in order to meet the requirements of an integrated Europe, especially the Common Agricultural Policy of the EC. Hungarian agricultural policy has to be modified in parallel with the transition of the country's economic environment. To study this question, four different political scenarios were elaborated and possible effects on export structure and allocation of exported quantities to different groups of countries were also studied. Projection of the results shows that agriculture can remain a prosperous branch of the national economy of Hungary in the future.

Domestic Rent-Seeking Effects of the International Coffee Agreement: An Indonesian Case Study, Mary Bohman *(University of British Columbia)*, Lovell Jarvis *(University of California)*, and Richard Barichello *(University of British Columbia)*

. The implementation of International Coffee Agreement (ICA) export quotas, by creating quota rents in coffee-exporting countries, encourages directly unproductive behaviour by domestic groups seeking to capture such rents. Such activity causes economic waste and alters income distribution. Farmers and the government in the exporting country, whom the developed country importers intend to be the beneficiaries of the ICA, are more likely to lose, while coffee-exporting firms and government officials may gain. Although quotas are known to create opportunities for rent seeking, such effects have not been examined in the context of international commodity agreements. This paper is concerned with the effects of the ICA, but there are many parallels with other commodity agreements. The paper uses a model of policy in exporting countries to show how the imposition of ICA quotas creates potential rents within coffee-exporting countries and analyses how domestic coffee policy determines the actual size and distribution of these rents among competing domestic groups. The model is applied to Indonesia.

Optimal Import Quotas in Oligopolistic Processed Food Markets, Steve McCorriston *(University of Exeter)* and Ian M. Sheldon *(Ohio State University)*

Recent developments in international trade theory suggest that, where markets are imperfectly competitive, there may be a justification for protectionism. This has come to be widely known as strategic trade policy. There has, however, been little consideration of the applicability of these arguments to agricultural trade. Since trade in processed food products is the most dynamic sector of agricultural trade and given that these markets are typically characterized (to varying degrees) by imperfect competition, it may nevertheless be the case that these recent theoretical developments may have some relevance for the use of protectionism in processed food markets. This paper, therefore, considers the use of import restrictions as a means of increasing national welfare, with the US cheese processing sector

chosen as a case study. Using a computable partial-equilibrium model, the results suggest that the US government could increase national welfare by using import quotas to protect its cheese-processing sector; however, compared with the quota régime currently in use, the optimal import restrictions are more liberal in terms of the level of imports permitted.

Industrial Organization as a Determinant of International Competitiveness in Food, Dennis R. Henderson *(Ohio State University)* and Stuart D. Frank *(US Department of Agriculture)*

International trade is increasingly being viewed in the context of imperfect competition. This is particularly appropriate for food and other processed agricultural products as most food processing and manufacturing industries are oligopolistic. Industrial organization theory demonstrates a negative relationship between concentration of market power and domestic market performance. One theme emerging from the integration of industrial organization and international trade theories is that seller concentration is also negatively related to international market performance. This theme is tested and validated for US food manufacturing industries.

The Influence of Intrinsic Attributes on the Loss of US Market Share in the Japanese Oilseed Market, Joyce Cacho, Eluned Jones, Daniel B. Taylor, and David Kenyon *(Virginia Polytechnic Institute and State University)*

This paper uses a mathematical optimization model of the Japanese oilseeds and products market to analyse the impact of the current US soyabean marketing policy that excludes protein and oil intrinsic attributes from grades and standards on the US market share of Japanese oilseed imports. Intrinsic attribute data on competitor oilseeds, Brazilian soyabeans and Canadian rapeseed (canola), are available to market participants. The results show that a relationship exists between the foreign material content, the protein/oil composite, and both level and market share of US soyabean imports. Producers respond to price incentives provided by the market. Within the soyabean market structure, price signals have not encouraged producers to differentiate soyabean varieties by oil or protein production potential, but rather on the basis of yield. The 1990 US Farm Bill includes a "Grain Quality Incentives Act," which explicitly recognizes the importance of associating grades and standards with end-use value of the commodity. The results presented in this study indicate that potential exists whereby the USA could regain share in the Japanese market through identification of the threshold attribute levels.

Export Supply and Import Demand Elasticities in the Japanese Textile Industry: A Production Theory Approach, Timothy A. Park *(University of Nebraska)* and Daniel H. Pick *(US Department of Agriculture)*

The close link between Japanese industrial policy and domestic industries facing declining international competitiveness is clearly illustrated by developments in the Japanese textile industry. A production theory approach for modelling trade in intermediate goods is applied to derive export supply and import demand functions for the Japanese textile industry. Measures of biased technical change and the estimated elasticities are linked to structural adjustments in the Japanese textile industry. Technical change is biased towards domestic textiles and away from cotton imports, consistent with a pattern of domestic coordination and partnerships linking small-scale textile firms. As export markets contracted, textile firms became more price responsive to the Japanese domestic textile market. Although the price responsiveness of labour demand has increased over time, wage reductions played a relatively minor role in employment adjustment in the textile sector. The cross-elasticities showed that changes in imported cotton prices and in domestic textile prices have the largest impacts on labour demand in the textile industry and that these effects have increased over time.

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Government Grain Storage in a Market-Oriented World Economy: Acquisition and Dispersal Rules for Market Stability, Robert D. Reinsel *(US Department of Agriculture)*

Under market-oriented conditions, grain price increases have led to calls for market intervention by import-dependent countries. Past experience shows that requests for international buffer stocks have increased during periods of high prices. During periods of low prices, major exporters have attempted to institute market-sharing schemes through international grain agreements with the hope of raising prices. Neither the cartel nor the buffer stock system has been able to provide price stability. Cartels were implemented but never really functioned, and international buffer stocks were never implemented. A yield-triggered stock acquisition and dispersal programme could buffer the market from weather-induced yield shocks, which are the noneconomic force in the market. Storage and dispersal of yield deviation from expected yield would allow true supply and demand shifts to become more readily discernible. Long-run supply and demand forces would provide appropriate signals to the market. If implemented unilaterally by both exporters and importers, price stability would be accomplished with low levels of stocks.

An Econometric Analysis of World Wheat Trade: An Application of a Gravity Model, Won W. Koo *(North Dakota State University)* and David Karemera *(Wayne State University)*

A commodity-specific reduced-form gravity model is derived from a partial equilibrium model of world trade. The model is then applied to the world wheat market to analyse factors affecting wheat trade flows. The study reveals that all independent variables, including production capacities, income, import and export unit value indexes, and trade policies, used in wheat trade play an important role in determining wheat trade flows. Long-term agreements achieved the highest performance by significantly enhancing international wheat trade. Credit sales also contribute to increased wheat movement. However, export enhancement and export refund programmes do not significantly increase wheat trade flows. Protectionist policies of supporting domestic prices greatly impair wheat trade.

Accounting for Export Market Performance of Major Wheat Exporters: A Constant Market Share Analysis, Michele Veeman, Terrence Veeman, and Xiao-Yuan Dong *(University of Alberta)*

In this paper, two versions of a constant market share (CMS) model are applied to analyse wheat export market performance of major exporters. Based on the analysis, an assessment is made of the uses and problems of CMS models for agricultural trade. These models are based on the assumption that a country's ability to increase market share reflects an increase in its competitiveness, after accounting for changes in the structural orientation of its exports in terms of its reliance on relatively fast- or slow-growing markets and products. The structural component of focus in the simpler model version is the regional orientation of wheat exports. The expanded model version also focuses on export concentration in different classes of wheat. The latter extension involved some limitations. It introduced ambiguities into the calculations of structural components. Econometric testing of annual changes in the calculated competitive effects of the two-model versions consistently indicated stronger performance of the results from the simpler model in explaining changes in export market growth. Although the CMS model does not identify sources of changes in competitiveness, it focuses attention on export growth that arises from regional concentration in exports and on exporters' relative performance.

Domestic Policy Reforms and the International Audience: Canada's Agricultural Policy Proposals, Theodore M. Horbulyk *(University of Calgary)* and Michael P. Kidd *(University of Tasmania)*

This paper provides a brief review of the principal criteria used to determine whether domestic agricultural policies are consistent with the general principle of liberalization of international trade in agriculture. The focus is on one aspect of Canada's recent agricultural policy proposals, those concerned with "financial farm support programmes" (the so-called "safety nets"). From a theoretical point of view, the proposed combination of domestic policies may induce output effects that are in clear contravention of the spirit of trade liberalization. Output effects may arise, for example, due to either sector-specific income transfers or the lack of precision with which such schemes can be administered.

Effects of Macroeconomic and Trade Policy Changes on the Chinese Grain Market: A General Equilibrium Analysis, Gil Rodriguez and H. Don B.H. Gunasekera *(Australian Bureau of Agricultural and Resource Economics)* and Will Martin *(World Bank)*

Excess demand in major sectors of the economy, a high level of government support to heavy manufacturing industries, and implicit taxation of agriculture continue to persist in China despite the economic reforms undertaken since 1978. Given this background, the focus in the paper is on the implications for the Chinese grain market of a reduction in domestic absorption and changes in some key trade policies. To analyse these implications, a general equilibrium model of the Chinese economy is used. The results indicate that China's ability to earn the foreign exchange required for grain imports could be increased by policy reforms such as the reduction of implicit export taxes imposed on key farm products like rice. Furthermore, compared with the trade policy reforms, macroeconomic policy changes, such as change in absorption, are likely to have greater impacts on China's grain sector and the overall economy.

Effects of Export Promotion on Import Demand for US Cotton in the Pacific Rim, Hosanna Solomon and Henry W. Kinnucan *(Auburn University)*

Government-subsidized export promotion of US cotton in the Pacific Rim is evaluated using an extended Armington trade model. Results suggest that US export promotion programmes over the 1965–85 study period had a significant impact on cotton trade flows in four of the six countries examined (Japan, South Korea, Hong Kong, and the Philippines). Marginal returns are estimated to range from US$11 in the Philippines to US$171 in Hong Kong, suggesting that a reallocation of funds or increased funding level could enhance the economic effectiveness of the promotion effort for US taxpayers, affected industry participants, and foreign third-party cooperators. The market share and product differentiation emphasis, coupled with the satisfactory statistical results obtained in this study, suggest that the Armington model is a useful methodology for examining the economic impacts of export promotion of agricultural commodities.

Policies to Increase Agricultural Exports in Chile, Indonesia, and Egypt, John B. Parker *(US Department of Agriculture)*

This paper shows recent drastic changes in exports in Chile, Indonesia, and Egypt. Chile, the "star" of agricultural exporters from South America, offers modern banking policies and a favourable climate for foreign investment. Agricultural exports increased dramatically during 1980–90. For example, exports of table grapes and apples are overwhelming other exporters such as the USA or Italy. The new horticultural exports, such as plums, cherries, pears, etc., are also increasing. For Indonesia, striking gains from about 30 new agricultural exports, such as live animals, confectionery, cakes, and soft drinks, helped offset the decline in exports of rubber and coffee. Exports of such tropical items as tea and spices are also

increasing. Indonesia's total agricultural exports are now worth more than $3,000 million annually. Further gains are expected because of great progress with newer commodities like canned pineapple and cassava. Exports of horticultural items from Egypt increased, with oranges reaching $140 million. Cotton exports declined from the $500 million of the early 1980s to $123 million in 1990. In 1990, however, textile exports totalled $1,200 million, about double the mid-1980s' level. During 1980–82, Egypt's total agricultural exports averaged $780 million. Today Egypt promotes food crops like maize and rice. Egypt has also resisted changes in foreign investment or banking that could have helped cotton exports.

Trade Policies and Poverty Alleviation: A Taxonomic Study, Habibullah Khan *(National University of Singapore)*

The paper provides an empirical investigation of the relationship between poverty alleviation and trade policies. The former is measured in terms of certain basic needs indicators and the latter is proxied by a recent World Bank classification of 41 developing countries. The Wroclaw taxonomic method is used to generate a number of composite indices for 1975 and 1985. The results indicate that as a country moves from strongly inward-oriented to strongly outward-oriented policies, the poverty situation improves gradually.

Economic Adjustment and Agricultural Exports in Latin America, Yony Sampaio *(Universidade Federal de Pernambuco)*

Increased external indebtedness in Latin America generated a crisis at the beginning of the 1980s that required external and internal economic adjustment. As a consequence, on the external front, the currency was devalued in order to increase exports, and, internally, incomes and wages were depressed. The effect of economic adjustment on agricultural exports was positive, but, although acting simultaneously, wage decreases seem to have been much more influential, imposing high social costs in the process of adjustment. But the analysis shows that wage increases can follow from export increases, meaning that, if the adjustment is successful, the initial social cost can be compensated by income and wage growth in the medium term.

Latin American Debt, Debt Forgiveness, and the Impact on Agricultural Trade, Daniel Pick and Barry Krissoff *(US Department of Agriculture)*

Financial conditions seriously deteriorated in many Latin American countries in the 1980s. A decade earlier, the Latin American countries borrowed significantly from foreign commercial banks, obtaining large capital inflows to purchase imported goods, including agricultural products. While borrowing continued in the 1980s, many of the Latin American countries suffered from a financial exodus. Net capital outflows have affected the ability of Latin American countries to import agricultural products, but there is considerable diversity in opinion regarding the magnitude of the impact. This estimation and simulation analysis indicates that a 50-percent debt forgiveness of four heavily indebted Latin American countries—Brazil, Mexico, Chile, and Venezuela—increases agricultural imports modestly, by approximately $400 million per year. Of that total, the USA and EC expand exports by $225 million, mostly in grains and meats. Two reasons may explain the modest increase in trade. First, agricultural imports of developing countries tend to be basic foodstuffs, which are less likely to be squeezed in times of financial stress. Second, as foreign exchange became less available to developing countries in the early- to mid-1980s, US credit guarantee programmes expanded and substituted for commercial borrowing guaranteed by the governments of developing countries.

Development, Trade Policies, and Income Distribution: An Analysis of Brazil's Performance and Policy Options, Jackelyn Lundy *(University of California)*

This work attempts to provide some insight into the relationships among economic development, trade, and income distribution. The case of Brazil is used to analyse whether trade policy options can simultaneously promote economic growth and greater equity in income distribution. Specifically, a computable general equilibrium model was used to run three border policy experiments and to test for their effects on different income groups. The first experiment reduced tariffs on wage goods and increased tariffs on luxury goods. In contrast, the second experiment reduced tariffs on luxury goods and raised tariffs on wage goods. The third experiment followed a more traditional trade liberalization scenario by uniformly reducing tariffs for all goods. Even though the results of the experiments were mixed, they were revealing in terms of the amount of economic influence needed in order effectively to institute an economic policy and to overcome macroeconomic adjustments.

Comparative Assessment of Competitiveness of Commercial Wheat Farm Operations in Canada and the USA, 1985–89, Shankar Narayanan *(Agriculture Canada)* and Michael E. Salassi *(US Department of Agriculture)*

Comparison of performance of typical large commercial wheat farms from the USA (major grain exporter) and Canada (medium-sized grain exporter) simulated over the 1985–89 trade-war period shows that in terms of their (export) competitiveness, the US wheat farm had relatively higher productivity and direct government payments resulting in higher total revenue, and the Canadian farm had relatively lower land costs and higher farm gate prices. The US farm, however, had lower non-land costs and higher flexibility to adjust to changing market conditions, although it was strained to service debt fully out of farm income. Overall, competitive performance remains very similar in both the farms. This implies that market effects of a further decline in grain prices and/or strengthening of own currency would enhance the burden of government payments relatively more for the Canadian farm, due to lack of scope for further improvements in cost or production efficiency. On the other hand, enhanced grain prices through global trade reform would benefit farm incomes as well as save government expenditures similarly in the two countries.

Structural Adjustment of the Japanese Textile Industry and Impact on Trade, Fawzi A. Taha *(US Department of Agriculture)*

The Japanese textile industry grew rapidly until the early 1970s, but since then it has had to resort to structural adjustment due to rising production costs and keen competition. Japan's competitiveness in textiles has weakened, as labour has become increasingly expensive. Structural changes within Japan's textile industry over the past 20 years are a good example of the implication of the Heckscher-Ohlin theory of comparative advantage and international trade. Japanese textile policies are of particular relevance to other countries, industries, and commodities. Textile mills shifted from labour-intensive to capital-intensive methods of production, which consequently affected the commodity composition of trade and fostered a smooth transition from imports of raw fibres to value-added textile (yarn, fabrics, and ultimately clothing and finished goods). For example, the share of raw fibre in Japan's total textile imports fell from 82 percent in 1969 to 22 percent in 1989, while the share of yarn and woven fabric increased from 11 percent to 19 percent. The import share of clothing and other textile finished goods greatly increased from 6 percent to 59 percent during the same period. Adjustments of the Japanese textile industry included domestic specialization in the production of top-quality textiles, diversification to non-textile products, and the transfer of capital and machinery to low-labour-cost countries.

Agricultural and Regional Development

Tourism and Development: The Forgotten Issues, Joseph Thuo Karugia *(University of Nairobi)*

Many Third World countries view tourism as a panacea for the many problems constraining their development. The benefits of tourism include its contribution to foreign exchange earnings, generation of employment and income, improvement of economic structures, and encouragement of entrepreneurial activity. However, there has been a tendency to promote tourism without taking into consideration its negative economic, social, and environmental impacts. This paper attempts to bring to the fore some of the issues that have received minimal attention when the role of tourism in Third World development is being assessed. The economic costs of tourism include investment in infrastructure for tourists, promotion, importation of goods and services for tourists, opportunity costs, and economic dependence. Social impacts include the effect of tourists on the moral conduct of host communities, the demonstration effect, and the effect of tourists on the health of host communities. The consequences of social and environmental impacts can seriously negate any benefits that might accrue from tourism. All these costs must be taken into account when promoting tourism as a vehicle for achieving development.

High-Value Agricultural Products from Developing Countries, Mary Burfisher and Margaret Missiaen *(US Department of Agriculture)*

This study analyses exports of high-value and processed agricultural products (HVPs) from 35 less-developed countries (LDCs) during 1970–87, and the roles of supply and demand factors in accounting for their export performance. HVPs account for 83 percent of LDC agricultural exports. Processed exports have undergone the most rapid growth and accounted for almost half of LDC high-value exports in 1986–87. Developed countries remain the major HVP export market for LDCs. LDCs' share of this market fell during 1970–87, although their share of developed country imports of highly processed HVPs increased.   Domestic policies favourable to exports distinguished successful from unsuccessful LDC exporters. Several of the most competitive LDC exporters also adopted policies that promoted exports of specific HVPs. However, favourable domestic conditions were not sufficient; strong developed country demand was also necessary for successful LDC HVP export performance.

Problems of Perception in Rural Development Programmes: Some Socioeconomic Implications for Smallholder Agriculture, Diego Roldan *(Universidad del Valle)*

Most of the problems encountered in the process of implementation of integrated rural development programmes seem to have much to do with the so-called "problems of perception" regarding whether government researchers and extensionists perceive the needs of peasant producers and what the latter think those needs actually are. As a result of this conflict, what happens in practice is that, on the one hand, researchers and extensionists try to impose certain modern packages on peasants and, on the other hand, peasant producers are, to a great extent, not able to adopt them since they do not address their real needs. The problem seems to be partly one of the ideological factors underlying the practice of knowledge and training, which make technical officials view peasants as people who know little about modern techniques and therefore as people who have nothing to contribute or suggest in regard to farm production techniques.

An Analysis of North Korea's Economic Development with Special Reference to Agriculture, David W. Culver and Chinkook Lee *(US Department of Agriculture)*

The paper examines North Korea's record of economic development with special reference to agriculture. There was some initial success in grain production under the centrally directed economy and the *Juche* method and *Chungsan-ri* spirit of farming. However, too much emphasis on grain production has resulted in continuing shortages of other agricultural products, such as livestock and livestock products. Meanwhile, the early success of grain production now appears to have stalled. The economy as a whole is supply constrained, and effective demand is not recognized, a common failing of a planned economy.

Impact of Rural Industry on Agricultural Development in China, Zhang Cheng-liang *(Beijing Agricultural Engineering University)*

This paper analyses the impact of China's rural industry on agriculture with a tentative model illustrated by case study data. The model centres on the pattern of transfer of agricultural surplus labour to rural industry. Rural industry has a positive effect on agricultural labour productivity and agricultural transformation and a negative effect on agricultural land area, land productivity, and agricultural output, if labour transfer occurs. The two-sided impact has implications for policy making.

Taiwan's Agricultural Development at the Crossroads, Sophia Wu Huang *(US Department of Agriculture)*

Taiwan's rapid economic development has changed its agriculture dramatically. The traditional agricultural products—rice, sugar, and potatoes—are giving way to higher value, land-saving products. Taiwan increasingly depends on importing coarse grains, soyabeans, cotton, hides, and food products, while agricultural exports are no longer contributing much to foreign exchange earnings. There has been a significant increase in part-time farm households and a decrease in the intensity of land use. Surging production costs, a shrinking number and ageing farm workers, lack of an efficient scale of farming, and concern for pollution all bode ill for Taiwan's agriculture. Faced with a dwindling sector and increasing pressure on trade liberalization, Taiwan's agricultural development is indeed at the crossroads. The recently approved 6–year (1992–97) farm programmes should help to ease the transition of the agricultural sector to a smaller but more efficient and market-oriented farming operation. Given Taiwan's intention to join the GATT, its agricultural markets may open up further in order to conform with the GATT rules on agricultural trade.

Structural Adjustment and Agricultural Development in Taiwan, Chaur Shyan Lee *(National Chung-Hsing University)*

Structural adjustment is one of the most important ways of facing problems and challenges in agriculture. Problems of agricultural structure in Taiwan are: average farm size is very small, part-time farming predominates, age and poor training limit farmers, and there are wide regional disparities in rural development. In order to overcome these structuralal problems, the following remedial measures should be taken: establish a nucleus farming system for enlarging the size of farms of full-time farmers, which can help to solve problems of labour shortage in part-time farming; renew and retrain farmers through creating special aids to young farmers, enact a pension scheme for old farmers to encourage them to retire early, and strengthen vocational training for farmers; reinforce development in less-favoured areas through integrated regional programmes aimed at balancing regional development in rural areas; and introduce socio-structural programmes with direct income aids for the poorest farmers. Any policy on agricultural structure should be coordinated with general economic policy and regional development policy.

On the Contribution of Public Investment in Research and Extension to Agricultural Output in Taiwan, Jhi-tzeng Shih *(National Taiwan University)* and Tsu-tan Fu *(Academia Sinica)*

The objective of this paper is to estimate the contribution of public investment in research and extension to Taiwan agricultural development since the Second World War (1954–81). The well-behaved inverted-V and polynomial distributed lag regression models are used. The empirical results estimated from both models are shown to be consistent. The optimal lag length identified by the $\bar{R}^2$ method for the inverted-V model is 13 years, whereas that identified by Schwarz-Bayesian criteria for the polynomial model is 12 years. The mean lag length for the true lag effect of public investment in education on agricultural output is around 6–7 years. The shape of the lag distribution identified follows an inverted-V or second-degree polynomial scheme. That means that the lag response of public investment in research and extension on Taiwan agriculture will last for a period of 12–13 years. The distribution of the lag effect will show an increasing trend in the early years and a decreasing trend after year 6 or 7. The highest lag effect occurred in year 6 or 7. The marginal internal rate of return to public investment in research and extension was about 65–69 percent during 1954–81.

Agricultural Growth in the South Pacific Island Economies: Constraints and Key Issues, K.L. Sharma *(Bureau of Transport and Communications Economics, Australia)*

After examining the trends in agricultural growth in the islands of the South Pacific during 1980–87, this paper attempts to identify major constraints on and key issues in the performance of agriculture. Specific policies on productivity improvement, infrastructural development, and diversification of production and exports need to be instituted to achieve sustained agricultural growth in the Pacific Region.

Agricultural Structure as a Determinant of Technology Choice in Bangladesh, Koichi Fujita *(National Research Institute of Agricultural Economics, Japan)*

One of the most notable features of agricultural structure in South Asian countries is that the skewed land distribution is not corrected through the tenancy market. The relatively privileged, often owning some land, occupy a larger share of rented-in land. This paper analyses the effects of agricultural structure on productivity and/or technology choice using multiple regression methods and 1983/84 Agricultural Census data for Bangladesh. Land quality variables are incorporated to be controlled. Small farmers use their limited land much more intensively than large farmers. Additional cropping of unremunerative crops such as *aus* rice is largely attributed to this. An inverse relationship between farm size and land productivity is observed under both traditional and modern technology. Tenancy itself could not be regarded as a constraint to technical progress, which refutes the theory of semi-feudalism in eastern India, including present-day Bangladesh. However, the inverse relationship is persistent even among owner-cum-tenants. The agricultural structure as a whole thus suppresses productivity. Land reform in terms of strengthening the land ceiling promises increased production.

An Interregional Equilibrium Model to Evaluate the Impact of Agricultural Policies and Development Projects on the Agricultural Sector of Sri Lanka, Giovanni Vergani and Peter Rieder *(ETH Zürich)* and Cyril Bogahawatte *(University of Peradeniya)*

The objective of this study is to develop a suitable instrument for analysing the agricultural sectors of developing countries. This involves both the representation of the interdependencies that rule an economic sector and the evaluation of the reaction of the different market participants following the implementation of either agricultural policy measures or development projects. The methodology presented in this study relies on mathematical programming within which a linear programming approach was chosen, relying

on a spatial equilibrium model. The model reproduces features of the Sri Lankan agricultural sector in order to be able to analyse the role played by each market interdependency. The simulation of different agro-political scenarios allows an impact analysis of exogenous interventions on the sector.

Contract Farming and Sugar Cane Outgrower Schemes in Kenya, L. Maurice Awiti (University of Nairobi)

Contract farming and outgrower schemes in Kenya were studied to understand how they contribute to and limit increased agricultural growth and rural development in general. There is much concern in sub-Saharan Africa about the inability of the agricultural sector to maintain sufficient growth rates to match the demand of the rapidly growing population. There is a need to design alternative institutional arrangements so as to enhance the effectiveness of policy reform and technological innovation in promoting agricultural growth. This paper presents the results of a case study of sugar cane smallholder outgrower schemes in Kenya based on primary and secondary data. The basic description, performance, and impact as well as prospects for these schemes are presented.

Structural Adjustment Policies and Agricultural Production in a Developing Economy: The Case of Tanzania in the 1980s and Prospects, A.K. Kashuliza and J.R. Rugambisa (Sokoine University of Agriculture)

This paper reviews the structural adjustment programmes implemented by Tanzania in the 1980s to reverse the declining trend in the economy. Selective policies with a direct bearing on agriculture such as producer prices and exchange rate adjustments implemented in the context of the Economic Recovery Programme (ERP) are described. This is followed by an assessment of the performance of the economy and in particular the agricultural sector in the face of ERP implementation. The paper concludes by suggesting short-, medium-, and long-term strategies for developing and sustaining agriculture and other sectors of Tanzania's economy.

Application of Stochastic Dominance Criteria to Evaluate Bean Production Strategies in Central Province, Zambia, Mesfin Bezuneh (Clark Atlanta University)

Beans are the most important "relish" crop in the farming systems of Serenje District in Central Province, Zambia. Both leaves and dried beans are major food sources for home consumption, and dried beans have a commercial value in the system. Given this dual role, increasing bean yields would improve family nutrition as well as economic returns to capital and labour. However, low levels of production have been recorded over the years due to the use of local bean varieties, low fertility, and inadequate pest control. As a result, on-farm research on beans was carried out for four years to identify bean varieties and management strategies that would result in higher yields and economic returns. In this paper, results of the four years' on-farm research were analysed using stochastic dominance efficiency criteria in order to determine the most risk-efficient production management strategies. The results indicated that the Brazilian bean variety carioca, when used in combination with fertilizer and insecticide, performed best for the traditional and small-scale farmers in Serenje District who are usually highly averse to risk.

Shifting Affirmative Action in South African Agriculture: Problems and Considerations, C. McKenzie and M. Lyster (Development Bank of Southern Africa)

The South African agricultural sector has been characterized by excessive state intervention in the form of affirmative action in favour of a limited number of European commercial farmers. In the context of the changing political economy, there is a real need to shift affirmative action to meet the needs of those denied support in the past. A number of

mechanisms have been identified in order to make the agricultural sector more equitable. The implications of these are discussed in the context of their practical implementation with respect to available resources and recent experience in the South African commercial farming sector.

Post-Harvest Rural Infrastructure Combination for Sustained Food Flow in Nigeria: The Case of the Kwara Agricultural Development Programme, J.C. Umeh *(University of Agriculture, Nigeria)*

The World Bank-assisted Agricultural Development Programme in rural Nigeria has led to an accelerated productivity growth in food supply. However, these gains are rapidly eroded soon after harvest as a result of poor post-harvest activities. With the aid of a principal component analysis model, this paper examines Nigerian efforts in forestalling the food-flow programme. Indices of food flow are constructed for two major post-harvest rural infrastructures—storage facilities and the rural road network. A third sample, which serves as a control and is thus not deficient in any of the post-harvest rural infrastructures, is also used. Each of the two rural infrastructures influence the rate of food flow, although storage facilities, in relative terms, are of greater importance. A combination of the two infrastructures will accelerate, on a sustained basis, the rate of food flow in Nigeria. Various policy implications of the results are indicated.

Sources of Growth in Brazilian Agriculture Revisited: The Crop Sector, Léo da Rocha Ferreira *(Instituto de Pesquisa Econômica Aplicada and Universidade do Estado de Rio de Janeiro)*

This paper describes some of the results of a study of changes in the pattern of growth of Brazilian agriculture in the 1980s and its relationship with public investment in the sector. A modified version of a shift-share model was used to analyse the sources of agricultural growth. The partial results obtained show that productivity (yield) gains were of greater importance as a source of growth in the 1980s than the expansion of the cultivated area found in previous decades. The possible relationship between this change in the pattern of growth and the increase in public investments in agriculture is discussed.

Stabilization Policies and Agriculture in Brazil, 1986–90, Gervasio Castro de Rezende *(Instituto de Pesquisa Econômica Aplicada)*

This paper shows that the increase in inflationary instability in Brazil after 1986 and the policies adopted by the government since then to fight hyperinflation caused the terms of trade of agriculture to become much more unstable at the same time that the government—pressed by a growing fiscal crisis—withdrew the support it had been providing to agriculture. Under these circumstances of increased risk, agricultural investment and output fell drastically in 1990 and were expected to remain at low levels in 1991. Turning to the current stabilization strategy, the paper points to its depressing effects on agriculture and stresses the need for policies specifically designed to support agriculture if the latter is to recover and contribute to the success of the stabilization programme itself.

Intersectoral Capital Transfers: The Role of Relative Prices, Luis Romano *(Instituto de Agricultura, Colombia)*

Several theories of economic development indicate that one of the basic functions of the agricultural sector in developing countries is to generate an economic surplus to provide capital resources for industrial development. While there are different mechanisms for transferring these resources from one sector to another, one of the most important is the price system. The main objective of this paper is to provide an analytical and empirical framework to estimate the amount and direction of the intersectoral capital transfer through relative

prices and to calculate terms of trade among sectors. The concepts of implicit transfer, implicit deflator, terms of trade, and index numbers are used. A significant net transfer from agriculture to other sectors was found for the 1970–88 period in Colombia, indicating that the agricultural sector has been an important source of capital for the country's economic development. Also, the industrial sector transferred capital resources to the service sector over the final time period, which is surprising but fits with trends in financial and government activities in Colombia in recent years.

Argentina: Possibilities and Restrictions of Agricultural Policy in an Adjustment Policies Framework, Edith S. de Obschatko *(Instituto Interamericano de Cooperación para la Agricultura)*

Argentina is at a critical point in its economic development. GNP is similar to that of 1970, per-capita income has seriously decreased, infrastructure is deteriorating, and external debt is seven or eight times the value of annual exports. In the current world context, Argentina needs to develop an export strategy to re-start economic development based on the production and processing of agricultural, fishery, and forestry products. The macroeconomic adjustment framework is favourable for the development of the export-oriented agro-industrial sector because of non-intervention policies. However, the scarcity of public funds reduces the possibility of addressing the three principal constraints on sustained growth: technological gap, agricultural protectionism practices, and dangers to natural resources. In order to achieve sustained growth of the agricultural and agro-industrial sector, a new approach to agricultural policy is needed. This approach is not based on market interventions, but relies principally on four features: state modernization, increased coordination among macroeconomic policy and sectoral policies, greater coordination among national and provincial governments, and increased interaction and cooperation among the public and private sectors to enhance their respective technical capacities and resource availabilities.

Marketing and the Rural Poor, John C. Abbott

The numbers of poor people of the world are increasing. Most live in the rural areas of developing countries. The role of marketing in alleviating such poverty is examined through the projects of the International Fund for Agricultural Development, which has taken some path-breaking initiatives.

Farm Structure, Land Use, and Rural Problems

Segmentation of the Life of the Farm Household: Trends and Actual Situation in Japan, Kiyomitu Kudo *(Chugoku National Agricultural Experiment Station)*, Tokuya Kawate *(National Agricultural Research Centre)*, Keiichi Murano *(National Institute of Sericultural and Entomological Science)*, and Kiyoko Arai *(National Agricultural Research Centre)*

During the pre-war years (before 1945), farming households in Japan preserved their strong unity under the leadership of their patriarchs. Today, however, there are a number of signs that the traditional patriarchy is rapidly being replaced by a new type of household managed by husband and wife rather than by the patriarchy. Based on a questionnaire in Ibaraki Prefecture, this report studies the actual life of farm households in recent years from the viewpoint of housework, family budget management, transfer of family budget management rights, decision making, living space, leisure time, and attitude towards living with parents. The study reveals that the family relationship in farm households is changing from one of vertical cooperation among different generations to one of lateral links among different family units within farm households.

An Economic Analysis of Family Size Decision Making with Reference to the Developing Areas of South Africa, C.D. Fairlamb and W.L. Nieuwoudt *(University of Natal)*

South Africa's annual population growth rate in the traditional sector is 2.9 percent. This study identifies economic factors affecting family size choice to provide policy makers with a strategy for reducing fertility. A neoclassical utility framework was used to analyse linkages between family size decisions and socioeconomic variables. Household utility for "child services" and "standard of living" was maximized subject to the resource constraints of time, labour, and income. A demand curve for children was specified within a simultaneous model of family decision making. A stratified sampling technique was used to collect household data from Ulundi and Ubombo in KwaZulu; 175 women in three equal occupational strata were interviewed. The simultaneous model was estimated by two-stage least squares regression analysis. Dummy dependent variables were estimated by probit analysis. Child education, women's opportunity cost of time, and formal market participation were negatively related to fertility, reflecting substitution from numbers of children (time intensive) to fewer, more educated children (less time intensive) as opportunity costs rise. Child labour was positively related to fertility. Strategies to reduce population growth rates should therefore include improvements in women's education and employment opportunities to raise their time costs and time-saving devices to reduce demand for child labour.

Poverty among US Rural Husband-Wife Households: An Econometric Analysis, Wallace E. Huffman *(Iowa State University)*

The paper presents a human-capital-based household model of a household's cash income and poverty status. The data are for US farm and rural nonfarm households included in the annual Current Population Surveys of 1978–82. The empirical analysis sorts out the relative importance of human capital and family size, local labour market conditions, and local cost of living and amenity factors on income and probability of a household being in a state of poverty. For farm and rural nonfarm households, the human capital and family size variables are shown to be significant determinants of household income and poverty status. Local economic conditions are shown to matter significantly for income and poverty status of rural nonfarm, but not farm, households. Although married males and females have quite different frequencies of participating directly in income-generating activities, the marginal effects of men's and women's schooling on household cash income and probability of poverty are very similar.

Ordering of Multiple Objectives of Small Farmers in Bendel State, Nigeria, O. Dicta Akatugba *(Bendel State University)* and M. Upton and T. Rehman *(University of Reading)*

Consideration is given to the line of thought that farmers have multiple objectives and thus behave in such a way as to attain satisfactory levels among the different objectives rather than the traditional maximization of a single objective. The procedure for ordering the farming objectives of farmers on the basis of a sample of 150 small farmers in Bendel State, Nigeria, uses both a numerical rating scale and a paired comparison. Results support the fact that even though profit is an important objective for small farmers, it is neither the only nor the highest priority consideration in their decision making.

Allocation of Activities by the Farm Household: Organization of the Farm Firm, Gregori M. Chiesa R. *(Università di Udine)*

The paper analyses the organization of the farm firm as an example of productive activities inside or outside the farm. The analysis involved a concise survey of some of the main usable interpretative models in approaching the problem, a comparison of the casual variables used by each, and a quantitative assessment of the heuristic capacity and compatibility of these interpretative models. The models adopted are the microeconomic "farm

household" model (conveniently integrated with an interpretation of industrial vertical disintegration processes) and a simple description of the productive process through the "stocks and flows" model. The models are complete alternatives in construction, open to some common interpretations (allocation outside the farm is negatively correlated to farm size) and some differing interpretations (allocation outside the farm is linked to minimization of production costs or reduction of factor inactivity), and useful in interpreting particular phenomena such as the substitution effect for mechanized labour and the correlations between structural features of the farm and phases in the family life-cycle (the first model), that part-time farms engage in work outside agriculture to render farm activity compatible with employment outside agriculture and that farms externalize or internalize activity to set requirements for manual work in terms of time (the second model). A quantitative analysis applied to a sample of approximately 300,000 farms led to results in line with this set of theories, confirming how alternative theoretical models may lead to complementary explanations of empirical phenomena.

A Comparison of Cost Efficiency of Part-Time and Full-Time Cash Grain Farming in the USA, Gerald W. Whittaker, Mary C. Ahearn, and Hisham S. El-Osta *(US Department of Agriculture)*

Individuals associated with farming are more likely than the average individual in the USA to be engaged in multiple job-holding. Concerns have been expressed that part-time farming may not be healthy for US agriculture because of production inefficiency. This paper analyses the cost efficiency of a sample of cash grain farms from USDA's Farm Costs and Returns Survey which represents 133,463 farms. Two-thirds of these farms participated in off-farm economic activity. A non-parametric "best practice" frontier is established following the method of Färe *et al.*, and the average cost efficiency of two groups, those farm operators who do not participate in off-farm income generating activities and those who do participate, is compared. A statistical test of the means leads to the conclusion that there is no difference in cost efficiency between part-time and full-time cash grain farms in the USA.

Economic and Financial Planning in Farming: A Case Study, Manuel Cabanes and Francisco Amador *(Universidad de Córdoba)*

Several research projects indicate that decision making in farming is characterized by the presence of multiple objectives and by a non-maximizing attitude on the part of the decision maker as far as the proposed objectives are concerned, adopting instead an attitude of "satisfying." In general, farm planning objectives, such as gross profit, level of employment, etc., are usually included, but the inclusion of a set of coordinated economic and financial objectives is not so frequent, and these are the ones that really have an important part to play when the decision maker prepares an action plan for the following year. The objective of this paper is to show in a real case study how multi-criteria techniques can help to define suitable short-term economic and financial policies.

Substitution between Labour and Capital in South African Commercial Grain Production, Johan van Zyl and Helmke Sartorius von Bach *(University of Pretoria)*

This paper is particularly concerned with the analysis of trends concerning farm labour-capital substitution in five major commercial grain producing areas of South Africa. Discussions involve labour and machinery usage in quantitative terms, capital-labour substitution, and the policy relevance of the findings. Only trends and annual changes are considered. The identified trends and other characteristics of the agricultural labour market have definite implications. Capital is relatively scarce in South Africa, while there is an abundance of unskilled and semi-skilled labour. Capital should thus be used with a great deal of discretion to maximize income and work creation opportunities. Policy makers should

therefore review certain policy aspects that impair job creation opportunities in agriculture and that have resulted in distorted prices of production factors relative to their scarcity.

New Human Resource Structures in the Hungarian Farm Production System, Katalin Daubner *(Budapest University of Economic Sciences)*

Industrial-type farm production systems in Hungary are operating as a form of inter-farm cooperation where one of the large farms at the centre performs coordination, research, technical development, information, and several service activities. In the process of production, the member farms join the system with their specific branches and technological procedures. The human resource endowment of these centres is illustrated on the basis of information about education, technical training, practical experience, and land-labour ratios. Recent features on the partner farms are the disappearance of "dictatorial" management approaches, organiza-tional decentralization in various forms, and the reappearance of large-scale cooperatives.

Land Use and Potential for Agriculture in Kenya, Cameron Short *(Carleton University)* and Kangethe W. Gitu *(Ministry of Planning and National Development, Kenya)*

This paper describes a method used to create a national agricultural land data base for Kenya combining land use by land potential class. Information from a detailed Geographic Information System (GIS) data base was extrapolated to the whole country with a less detailed national GIS data base. At the national level, the overall area cultivated could be increased by 32, 35, and 101 percent for high-, medium- and low-potential land, respectively.

Improved Production in Traditional Agriculture with Specific Reference to a Land Market, W.L. Nieuwoudt *(University of Natal)*

Despite population pressure, land is underutilized in KwaZulu, South Africa. A market failure situation arises due to inadequate property rights. Using data from 564 farmers, a discriminant analysis shows that the following factors were positively associated with surplus production of food: inputs purchased on credit, renting of land, savings, and wage remittances. A variable with a high standardized coefficient was that surplus farmers tend to rent additional land. Creating an opportunity cost in land by promoting renting arrangements will benefit both owners of land and users of land. Farmers are presently reluctant to rent their land due to the perception that land rights are jeopardized. Policies should focus on reducing the transaction costs in renting arrangements through legal protection. Further, a modest tax on the rent could be paid to chiefs to obtain their support. Promotion of such a rental market in land has been recently proposed elsewhere, in the former USSR and in Mexico. In a further analysis, principal components were used to cluster the socioeconomic variables. Different household types were identified, implying that policies may affect different households differently.

An Empirical Analysis of the Relationship between Personal Distribution of Non-Labour Resources and Income and Geographical Redistribution of Population: The Case of Rural-to-Urban Migration in Iran, Mohamadreza Arsalanbod *(Urmia University)*

The purpose of this paper is to analyse empirically the relationship between personal distribution of non-labour resources and income within rural areas and population redistribution from rural to urban areas in Iran. Using multiple regression analysis and a number of variables as proxies for explanatory variables normally used in theoretical models of rural-urban migration, it was found that distribution of non-labour resources and income within the rural areas has a strong influence on rural-to-urban migration. The ratio of the difference between the population born in the rural area and the population that resided in the rural area over the population that resided in the rural area was used as a measure of

rural-urban population redistribution. The variance of farmland divided by average farmland is used as a proxy for the distribution of non-labour resources and income within the rural area. The correlation between the dependent variable and the distribution of agricultural land was 0.7695 and significant at the 0.001 level. The F value for this variable was also significant at the 1-percent level.

Perception of Regional Leaders on Agricultural Problems and Revitalization: A Cognitive Map Analysis of Tono-shi, Iwate Prefecture, Japan, Toshiyuki Monma *(Tohoku National Agricultural Experimental Station)*

This study demonstrates the usefulness of cognitive map analysis applied to the clarification of regional agricultural problems and future development planning in Tono-shi, Iwate Prefecture. Regional leaders clearly recognize that the factors that are important for the revitalization of regional agriculture and the rural community include reorganizing the present small-scale rice production system and promoting further rice farm enlargement by further land mobilization and contract rice operation, which will eventually lower the cost of rice production. For the effective use of labour freed by land mobilization and contract rice operation, promotion of such farm products as vegetables, beef cattle, and forest products is important. Production systems need to be established that are low cost but also promote high-value products adapted to diversified consumer demands. The promotion of forestry is perceived as an important measure for increasing farmer's income as well as environmental conservation.

The New Village Economics, Peter H. Calkins *(Université Laval)* and Michel Benoît-Cattin *(CIRAD, France)*

This paper explores the potential strengths of using village-level economics as a complement and corrective to household and macro-level studies of the economy. Village geographical areas and analytical methods are inventoried. Gaps in current thematic coverage and analytical tools are identified. Under-utilized tools, with mathematical programming examples from Africa and Asia, are illustrated.

Income Distribution in US Agriculture, Hisham S. El-Osta and Mary C. Ahearn *(US Department of Agriculture)*

When the size distribution of personal income is examined for US farm operator households, the households within each income quartile break into two distinctive groups based on farm assets. Using data from USDA's 1988 Farm Costs and Returns Survey, it is found that more farm operator households with farm assets of less than $500,000 across all quartiles of the income distribution, in comparison to those with farm assets of $500,000 or more, have sales of $40,000 or less. In general, these households earn less income from farming, receive less in government payments, are more likely to be organized as sole proprietors, and are more likely to specialize in beef, pigs, and sheep. These households, with the exception of those in the middle income quartiles, also earn less income from off-farm sources. In terms of human capital, operators of these households and their spouses have less education.

The Economic Consequences of a Changing Rural Economy: Implications for a US Rural Policy, Ralph D. Christy *(Louisiana State University)* and James T. Bonnen *(Michigan State University)*

The process of transforming agrarian societies into industrial service-based economies poses economic and social consequences for rural areas and their residents. The purpose of this paper is to provide a pragmatic conceptual understanding of public policy imperatives for the US rural economy. It considers problems confronted by rural economies in the USA and

outlines public policies that are needed in response to these emerging problems. The paper uses a framework that suggests that the basic characteristics of an economy give rise to critical problems, and these problems require policy responses. The relationship between characteristics and problems, between problems and policy, and, in turn, between policy and characteristics, are dynamic ones. This framework is further extended to include the "theory of change," which seeks to identify the fundamental forces that influence the economic process: institutions, people, technology, and physical resources. In designing a development strategy for a rural community, region, state, or nation, all four of these prime movers must be examined for their roles and included in some balanced mix in the policies that constitute the development plan and strategy.

Public Choice and Agricultural Reform in South Africa, Konrad Hagedorn *(Universität Hannover)*, Nick Vink *(Development Bank of Southern Africa)*, and Johan van Zyl *(University of Pretoria)*

This paper uses arguments from public choice theory to explain the relative efficiency of farmers in generating political influence. The success of farmers, however, also creates an opportunity for free riding by sub-groups. In South Africa, a sub-group within the group of European farmers has captured most of the benefits of farm policy, to the detriment of all other farmers and all consumers and taxpayers.

Farm Structural Changes as Transition to Eastern European Market Economies: Ownership and Prospects in Hungary, Katalin Sebestyén *(Agricultural Economics Research Institute)* and Ferenc Fekete *(Budapest University of Economic Sciences)*

The paper is divided into the following main sections: changes in agricultural land ownership and land use patterns, economic reconstruction and agricultural policy objectives, and market orientation and social stratification. The major lessons drawn from Hungary's history in the past five decades, particularly since the 1956 revolution, are sketched. Some characteristics of the recent reform of farm structures and ownership are also analysed. From the beginning of the transition period marked by the political events of 1988/89, land ownership relations have become of central interest. The paper views the recent economic crisis and expected conditions of capital supply and labour motivation. While the secondary and tertiary economic (employment) sectors grew at a considerable rate, the productive and export capacities of Hungarian agriculture declined. In the past, relatively high incomes were not accompanied by appropriate rates of savings. In the transition from an autocratic system characterized by overcentralized planning and bureaucratic coordination to a democracy with several parties and to a market economy of mixed (including some private) ownership, Hungarian agriculture may serve as a model for and stabilizer of the overall developing political system.

Transition Towards a Market-Oriented Agriculture, Csaba Forgács *(Budapest University of Economic Sciences)*

The paper deals with the major questions of the transition period from centrally planned towards market-oriented agriculture in Hungary. The roots and the basic structure of the present agricultural performance, dominated by large-scale farming, are illustrated. The most important questions of the transition period are highlighted. Special attention is given to agricultural performance between the early 1960s and the mid-1980s. The framework of the New Agricultural Policy (NAP) is discussed in terms of the requirements of a market-oriented system, reforming land ownership, the privatization process, and the transformation of large farms into more efficient ones. The paper also covers the problem of restructuring both agricultural performance and the organization of the sector. Conclusions concentrate on how to introduce the NAP in practice and the major features it should include to develop a new environment-oriented agriculture that can also compete on the world market.

The Shift to a Deflationary Era and the End of the Road to Farm Expansion: Implications of the Farm Crisis in the 1980s, Shinnosuke Tama *(Hirosaki University)*

The aim is to indicate from an historical perspective that the 1980s marked a turning point for Japanese agriculture. After the passage of the Agricultural Basic Law in 1961 many support measures for farm expansion were introduced and facilitated by the inflation of the 1960s–1970s. Farm expansion did not take place in Japan, however, except in Hokkaido. On the contrary, an increase in part-time farming became the general trend, since the Japanese *Ie* (family) system prevented farmers from transferring property. The shift of the world economy from inflation to deflation in the 1980s dramatically changed the circumstances surrounding Japanese agriculture. Hokkaido, the major producing region of Japanese agriculture, faced a farming crisis similar to that in the USA because of scaled-down support measures. Moreover, part-time farming based upon the *Ie* system proved to be the more sustainable system during the deflationary era.

Evidence on Adjustment and Agriculture: Directions of Change for Developing Regions, Manuel Vanegas Senior *(Makerere University)*

Many developing countries, under structural adjustment, have now implemented policy reforms. The majority of them have aimed at reducing distortions in the agricultural sector, redressing financial imbalances, and liberalizing their trade régimes. Many have succeeded to some extent in the last two of these, but others have failed, and progress in agriculture and pricing policy has been limited. Real producer prices paid to producers for food and export crops continue to be eroded by inflation. In Africa, price and marketing controls continue to have an adverse effect on the performance and needs of small farmers. Excluding Argentina and Brazil, Latin America needs to import about $2,000 million of foodstuffs to feed its people, and inappropriate trade régimes and extremely large fiscal deficits are hindering the efficient use of its productive potential. In the long run, supply responses to change in prices are strong. The question of how to deal with the problems of the short run remains unsolved. Malawi shows a short-run elasticity of 0.09, compared with 0.63 in Chile. Building human capital, strengthening institutions, and infrastructural improvement can be more of an incentive to agricultural output than prices.

Searching for the Old Strategy: Polish Peasant Farming in the 1990s, Zbigniew Kowalski *(Academy of Technology and Agriculture, Poland)*

In mid-1990, when the market-oriented price system for agriculture was discussed in Poland, peasant farmers were among the most ardent supporters of the change. Now, their enthusiasm has abated abruptly and they want state intervention in the market. The newly introduced system faced farmers with problems they never encountered under Communist rule. Although they had been anxious during the previous 45 years about the long-term existence of family farming under collectivization, they were, in fact, quite secure. Farm bankruptcy was something unknown to Polish farmers. The durability of family farms was even confirmed by the Constitution Act. After the Communist system had been dismantled, anxiety about the future turned, paradoxically, into reality. The paper discusses the most vital problems faced by Polish farmers during the present period of rebuilding the market mechanism in the economic environment shaped by the previous system of central planning.

Price Analysis and Technology

General Equilibrium Approach: Lessons from Theory, Jacques Loyat *(Ministère de l'Agriculture et de la Forêt, France)*

Applied general equilibrium (AGE) models are part of a growing literature on international trade policy analysis. Insofar as models are used in a normative way, this poster seeks to summarize the limits of such models. A general competitive economy is a Walrasian one, where prices are market signals; an equilibrium is established through agents' preferred actions. The temporary equilibrium hypothesis achieves a good level of simplification for applied models, but it is not Pareto efficient. Incomplete information and uncertainty do not conflict with general equilibrium, but they make applied models more complicated. The limit of the AGE approach is reached with non-Walrasian equilibrium. Equilibrium with rationing generalizes the notion of Walrasian equilibrium by allowing markets not to clear. The Hicksian fixed price model provides a different method of analysis that links micro- and macroeconomics and where prices are taken outside the model. The conjectural analysis introduces interaction among agents, the effects of which are subject to conjecture. These are important extensions of the understanding of the economy, insofar as models cannot disregard history. AGE models give a simplified representation of an idealized exchange economy, where generally no comparison between prediction and experience is done.

Direct Comparison of General Equilibrium and Partial Equilibrium Models in Agriculture, James V. Stout *(US Department of Agriculture)*

Both partial equilibrium and general equilibrium models are used for the study of agricultural policy liberalization. Partial equilibrium models can include detailed descriptions of agricultural markets and agricultural policies but are criticized for not considering intersectoral effects. General equilibrium models capture the intersectoral effects but often lack the agricultural market detail of the partial equilibrium models. The model described in this paper represents an attempt to reconcile partial equilibrium and general equilibrium modelling techniques by building a general equilibrium model based on the same agricultural sector information as in the US Department of Agriculture's partial equilibrium SWOPSIM model. The model is able to produce agricultural sector supply and demand response consistent with partial equilibrium elasticity estimates because it uses a generalized form of CES function called a "constant-difference elasticity" function to represent producer behaviour towards production (output) decisions and consumer behaviour towards consumption decisions. Results for the general equilibrium model's agricultural sector are not significantly different from the results for the partial equilibrium model on which it is based. The general equilibrium model shows how changes in non-agricultural supply and demand take place after agricultural policy liberalization, and it allows welfare changes to be easily and unambiguously calculated in terms of either equivalent or compensating variation.

Factor Markets and Agricultural Policy Shocks, Bradley J. MacDonald *(US Department of Agriculture)*

Nearly all existing computable general equilibrium (CGE) models use quite restrictive functional forms for the specification of technology, i.e., Cobb-Douglas or CES. While some authors have used flexible functional forms, the global stability properties for equilibrium analysis of these forms can be problematic. This paper applies recent theoretical work on the nonseparable constant elasticity of substitution (NCES) functional form to the specification of technology in the Japanese component of an existing four-region CGE model. The results of a unilateral agricultural policy liberalization by Japan under the NCES form are compared to earlier results using the standard CES form. The use of improved functional forms in this

example is of great importance for the analysis of the effects of liberalization on factor markets and of modest importance for the effects on agricultural output and prices.

Effects of Japanese Monetary Policy on Agricultural Income, Tada Minoru *(Shikoku National Agricultural Experiment Station)*

Japanese agriculture will be strongly influenced by macroeconomic factors such as foreign exchange rates or interest rates as well as agricultural policies, since its markets will be tightly linked to the world markets after the introduction of market liberalization for beef and oranges. The effects are analysed of Japanese monetary policy (i.e., official discount rate and money supply) on agricultural income through the fluctuations of the yen-dollar exchange rate and prices of imported agricultural products. Equations composed of a yen-dollar exchange rate determination, a money supply-inflation multiplier, the relationship between exchange rate and agricultural product prices, and production and income functions of rice and non-rice sectors are estimated. These estimated results show that a 1-percent increase in the rice price leads to a 1.74-percent increase in the income of the sector and that a 1-percent increase in the money supply growth rate and a 1-percent decline in the official discount rate lead to increases of 0.32 and 0.03 percent, respectively, in the income of the non-rice sector. A 1-percent increase in the rice price and a 5.4 percent increase in the money supply growth rate thus seem to have equivalent effects on agricultural income.

Exchange Rate Appreciation: The Case of Taiwan's Grain Prices, Cameron S. Thraen *(Ohio State University)*, Ain-Ding Liaw *(Council of Agriculture, Taiwan, China)*, and Donald W. Larson *(Ohio State University)*

This study investigates the macroeconomic linkage between exchange rates and the Taiwan grain sector. The appreciation of Taiwan's currency against the US dollar during the 1980s may decrease domestic prices and increase imports of maize, sorghum, wheat, and soyabeans. The exchange rate impact on Taiwan's prices, imports, domestic consumption, and production of grains is analysed by developing a simultaneous equation model that incorporates the exchange rate, cross-price, income, and target price variables. Elasticities are estimated from both the structural trade model and its reduced form. Taiwan's grain imports, with respect to the world price in real domestic currency, are elastic for maize, sorghum, and soyabeans and inelastic for wheat. Taiwan's domestic target price policy has no significant effect on grain imports. The empirical results of the reduced form model suggest that Taiwan's exchange rate appreciation has decreased domestic prices for maize, sorghum, soyabeans, and wheat. The exchange rate elasticities are positive and inelastic for all grains. The elasticity of grain prices in Taiwan with respect to real income is positive for maize and negative for the other grains.

The Production Response of the Firm to the Elimination of Commodity Support Programmes in the USA, Phil Johnson and Eduardo Segarra *(Texas Tech University)*

The production response of a farm in the Texas High Plains to the elimination of support programmes for certain agricultural commodities in the USA is estimated using duality theory. Linear programming methods were used to derive optimal profit-maximizing combinations of enterprises with current farm programmes and without farm programmes for a grain/cotton farm. An indirect profit function was estimated using ordinary least squares methods. Duality theory was used to derive the farm supply functions for each commodity with and without farm programmes. The results indicate that a short-run increase in the supply of each commodity due to shifts of the supply curves would be expected.

Fiscal Reform and the Chinese Wool Industry, Du Yintang *(Chinese Academy of Social Sciences)*, Gregory J. Williamson *(University of Queensland)*, and Ross G. Drynan *(University of Sydney)*

Reforms aimed at improving allocative efficiency and promoting the modernization and growth of the Chinese economy were set in motion in 1979. Fiscal reforms giving all levels of government incentives and responsibility for their own budgets were introduced to encourage greater efficiency. This contributed to a phase of investment in regional wool processing facilities by lower levels of government in those regions where there is little other industry and thus little opportunity for collecting tax. Further, after the central government relaxed national wool market policies, provincial and county governments had varying incentives to introduce their own wool market controls, with those dependent on the wool industry for revenue often rigidly controlling the market.

The Supply of and Demand for Malaysian Palm Oil, Karsheng Au and Milton S. Boyd *(University of Manitoba)*

This paper investigates the supply response, demand for, and stocks of Malaysian palm oil using an econometric model. Both the long-run price elasticities of supply and the price elasticities of demand for Malaysian palm oil are quite elastic. The relatively high elasticity of export demand suggests that a large increase in quantity supplied would increase export earnings for Malaysia because the palm oil price would only decrease slightly in relation to the increased quantity. Restrictions on production to raise prices and revenue would be likely to fail because the increased palm oil price would not offset the revenue lost, due to the lower quantity exported. But since the population elasticity of export demand is much higher than the income elasticity, it appears that most of the increase in export demand for palm oil in the future will be through population increases, rather than increases in income.

A Political Economic Analysis of Philippine Sugar Pricing, Rigoberto Adolfo Lopez *(University of Connecticut)*

The focus is on the motivation for government intervention in the Philippine sugar market. Regression analysis was performed using real consumer prices and the ratio of domestic/world sugar prices as dependent variables and a set of commodity and political market variables as regressors. The results support the notion that the government has responded to distributional concerns as well as political economic issues beyond the sugar market in the post-war period. The goals and weights placed on various societal groups changed markedly over the industrialization period (1945–61), the Marcos' years of political upheaval (1974–85), and the recent period under President Aquino (1986–92). The US quota, in particular, has played a central role.

Livestock Pricing Policies and their Effects in Five Sub-Saharan African Countries, Timothy O. Williams *(International Livestock Centre for Africa)*

Livestock pricing policies in many developing countries are often instituted without a good appreciation of the consequences of such policies for allocative efficiency, output, and trade. This paper evaluates, in a comparative cross-country context, the objectives and instruments of livestock pricing policy in five sub-Saharan African countries—Côte d'Ivoire, Mali, Nigeria, Sudan, and Zimbabwe—during the 1970–86 period. It assesses the extent to which pricing policy objectives have been attained and also estimates the effects of price interventions on output, consumption, trade, and government revenues. The empirical results indicate that, in comparison with real border prices, a certain degree of success was achieved in stabilizing real domestic producer prices. The results also show that since the early 1980s, there has been a gradual shift away from taxation of producers. However, consumers still appear to gain as much as producers in three of the study countries, with negative consequences for foreign

exchange earnings and government revenues. The analysis reveals the importance of domestic inflation and exchange rates as key variables for livestock pricing policies and highlights the need to address the macroeconomic imbalances that cause exchange rate distortions and high domestic inflation at the same time that direct price distortions are being tackled.

Prices of Livestock Products in Japan and other Countries, Michio Sugiyama and Katsuyuki Oguri *(Gitu University)*

The price of livestock products (except eggs), especially beef, pigmeat, and chicken, has been high in Japan and higher than in the countries that export to Japan. In order to analyse the reasons for these high prices and clarify the marketing process, comparisons were made between countries in terms of prices at different stages of the marketing chain. Beef prices in Japan are 2.8 times those in the USA, and the prices of calves, live cattle, carcasses, and portioned and sliced meats are higher than in the USA. This is because the marketing channels are complicated and the cattle and meat merchants are numerous and scattered. Also, the marketing form or style changes with the marketing level; live animal, carcasses, and portioned and sliced meat. Integration of the broiler industry has advanced in Japan, but cutting and further processing have not been fully integrated. The reason why the processing cost of meat has been higher in Japan than in Thailand is the high price of land and labour. Pigmeat and egg prices are also analysed. Marketing and distribution costs could be reduced by enlarging the scale of production and integrating marketing and processing.

Production Efficiency of Multiproduct Milk Plants in Taiwan, Ming-Ming Wu and Tsorng-Chyi Hwang *(National Chung-Hsing University)*

This research applies the multiproduct translog cost function to analyse the efficiency of dairy plants producing milk for drinking, including fresh flavoured, preserved, and fermented milks, in Taiwan. The sample points are monthly data for 168 firms for 1988 and 1989. Dairy plants have an inelastic demand for domestic raw milk with respect to price. A small increase in raw milk supply may largely depress the milk price. Enlarging the difference between market and government fixed prices may increase the use of imported milk powders as substitutes for domestic raw milk. Providing that the short-run supply elasticity is smaller than that of demand, most risks of the decreased price should be borne by dairy farmers. The demand for research funds is elastic with respect to prices. Since research and development is beneficial to the performance of material, manufacturing, and management inputs, it is suggested that dairy plants invest in research and development and increase expenditure on it. Manufacturing costs and wages have a high degree of substitution. If the wage rate increases, dairy plants should increase capital inputs to improve automation. Plants already producing all dairy products are not recommended to increase outputs at the same time. Plants producing preserved milk may increase inputs to seize scale economies. Plants producing fresh flavoured and preserved milks should increase the production of fermented milk. There is no need for plants producing fresh milk only or plants producing all products except fresh milk to add the production of new products.

Impacts of Alternative Government Policies on Farm Investments, Doo Bong Han *(Korea Rural Economics Institute)* and John B. Penson, Jr. *(Texas A&M University)*

The focus of this study is modelling investment in durable farm inputs under alternative expectations patterns in the US farm sector. The neoclassical investment model is chosen over other approaches because of the direct linkages that can be established between farmers' investment and government policies, including macroeconomic policy and farm policy. The estimated equations for the alternative expectations patterns are endogenized into the AG–GEM model to examine the extent to which each hypothesis filters the impact of two topics of current interest: no chemical use and high deficits. *Ex ante* simulation results suggest that farmers' expectations may also depend on the durability of an asset or a commodity. Shorter

lived assets (equipment) are more sensitive to current information-based expectations than longer lived assets (structures).

Investment Behaviour of Farmers: An Empirical Assessment of Alternative Expectations Specifications, Geert Thijssen *(Wageningen Agricultural University)*

Demand functions for capital were estimated using an incomplete panel of Dutch dairy farms. Three forms of expectations formation about the path of future variables were used: static expectations, non-static expectations, and rational expectations. The models based on static and non-static expectations fit the data well. The own-price elasticity of the output is 0.10 in the short term, 0.21 in the intermediate term, and 0.84 in the long term for the model based on static expectations of prices and fixed factors. For the model based on non-static price expectations, the results are approximately the same. The results with respect to the rational expectations model are not consistent with the received theory. It is possible that this rejection of the rational expectation hypothesis is due to the instrumental variable estimation technique used.

Cross-Country Comparisons of Technical Progress and Efficiency Gains in EC Agriculture, Eldon Ball and Hyunok Lee *(US Department of Agriculture)*

Not all countries are identical in their productivity performance. Their relative productivity efficiency differs. Productivity growth of the most efficient, or "best practice," countries requires new technical innovations. Those countries not performing at full efficiency, however, can potentially improve productivity by increasing efficiency with existing technology. The emerging EC–1992 will probably lead to increased flows of resources and technologies among member countries. Thus, the new economic environment will help countries improve efficiency levels. Evaluating a country's relative performance provides information on the potential efficiency gain of that country. Identifying the "best practice" technology, however, provides information on how to reallocate resources to capture those efficiency gains.

Technology Adoption and Productivity: A Simultaneity Problem, Lydia Zepeda *(University of Wisconsin)*

An adoption model is estimated to determine factors affecting the adoption of a record-keeping system (DHIA) by California dairy farmers. Since productivity both influences technology adoption and is influenced by the adoption, a single-equation adoption model contains simultaneity bias. Thus, productivity and DHIA adoption are estimated as a mixed system of equations with continuous and discrete endogenous variables. Generalized probit does not rid the system of simultaneity bias, so two-stage least squares, as suggested by Heckman, is used. When the results are compared with biased single-equation estimates, the implications are quite different. System estimates indicate that DHIA does indeed improve productivity, while productivity has no effect on adoption of DHIA. The biased single-equation estimates indicate that education and industry involvement enhance DHIA adoption, while productivity diminishes it.

Technology Adoption on Third-World Small Farms, Ganesh P. Rauniyar and Frank M. Goode *(Pennsylvania State University)*

The study examines the interrelationships among five technological adoption practices and identifies packages of practices. The socioeconomic determinants of these five individual practices are then compared with the determinants of adoption of a corresponding package of practices to determine whether explanatory variables explaining single practices are significantly different from the package model. Finally, conclusions are drawn from the package of practices models. The results suggest that five practices are summarized by two distinct but independent packages, referred to as the "basic" and the "advanced technology"

packages. Adoption of the basic technology package is explained by household educational level, revenue from sale of maize, proximity to the output market, amount of credit, number of cattle owned, and per-ha family labour units available on the farm. The number of household members working off the farm, the level of education of the male heads of household, and less variability in rainfall are important for "advanced technology" package adoption. Furthermore, the variables explaining adoption of individual practices are different from the variables explaining adoption of a package of practices. The study concludes that inferences would differ depending upon the nature of interrelationships among technological practices. If the practices are interrelated, as in this study, then the policies based on individual practice models will be misleading.

The Impact of Tractorization on Employment in Agriculture Using the Translog Cost Function, Farman Ali *(University of Agriculture, Pakistan)* and Ashok Parikh *(University of East Anglia)*

The objectives of this study are to study the impact of tractorization on employment and input use in the Northwest Frontier Province of Pakistan (NWFP) using farm-level survey data for 98 farms. The study established that human labour and tractors are substitutes for one another. Similarly, draught power and tractors are substitutes. These relationships are expected in NWFP agriculture. The demand for fertilizers is price elastic, and, if a subsidy scheme were operated, it would significantly increase this demand. On the other hand, the demand for human labour is price inelastic, due to the existence of surplus family labour. The policy of taxing tractor use can lead to greater use of both human labour and draught power. If there were a choice between taxing tractor services versus a subsidy on human labour, the former would be preferred if the objective was to increase labour employment.

Application of Risk Analysis in the Adoption of New Maize Technology in Zaïre, Glenn C.W. Ames *(University of Georgia)*, Donald W. Reid *(University of South Alabama)*, and Li-Fang Hsiou *(University of Georgia)*

A quadratic programming model was used to analyse the adoption of new maize technology, subject to minimum food security requirements and agricultural policy constraints, in the Kasai Oriental Region of Zaïre. Net returns to four levels of maize technology for the primary and secondary rainy seasons were evaluated in combination with staple food crops for four cropping systems with and without mandatory cotton production. The results indicate that cropping systems that include new maize technology were more risk efficient than those with local maize varieties. Minimum food security requirements were met. The analysis indicates that mandatory cotton production was not risk efficient at the prevailing price and yield levels in the Kasai-Oriental farming system. Mandatory cotton production not only lowered the level of profitability but also increased the variability of returns for a given level of expected returns. Zaïre and other African countries must analyse policy constraints to agricultural growth and evaluate on-farm technology. To stimulate the adoption process, the technology package needs to be evaluated from a risk efficiency perspective.

Method for Assessing and Verifying Efficiency of Farm Management in Vegetable Growing, Masayuki Yoshida *(Chiba University)*

The aim is to prove that discriminant analysis can be applied to assessment of management efficiency in vegetable growing and that statistical methods can be used effectively to perform an assessment by variety of crop. Discriminant analysis is found to be effective for analysis of a single production activity, and the method is considered superior to the direct comparison method in that it makes analysis of factors possible. Discriminant and standardized scores are useful to discover analytically defects in farm management and to make an assessment of these defects; in order to make a diagnosis by variety, regression analysis and other statistical methods are useful to analyse such determining factors of

significant management indexes as shipment price and yield per 10 ares. It was also found that, in regression analysis, calculated residuals can be used for the diagnosis.

Market Factors, Government Policies, and Adoption of New Technology by Small Farmers in Honduras, Miguel A. Lopes *(Centro Internacional de Mejoramiento de Maiz y Trigo)*

This paper reports the findings of a recent study on the potential effects of new soil erosion control and sorghum technologies on the income and productivity of small farmers in Honduras and explores the relationship between potential adoption rates and government agricultural policies. A discrete stochastic programming model, based on the results of a socioeconomic survey of farmers in the region, was used for the analysis. Results indicate that the soil conservation technologies are profitable and enable more intensive and sustainable hillside farming systems. When resource constraints and key policy variables are relaxed, improved sorghum cultivars combined with fertilizer and insecticide would allow further productivity gains once the land is improved. Income gains of 70 percent, risk reduction by 15 percent, and doubled expected grain production can be achieved when both technologies are introduced and the cereal price collapse is avoided. Suggested alternatives to moderate the price reductions expected from increased cereal production include storage bins for surplus sorghum and increased small animal production using surplus grain for feed. Policy initiatives that encourage these activities and offer greater access to official credit at more favourable conditions would facilitate adoption of the technologies.

The CAP Faces European Unification and the GATT, David R. Kelch and Mary Lisa Madell *(US Department of Agriculture)*

The unification of Europe through the EC harmonization programme, German unification, economic and monetary union, and political union will affect the production, consumption, and net trade of food and agricultural products in the EC. The Common Agricultural Policy (CAP) of the EC is also under pressure from its agricultural trading partners in the Uruguay Round of the GATT. The EC's harmonization programme threatens the agrimonetary system, which is the price-setting mechanism of the CAP and its most distorting aspect. German unification will add more productive capacity to the CAP in products that are already in surplus. The GATT negotiations should result in lower CAP prices and reductions in other forms of production-enhancing support. The adoption of market-oriented agricultural policies in Eastern Europe will add to the oversupply of temperate zone products in Europe. All these pressures should lead to lower CAP prices and less farm support.

Estimation of Wheat Production Response Functions by Province for China: Implications for Trade, Shwu-Eng H. Webb *(US Department of Agriculture)* and Catherine Halbrendt *(University of Delaware)*

This paper uses crop production acreage and price data by province over the 1979–88 period to estimate provincial wheat production functions for China. The study shows that wheat production during the 1980s in China was responsive to changes in crop prices. Peasants in China still have very limited power in allocating land in response to prices. Within this constraint, the economic incentive in terms of crop prices does provide a mechanism to allocate variable inputs and, thus, affect yield and production. This paper further analyses the impact of continuing reform in agricultural production on provincial wheat production. The effects of crop prices on wheat self-sufficiency are discussed.

An Application of Composite Forecasting to Predict the Impact of EC Milk Quotas on Milk Supply at the Farm Level, Franco Rosa *(Università Cattòlica di Piacenza)*

Milk quotas introduced in the EC since 1984 have induced reactions from milk producers due to changes in market prospects and expected revenues in the short to medium term. An attempt is made to simulate, using alternative forecasting techniques, the future supply of milk in Italy and to evaluate farmer reaction to quotas. Statistical tests showed that composite forecasting using adaptive and minimum variance weights was able to predict milk supply more accurately than other forecasting methods (single and composite). The forecasts obtained predicted the supply pattern quite closely and confirmed the decline in supply and the overreaction of producers to the market uncertainty caused by the quota restriction.

The Growing Demand for Food Quality: Implications for Agricultural and Trade Policy, Harald von Witzke *(University of Minnesota)* and Ian M. Sheldon *(Ohio State University)*

The growing demand for many food quality components is usually expressed in the form of a growing demand for food quality standards. Such standards represent public goods and thus involve market failure. The general focus of this paper is on both the nature of this market failure and its central implications for agricultural and trade policy. If competitive markets do not generate the necessary standard-assuring mechanisms, the nature of such a market failure needs to be understood. By setting out a simple model of contractual enforcement, it is possible to show that asymmetric information on food quality components is sufficient for the quality enforcement mechanism not to work in the case of food safety. Given that public institutions will tend to set nationally divergent food quality standards, many will act as barriers to trade. Therefore, political coalitions between consumers and agricultural producers are likely to gain in importance, which will add a new dimension to attempts at international agricultural and trade policy coordination.

On the Importance of Including Microeconomic Information in General Equilibrium Models, Federico Perali *(University of Wisconsin)*

The main objective of the study is to evaluate the advantages for policy making of including microeconomic information within general equilibrium models. What is often neglected is the richness of information contained in Sah and Stiglitz's description of the economics of price scissors, both in regard to producer and consumer choices and to government behaviour in choosing the rules to reform the terms of trade. In particular, input, land, labour, and consumption allocation decisions are not modelled by taking into account the theory of the farm household and government behaviour in the process of price formation. Following the analytical structure exposed in Sah and Stiglitz, the present study proposes some modifications of classical structuralist general equilibrium models to incorporate such micro-information and discusses some policy implications.

Food Consumption, Marketing, and Credit

Food Consumption Patterns of Asian Countries, Michio Kanai *(National Research Institute of Agricultural Economics, Japan)*

This paper seeks to classify 27 Asian countries by their food consumption patterns using a cluster analysis method. Five possible groups, Asia high- and middle-income, West Asia, Southeast and East Asia low-income, South Asia low-income, and isolated countries, were found. The food consumption patterns of countries belonging to the Asia high- and middle-income group change more rapidly over time and seem to become relatively similar.

Changes of Diet Patterns in Japan, Korea, and Taiwan: Application of Principal Component Analysis to Food Balance Sheets, Yasuhiko Yuize and Hiromichi Inaba *(Chiba University)* and Youko Miura *(Chiba Keizai University)*

Economic development tends to change diet patterns, which has an effect on the food industry. The significance of this change is assessed by applying principal component analysis to the food balance sheets of Japan, Korea, and Taiwan during 1965–87. The Japanese experience is analysed in detail, so that changes in the three countries can be compared on the basis of the Japanese case. Finally, changes in the diet patterns in the three countries are classified by plotting the scores of the second and third components with those of the first component. Three main components in the three countries can explain almost the all changes in food patterns. The first component, the trend or structural change factor, suggests that Japan and Korea belong to the same group, while Taiwan is different. The third component, the stability or nutrition adjustment factor, suggests that Japan and Taiwan belong to the same group, with Korea the exception.

Estimating Consumer Purchase Intentions for Organic Produce, Chung L. Huang and Sukant Misra *(University of Georgia)*

The study postulated a sequential probit model to estimate consumer purchase intentions for organic produce based on data collected from a mail survey of Georgia residents. The first equation estimates the probability that a respondent would prefer to buy organic produce. Results suggested the profile for potential organic buyers is consumers who have fixed attitudes on use of chemical pesticides on fresh produce, want produce to be tested and certified as residue-free, tend to believe that organic produce offers better nutritional value, are younger than 30 years or older than 60 years, and have annual household income of less than $20,000. The second equation estimated the probability that a potential organic produce consumer would buy organic produce with apparent sensory defects. Results suggested that consumers who would accept low sensory quality are likely to be white, have a higher educational level, and have a larger family. The study concludes that consumers have found organic produce attractive mainly because of concerns about food safety associated with pesticide residues. The most important factors for the marketing potential of organic produce are testing and certification for freedom of chemical residues, good sensory qualities, and a reasonable price that is competitive with conventionally grown produce.

Optimal Marketing Decisions under Imperfect Competition with Price Uncertainty: A Programming Model with Stochastic Demand Functions, Teruaki Nanseki *(National Agricultural Research Centre, Japan)*

This paper presents a new optimal marketing planning model where stochastic demand functions, transport costs, and various marketing constraints are incorporated. The model is formulated by quadratic programming with stochastic linear coefficients. This model is applied to problems of marketing pimentos in Miyazaki Prefecture, Japan. The risk averse and risk neutral optimal solutions are obtained and compared with actual quantity marketed. The results show that the risk averse solution is closer to the actual marketing quantity than the risk neutral solution, which is equivalent to that of an ordinary quadratic programming model with deterministic revenue functions. This implies that risk plays an important role in the marketing planning model under imperfect competition as well as in the model under perfect competition.

Branded Product Licencing: An Alternative International Marketing Strategy for Food and Beverages, Ian M. Sheldon and Dennis R. Henderson *(Ohio State University)*

Empirical evidence shows international licencing of the production and marketing of branded food and related products to be an important aspect of the globalization of the food

industry. Empirical evidence on the extent of international licencing is presented. Recent theoretical literature on licencing has dealt only with the licencing of process technologies. The paper therefore considers the possible motives for branded product licencing using a simple game-theoretic structure. The results suggest that imperfect competition in overseas markets and imperfect information may be important determinants of international product licencing. For a licensor, product licencing can be treated as a substitute for either exporting or direct foreign investment or as part of a long-term strategy for overseas market development. For a licencee, licencing may represent a lower cost method of product line extension and/or a means of discouraging market entry by a foreign competitor.

Farmers' Selling Decisions for Vegetables in Taiwan: The Case of Cabbage, Tsorng-Chyi Hwang and Ming-Ming Wu *(National Chung-Hsing University)*

Four vegetable marketing channels are proposed for cabbage farmers in Taiwan to sell their products. The aim is to find ways of improving cooperative marketing for vegetables. Eighty-one observations are estimated using the seemingly unrelated regression technique. The main findings are that small, full-time cabbage farmers tend to prefer direct marketing but those involved in processing prefer local dealers. Cabbage farmers do not trust grading standards and would like to have unstable prices. For other marketing channels, the nearby wholesale market is preferred by experienced farmers and those with labour and cash shortages. Cooperative marketing is preferred by growers, those with labour and cash shortages, and those near collection points.

The Competitive Structure among Japanese Wholesale Fruit and Vegetable Markets and Consumer Welfare, Fujishima Hiroji *(Chugoku National Agricultural Experiment Station)*

Currently, 22 Mt of fresh produce (fruit and vegetables), or three times as much as rice, is marketed every year in Japan. Nearly 90 percent of this produce is distributed through wholesale markets. The objective of this report is to explain variations in the competitive structure among wholesale markets for fresh produce in the last two decades and the increase in consumer welfare due to this variation. Competition among the large, central wholesale markets plays the dominant role, although it was weak in the past. An increase in the distribution areas for the central wholesale markets and distribution to supermarkets has increased competition. A high level of competition among the central wholesale markets has enabled consumers to purchase any item for a long period throughout the year, more items than before, and each item at almost the same price in any part of the country.

The Reorganization and Future of the Rice Control System in Japan, Tokuzo Mishima *(Hokkaido University)*

In 1942, the Japanese government introduced the Food Control System *(Shokuryo Kanri Seido)* in order to administer the production and consumption of food during wartime. This system evolved from the end of the war (1945) until the early 1960s as a system to protect the interests of both the rice-producing farmers and rice consumers. As a result of overproduction and a decrease in demand for rice since the late 1960s, the system was reorganized by weakening its former controlling function and, at the same time, strengthening its marketing function. However, it is apparent that the liberalization of domestic distribution will inevitably lead to the participation of large firms in the rice market and liberalization of rice imports. Since rice is a staple food and a key crop, it is essential to introduce necessary reform to the rice control system and also to ensure its functioning in order to maintain self-sufficiency in rice.

Scale and Scope Economies of Japanese Agricultural Cooperatives: Multiproduct Cost Function Approach, Tamotsu Kawamura *(Iwate University)*

This paper clarifies the present state of scale and scope economies in Japanese multipurpose agricultural cooperatives using multiproduct production theory. Their translog multiproduct cost functions are first estimated, and measurements of scale and scope economies are then derived from the estimated cost functions. The main conclusions are that Japanese agricultural cooperatives have multiproduct scale economies, product-specific scale economies are observed only in credit cooperatives but these also have scope economies, and there is cost complementarity between credit and purchasing cooperatives, while other combinations are not effective for cost saving.

Eroding the Remnants of Apartheid in Namibia: Structural Adjustment in the Beef Industry, Diethelm Metzger *(farmer, Namibia)* and Helmke Sartorius von Bach and Johan van Zyl *(University of Pretoria)*

The paper considers the regional influence of prices and access to markets on beef cattle numbers in Namibia, given the present inequalities, using econometric analysis of time-series data. This is particularly relevant because Namibia is in a process of structural adjustment following its recent independence and in view of the beef sector's importance in the Namibian economy. The results accentuate the role of access to markets in beef production in Namibia. In cases where access is severely restricted due to lack of infrastructure like processing facilities and adequate transport, for example in the communal regions, beef producers do not act on price incentives or react to climatological and ecological variables. On the other hand, beef producers with limited access to markets, mainly due to high transport costs, do react to environmental changes, but not to price incentives. Only producers with easy access to markets react to both environmental changes and price incentives. The major conclusion is that the present production and marketing structure in Namibia with respect to beef is probably non-optimal. The results highlight the need for an overall policy that accounts for all related industries, producers, consumers, and other relevant factors simultaneously.

The Marketing of Live Small Ruminants and Meat in Highland Balochistan, Khalid Mahomood *(Arid Zone Research Institute, Pakistan)* and Abelardo Rodriguez *(International Centre for Agricultural Research in the Dry Areas)*

The study identified livestock/meat marketing practices in highland Balochistan, Pakistan, through interviews with producers, village dealers, wholesalers, commission agents, butchers, and consumers. The majority of small ruminants are produced under transhumant/nomadic pastoralist systems. Producers showed a lack of knowledge regarding market forces and quality of livestock, thus limiting their ability to increase their income. However, they incorporate liveweight in their perception of livestock price per unit of weight. The average liveweight of sheep and goats was 24.1 kg/head with an estimated farm-gate price of Rs 496/head. The price paid by consumers was Rs 716/head. The services of intermediaries in the marketing chain represent 31 percent of the price paid by the consumers. Meat grading is absent, but there is government regulation of the retail price. Consumers thus have no mechanisms to convey their degree of dissatisfaction to producers through intermediaries in the marketing chain. Most of these services could be improved for the benefit of consumers and producers: the overall volume of the market could be higher, meat quality could be more uniform, and some marketing costs could be reduced. Extension efforts to improve producer market awareness, however, will face the risk minimizing strategy of the highland Balochistan pastoralists.

Inappropriate Rural Banking Policy Assumptions in a Developing Economy: Evidence from a Discriminant Analysis, Aja Okorie *(University of Agriculture, Nigeria)*

Ten years after the establishment of the Rural Banking Scheme in Nigeria, there are clear indications that the problems and issues that led to it are still prevalent. This study questions the validity of the central assumption of the scheme, that increasing the physical proximity of banks to the rural people enhances rural savings mobilization and increases the flow of funds to the rural sector. Rural residents were surveyed, and discriminant analysis of the data showed that four variables were significant in discriminating between rural bank users and non-users: household income, years of formal education, gender of respondent, and the awareness of the existence of the rural bank branch. The proximity of the bank to the respondent's residence was not a significant determining variable. These findings have important implications for rural bank designers and implementors in Nigeria and other developing countries. They suggest that the current excessive emphasis on physical distance as a critical factor in rural bank development in Nigeria should give way to a more comprehensive strategy, which would incorporate the four critical variables identified in this study.

Loan Repayment in Rural Financial Markets: A Multinomial Logit Analysis?, Nelson Aguilera-Alfred and Claudio Gonzalez-Vega *(Ohio State University)*

This paper analyses the repayment performance of loans disbursed by a typical developing country specialized lender, the Agricultural Development Bank of the Dominican Republic. It shows that loans in default are just one dimension of the repayment problems faced by specialized lenders and that rescheduling and payment of arrears should not be ignored. It also shows that, by following through time the status of loans disbursed in a particular period, the factors determining repayment performance may be better identified. It also shows how the results of multinomial logit analysis can be used by lenders to analyse the various types of potential repayment problems that they encounter.

Agricultural Loan Recovery Strategies in a Developing Economy: A Case Study of Imo State, Nigeria, Andrew C. Iheanacho *(University of Maiduguri)* and Aja Okorie *(University of Agriculture, Nigeria)*

Recovery of loans is critical to long-run viability of agricultural credit systems in most developing countries. There exists little understanding of the strategies and considerations lending agencies adopt in dealing with the problem. This paper thus provides some empirical evidence on loan recovery strategies of agricultural lending agencies in Imo State, Nigeria. It shows that both formal and informal lending agencies strive to deal with the defaulters in what they perceive as the most cost-effective way. Adoption of any strategy depends on a complex interaction of factors on the demand and supply sides of credit. These suggest that the lender, the borrower, and socio-political factors must be taken into consideration in planning effective loan recovery strategies in developing countries.

Applying Contestability Theory to Rural Informal Credit Markets: What Do We Gain?, Emmanuel F. Esguerra, Geetha Nagarajan, and Richard L. Meyer *(Ohio State University)*

The proposition of the theory of market contestability is applied to analyse whether certain identifiable features of the rural credit markets lend support to the contestable market hypothesis. Data of the type typically available from field surveys are used to argue that contestability of the rural informal credit market in the Philippines, given the methodological and data limitations, is empirically difficult to prove. The paper further argues that the effort to find evidence of market contestability is not necessary to argue against government regulation of informal financial markets.

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Are Land Banks Feasible as Market-Driven Substitutes or Complements of Land Reform? Some Insights for Central America, John Strasma *(University of Wisconsin)*

With land reforms in Central America completed or politically unviable, land banks could enable the landless to buy land parcels in the market. Pilot programmes are not replicable, but this paper suggests that land banks could be solvent, could transfer a significant amount of land, and could be viable without continuous government or external subsidy. Downpayments would be indispensable, and these banks would not provide costly social services. Buyers could resell the land freely to other *campesinos*, who would assume their land debt. Payments should be indexed to product prices where inflation is a problem. Sellers will have to carry much of the paper transaction as land contracts, increasing the land price to provide what they deem an acceptable return. Loan delinquency was eliminated successfully in a private Salvadoran land sale programme and in a Dominican Republic rice production credit programme. The former uses renting with option to buy; non-payers can be evicted quickly for non-payment of rent. In the Dominican Republic example, informal, temporary foreclosure by peers is used as the enforcement mechanism. Thus, creative methods can eliminate loan delinquency, a major threat to a land bank. The real key is to eliminate paternalism, allowing unsuccessful farmers to sell freely to others, as in any other business.

Informal Finance through Land Pawning Contracts: Evidence from the Philippines, Geetha Nagarajan *(Ohio State University)*, Cristina C. David *(International Rice Research Institute)*, and Richard L. Meyer *(Ohio State University)*

Land pawning contracts in which the pawner temporarily transfers his land cultivation rights to the pawnee in return for a loan with an agreement to redeem it on loan repayment have increased in importance in Philippine rice-growing villages. This paper uses cross-sectional data from farm households in five heterogenous production environments to analyse the determinants of the choice of pawning contracts. The analysis shows that land pawning is an informal credit instrument used by small farmers to obtain large loans to finance productive investments, such as non-farm employment, where the returns to investment are high. An econometric model was developed to examine the factors affecting the choice of pawning contracts and the observed loan size. The results suggest that farm households with poorer quality land, smaller farm sizes, and lower physical and human assets pawn out land, while wealthier farm households with larger farm sizes and greater physical and human assets pawn in. The observed loan size is explained by reputation of pawners and rice cropping intensity in the region.

Agricultural Budget for Land Improvement: Economic Significance and Issues, Junichi Shimizu *(National Research Institute of Agricultural Economics, Japan)*

Since World War II, investment in land improvement, along with expenditure on the food control system, has had a major share in public expenditure on agriculture in Japan. The primary economic function of land improvement is its use as a means of executing fiscal policy to control total demand in a Keynesian fashion. Its secondary function is its use in adjusting resource allocation. The post-war agrarian reform in Japan has resulted in a system of land ownership in a which a large number of farmers own small parcels of dispersed land. Today, when the issue has become one of cost reduction, government intervention to develop farmland has significance as supplying public goods. In fact, the emphasis of land improvement investment has shifted from irrigation and drainage to farmland partition adjustment. A future issue is likely to be comprehensive development of social overhead capital in rural communities.

Socioeconomic Impact of Credit on Rural Indian Households: A Gender Analysis
Elavia Behroz Hosi *(University of Baroda)*, Kathleen Cloud *(University of Illinois)*, and Alam
Zafar and Chavan Hema *(University of Baroda)*

This paper presents a methodology for gender analysis of levels and effects of credit at the
household level in Indian rural households. A regression function is used for estimating the
impact of credit on the income and the value of production gained by men and women
borrowers from activity/asset finance using data collected by a primary survey. The major
policy implication of the analysis is that credit given in small amounts has little effect on
poverty eradication, particularly in the case of women. The impact of credit on incremental
income and work days was higher in the case of men than for women. However, the opposite
was true in the case of value of production. Application of the proposed methodology to the
experience of other Third World countries will provide insight and data for translating
research activities into effective programmes for enhanced women's participation in rural
credit.

**Wheat Policy Reform in Ecuador: Analysis of the Distributional and Nutritional
Effects of the Wheat Import Subsidy,** Andres Guarderas *(Banco del Pacífico, Ecuador)* and
David R. Lee *(Cornell University)*

Wheat consumption has risen sharply in developing countries in recent years, partly due
to widespread food subsidies that have often encouraged the consumption of wheat-based
products at the expense of "traditional" food staples. These food subsidy policies have often
been key targets of structural adjustment and policy reform programmes instituted over the
past decade. This paper examines the household economic and nutritional effects of the
removal of the wheat import subsidy in one such country, Ecuador, in 1989. The analysis
centres on the estimation of Tobit food demand equations for a sample of 9,518 urban
households, divided into four geographic groups and four income quartiles. The results show
that the wheat import policy induced higher consumption of wheat-based products in Ecuador
over the 1973–88 period, particularly among Sierran consumers. High-income consumers
benefited disproportionately from the subsidy, due to both their greater absolute demand for
wheat-based products and their lower estimated cross-elasticity of demand for substitutes.
Caloric demand and nutritional effects are estimated to be minimal, however, due to the fact
that the higher caloric demand elasticities among lower income groups are offset by lower
absolute caloric availability. Alternative, more efficient, subsidy policies are simulated and
analysed.

**Marketing Problems of Rural Sources of Livelihood: Can the Transaction Cost
Approach Help in Dealing with Them?,** Petri Ollila *(University of Helsinki)*

The paper sees the problems of rural sources of livelihood as market failures. The
prevailing marketing system is not capable of transmitting information leading to proper
production decisions among rural entrepreneurs. An attempt is made to experiment with the
usefulness of the transaction cost approach (TRC) in dealing with these problems. The paper
concludes that TRC has potential but at its present stage lacks operational research
methodology. Combining TRC with the industrial organization approach is suggested.

**Food Self-Sufficiency, Fertilizer Use, and Access to Formal Credit: A Test of
Relationships on Small Farms in Ethiopia,** William Grisley *(Centro Internacional de
Agricultura Tropical)*, Wilfred Mwangi *(Centro Internacional de Mejoramiento de Maiz y Trigo)*,
and Gethun Degu *(Institute of Agricultural Research, Ethiopia)*

The relationships between household food self-sufficiency and fertilizer use and between
fertilizer use and credit obtained from an agricultural credit bank are investigated for a 1989
sample of 160 rural households living in the highland area of Areka in southern Ethiopia. A

logit model is used in estimation; 30 of the 160 farmers were found to be self-sufficient in food production. Obtaining bank credit increased the odds to 1 in 20 (in favour of fertilizer) that fertilizer would be used, and use of fertilizer increased the odds of being self-sufficient in food to 2 in 5. Household food self-sufficiency can thus be enhanced by strengthening the credit-fertilizer linkage. Households obtaining credit from informal sources did not tend to use fertilizer. The number of coffee trees was not significant in explaining food self-sufficiency. A probable reason is the production of food crops under coffee trees. This result can have important implications for other countries in eastern Africa as farmers are prohibited from intercropping coffee. Larger families decreased the odds of self-sufficiency, while farm size was not associated with self-sufficiency.

Willingness to Pay for pST-Treated Pigmeat, A. Elnagheeb, W.J. Florkowski, and C.L. Huang *(University of Georgia)* and C. Halbrendt *(University of Delaware)*

Progress in application of porcine somatotropin (pST) justified an assessment of consumer acceptance of pST-treated pigmeat. A survey of the metropolitan area of Atlanta, Georgia, USA, collected information about consumer attitudes towards lean pigmeat produced with biotechnologically developed pST. A qualitative dependent variable model was used to identify socioeconomic consumer characteristics influencing the willingness to pay for lean pigmeat. The model was modified to account for the selectivity bias of the sample data. Results indicate that frequent pigmeat consumers were willing to pay more for lean pigmeat produced using pST in contrast to respondents who frequently ate beef, were older, and had relatively high income. Probabilities associated with the willingness to pay a specific premium were calculated. In general, the average respondent was willing to pay an additional $0.18 per kg of lean pigmeat produced using pST.