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POSTER ABSTRACTS

Trade, Policy and Competitiveness

Shankar Narayanan, Agriculture Canada, and **Fu Lai Tung** — *Comparison of capital labour ratios in Canadian and United States agriculture and implications on competitiveness.*

Transition in capital labour ratios of primary agriculture in Canada and USA over 1961–1990 indicates gradual substitution of capital for labour in general and a situation of relative overcapitalization in Canadian agriculture compared to the USA. Some of the key implied consequences for the competitiveness of Canada of higher capital costs include higher taxpayer funded farm income support, reduced effectiveness of farm finance programs (debt review), and weakening of the competitive position for Canadian agriculture products in the world markets in relation to the USA, due to reduced productivity.

John Parker, USDA — *Trends in the agricultural trade of North Africa and Southern Africa compared.*

North Africa's agricultural imports trended upward in the 1980s, and flattened out in the early 1990s because of lower prices, while its agricultural exports declined, especially cotton. Agricultural imports by Southern Africa fluctuated and peaked in 1992, while agricultural exports were steady.

Mary Mafuyai and **Richard Robbins**, North Carolina Agricultural and Technical State University, **Blake A. Brown**, North Carolina State University, and **Enfiok P. Ekanem**, Tennessee State University — *Impact of tobacco policy legislations on the United States and world economy.*

Tobacco is one of the most valuable crops in the USA. Farm level sales of tobacco were about \$2.96 billion in 1992. Major tobacco exporters include USA, Brazil, Argentina and Zimbabwe. This research will evaluate legislation impacts on selected countries and world markets. An econometric model will be used in analysing the data.

R.W.M. Johnson, Ministry of Agriculture, New Zealand — *GATT and the regulation of technical barriers to trade.*

Major technical barriers to agricultural trade are sanitary and phytosanitary measures and environmental protection measures. Both could be justified in some circumstances and both are potentially covered by the provisions of Article XX of the GATT. Sanitary measures have been accepted as justified measures for a number of years for health reasons but it is only recently that environmental measures have been specifically discussed in the GATT context. The threats to trade can be resolved by reference to existing GATT provisions for exemptions and the possible development of new GATT rules for conflict resolution.

Mahmoud El-Jafari, Islamic University of Gaza City, Gaza Strip — *The international competitiveness of Palestinian agriculture.*

The purpose of this study is to identify and measure the impacts of factors which are expected to influence the competitiveness of Palestinian agriculture by using the market share approach with an econometric model. Over the past three decades, Palestinian agriculture has been subjected to increased international and regional competition. The impact of this competition is in part evidenced by trend decline in the West Bank and Gaza Strip agricultural exports on the one hand, and the increases in agricultural imports on the other. The empirical results indicate that the performance of domestic market and import shares could be improved through increasing the productivities of the major production factors, land, labour and capital. On the other hand, the competitiveness indicators of Palestinian agricultural exports have been found to be sensitive to changes in the export process prevailing in Jordan and Israel and to the changes in the relative real exchange rates of these countries. Also, the estimated coefficients of model have signified that Palestinian agricultural exports have deteriorated because of the non-tariff trade barriers (NTBs) imposed by Jordan and Israel. One could conclude that future farm export competitiveness will be closely linked to improvement agricultural factor productivities and marketing efficiency and eliminating NTBs imposed by Jordan and Israel.

Steve McCorrison, University of Exeter, UK and **Ian Sheldon**, The Ohio State University, USA — *Trade reform with market intermediaries.*

Most studies of agricultural and trade policy reform ignore the existence of market intermediaries. Yet casual observation suggests that such intermediaries play an important role in the agricultural and food system. Dealing with these intermediaries in applied work is complicated by the fact that a limited number of these intermediaries typically dominate specific markets such that the assumption of perfect competition — commonly assumed in applied policy analysis — no longer applies. This paper outlines a model for dealing with such features and is used to evaluate welfare changes following reform of the EC banana regime in 1992.

Jukka Kola, University of Helsinki, Finland — *A small country perspective on agricultural policy and trade disputes of large countries.*

Small EFTA countries depend heavily on international trade. Yet, their agricultural sectors are very protected due to the stabilized political economy of food security. In GATT, small countries can respond to large exporters' requirements of free trade and common markets by increasing agricultural efficiency, but also by emphasizing issues of new competitiveness based on environmental factors and full inclusion of externalities in production costs. Thus, the income redistribution effects illustrated by the surplus transformation framework may be more equally distributed, both between countries and within countries. In the search for local and global ecological and economic sustainability there is an important role for small countries.

Dennis R. Henderson and **Charles R. Hand**, Economic Research Service, USDA — *International commerce in food: market strategies of multinational firms.*

The annual value of international commerce in food is estimated to exceed \$1.5 trillion. Much of this is carried out by multinational food firms, engaging a variety of strategies for accessing foreign markets. Of these, trade in dissimilar products plays a relatively minor role. More important by several orders of magnitude are shipments originating from foreign operations. Other important strategies include international product licensing, joint ventures and intra-industry trade. These strategies are motivated by profit opportunities associated with firm- or product-specific advantages. Both in-bound and out-bound international commerce are positively associated with a country's level of economic development. The economic impacts of such commerce are pro-competitive in both host and originating markets, measured in terms of increased product availability and lower prices.

A. Joaquín, University Politécnica, Madrid — *Money supply, exchange rates and relative prices.*

The dynamic response of money and both nominal and real exchange rates and relative agricultural and industrial prices is analysed in Austria, Germany and Spain, using VAR. The long-run neutrality hypothesis is rejected in general but the evidence is weak. Monetary and international factors also vary in importance, depending on the openness of instability of the economy. The main conclusion is that models using nominal or real exchange rates lead to almost exactly the same results.

Roland Hermann, University of Giessen, Germany — *How agricultural and exchange rate policies affect the level and instability of producer prices in developing countries: a cross-country approach for major commodities.*

This paper contains an explanation of how the average level of producer prices in developing countries was influenced by agricultural and macroeconomic policies, how the influence on the price level changed over time and how producer price instability was altered by the policies under consideration. The analysis focuses on two important food crops, wheat and rice, and one major export crop, coffee, over the period 1969–85.

It is found that exchange rate policies are an important source of total net protection in agriculture in developing countries, as they affect the average level of producer prices as well as its trend and instability strongly. However, in many cases agricultural policy is more important than macroeconomics policy with regard to total net protection. The latter finding is different from the results of the World Bank study by Krueger/Schiff/Valdes.

When exchange rate distortions are taken into account, many countries discriminate against agricultural producers. Apart from this, the export crop coffee is clearly taxed compared with the food crops wheat and rice. This result is mainly due to the differential treatment of food and export crops in agricultural policy. That policy sets more favourable food crop prices compared with the prices of export crops has been shown in earlier studies. The bias against export crops is also valid with regard to the weaker stabilization of producer prices and the deterioration of the policy-induced incentives over time.

Nicholas Samuel and Elton Li, The University of Adelaide, Australia — *Heterogeneity in processed food and beverage markets in China: implications for competitive marketing.*

This study provides empirical support for the theoretical expectation that the Chinese market for processed food and beverages is made up of heterogeneous market segments. Analyses of primary survey data from four Chinese cities reveal significant inter-city difference in price levels and demand relationships, the latter in terms of price and income elasticities. This suggests dissimilar market growth prospects among the cities examined. The empirical evidence supports the need for businesses to consider geographical market segmentation analysis as a basis for target market selection and strategy formulation for marketing processed food in China.

Edith S. Obschatko, Interamerican Institute for Agricultural Cooperation (IICA) Argentina — *Competitiveness of the Argentine agro-industry.*

The competitiveness or 'agro-industrial complex' (primary and processed agricultural products) for Argentina is studied by means of several indicators; evolution of exports, Revealed Comparative Advantage coefficient and the Competitive Analysis of Nation (CAN) Model. Argentina's exports have increased during the eighties, with specialization in products in the OECD market in which the country has comparative advantage. Nevertheless, the agro-industrial complex as a whole has lost competitiveness in this market. Recent changes in macroeconomic policies — deregulation, price stabilization, privatization of public utilities — create conditions to increase competitiveness, but protectionism in developed countries poses a severe restriction. The private sector is undergoing organizational and technological changes to adapt to new conditions, such as a higher rate of adoption of available technologies, concentration of primary production in larger units, reduction in the number of small producers, diversification of production with non traditional crops, increased vertical and horizontal integration, associative arrangements, product differentiation and special arrangements related with the MERCOSUR.

Antonio Yunez-Naude, Centro de Estudios Económicos, Mexico — *Agricultural price reforms; results of general equilibrium models applied to Mexico.*

The deep process of liberalization conducted recently by the Mexican government, together with its negotiations to reach a free trade agreement with Canada and the USA, have motivated the construction of several independent General Equilibrium Models (GEMs) to quantify the impacts of these changes on the Mexican economy and its agricultural sector. Although they have differences, it is argued that the main findings obtained from such applied models can be used to present the repercussions of policy reforms on Mexico's countryside, on solid grounds. Since the results of all of these GEMs point to the unfavourable consequences for Mexican rural poor and for its grain and oilseed subsectors that price reforms would bring about, their authors suggest that policies of transition towards the attainment of a more deregulated situation are required.

Carl Mabbs-Zeno, Mesfin Bezuneh, John Chirwa and Barry Krissoff, US Agency for International Development, Washington, D.C. — *Potential gains from reducing agricultural trade barriers.*

This paper examines the effect of the tariff differential extended by members of the Preferential Trade Agreement in Eastern and Southern Africa (PTA) to other members. It presents a static simulation model of trade by PTA members. The experiments summarized here highlight the limitations for the PTA of using tariff preferences to encourage agricultural production. Existing tariffs have little effect on international markets and the tariff preferences have almost no effect.

A.W. Mukhebi, T. Munyombwe, C. Ncube, R.Kruska, International Laboratory for Research on Animal Diseases, Kenya, **U. Ushewokunze-Obatolu**, Veterinary Research Laboratory, Zimbabwe and **B.D. Perry Mukhebi**, International Laboratory for Research on Animal Diseases, Kenya — *Livestock diseases and food security in the preferential trade area with a focus on Zimbabwe.*

This paper discusses livestock diseases as a major constraint to livestock production and food security in the Preferential Trade Area (PTA) region. It highlights economic costs of two major diseases in the region, namely theileriosis transmitted by ticks and trypanosomiasis transmitted by tsetse flies. It provides a more detailed analysis of the economic cost of theileriosis in Zimbabwe and the economics of its control by a new method based on immunization using the infection and treatment method.

Jamal B. Othman, Jack E. Houston, University of Georgia, USA and **Christopher S. McIntosh** — *Competition in US edible vegetable oil markets — persistence of structural changes.*

This study utilizes a time varying parameters model to examine evidence of transitory and permanent structural changes in the edible vegetable oils market in the USA and the resulting competitive effects of a promotional campaign focusing negative publicity on imported 'fatty tropical oils'. The relative magnitudes of the permanent and temporary components of changes in domestic demand elasticities for soybean, palm, coconut, and cottonseed oils are examined for periods prior to and following commencement of the 'tropical oils' campaign. Low estimated values of structural change persistence suggest that the negative impacts on palm and coconut oils were largely transitory until 1989, when food labelling legislation passed.

M. Ben Kaabia and J.M. GilUnidad, Servicio de Investigación Agraria, Spain — *The effect of macroeconomic variables on competitiveness of Spanish agricultural exports.*

This paper investigates empirical relationships among the interest rate, the real exchange rate, agricultural export prices and agricultural export sales in Spain using a restrictive vector autorregression model. Positive exchange rate shocks have less influence than prices on agricultural exports due to the compensatory mechanisms of the Common Agricultural Policy. Agricultural exports, on the other hand, have little influence on the macroeconomic variables.

Joseph Salvacruz and **Michael Reed**, University of Kentucky, USA — *Product cycle trade in the processed food industry.*

A study was conducted to describe the characteristics of traditional Product Cycle (PC) indicators of processed foods within the context of a three country model; developed, developing, and less developed economies – represented by the USA, South Korea, and the Philippines, respectively. The PC indicators studied were processed food exports, capital intensity of food exports, industry size, and productivity. Results revealed PC indicator trends consistent with the predictions of the PC theory in the maturity stage. Chow test results confirmed significant differences in PC indicator trends between the USA and South Korea, but not between South Korea and the Philippines. This study suggested that the USA possesses a technological advantage over the lesser developed countries. The role of other variables which may determine PC trends should be examined more closely. These variables are foreign investment flows, investment incentives, technological progress, and political factors.

Farms, Markets and Efficiency

Claude Freud and **Ellen Hanak Freud**, Centre de Coopération Internationale en Recherche Agronomique pour le Développement (CIRAD), France — *Is there a future for African robusta coffees?*

The competitiveness of robusta coffee producers is analysed using comparisons of the cost structure during and prior to the collapse in world prices in the late 1980s. The scope for African producers, whose intermediation costs are highest, to regain their footing via devaluation and via intensification of production is assessed.

Natalia Aldaz, University of Lleida, and **Joaquín A. Millan**, Polytechnic University of Madrid — *Agricultural efficiency of the Spanish autonomous communities.*

An empirical analysis using both parametric and nonparametric production frontiers is carried out for the agricultures of the Spanish Autonomous Communities. There are great differences in the estimated efficiencies and rankings between models. The main result is a trend toward convergence in productivity between regions.

W.J. Florkowski, **A.H. Elnagheeb**, **J.E. Houston** and **C.L. Huang**, The University of Georgia, USA — *Measuring risk perception of existing and new food production technologies.*

In this study, survey data were used to develop a model to measure the relationship between a set of socio-economic characteristics of consumers and their risk perception of feed additives and growth hormones used in livestock production. Perceptions were measured indirectly by constructs based on responses to multiple questions. Factor analysis was used to identify the perception measures. Next, two econometric approaches were applied to estimate the relationships between the explanatory variables and risk perceptions. Estimation results gave both the direct and total effects of each explanatory variable on the three constructs, risk perception due to the use of bio-engineering in food

production or its specific example — the porcine somatotropin (pST) — the pig growth hormone, and support of pST use in pig production.

Franco Rosa, University of Udine, Italy — *Change in the EC food industry.*

The paper will focus on changes in the food industry in EC countries for the period 1980–90. The data, collected from Eurostat statistics referred to the 18 sectors of the food industry with 20 or more persons engaged. This allowed calculation of the indexes signalling the change in productivity and investments of a selected group of EC countries for the period considered. Conclusions are for a consistent improvement of the food industry performance with structural convergence signalling the diffusion of technical innovation in the EC.

Wen S. Chern and **Guijing Wang**, The Ohio State University, USA — *Food consumption patterns and agricultural policy in China.*

This study estimates a linear approximate almost ideal demand system (LA/RAIDS) for 2 specifications by treating grains and oils as rationed or unrationed goods. The models are estimated using data from 28 cities and provinces (based on household surveys) over 1985–88. The results show that the rationing model provides more plausible estimated demand elasticities than the nonrationing model. Furthermore, Chinese urban household demands for non-staple foods are shown to be elastic with respect to price and expenditure. These elastic demands will make future prediction of food demand in China more difficult.

Ian Jarratt and **Harold Brown**, Queensland Department of Primary Industries, Australia — *Commodity marketing board modernization: the Queensland experience.*

This paper describes and explains the recent very rapid reduction in the number of commodity marketing boards (CMBs) in Queensland as requested by their producers. The major influencing factors included: changed macroeconomic policies; changes to national marketing arrangements, reduced producer support for compulsory delivery, and producer demands for more flexible marketing systems. The key role of the Queensland Government in; encouraging reviews of the CMBs, providing innovative and flexible legislative changes, and providing information and other assistance, is emphasized. Research on the economic effects of the changes is suggested.

F. Sotile, Università di Ancona, Italy — *Public transfers to Italian agriculture.*

The scope of the poster is to sketch the origin and destination of agricultural public transfers in Italy. The study focuses upon EU, MAF and Region expenditures for agriculture, together with the differentials, in terms of fiscal and social security benefits, between farmers and other sectors' workers. An estimate of the total amount of public money transferred to the agricultural sector is provided. Finally, in the light of recent CAP reforms and GATT agreement, we also attempt a preliminary analysis of recent changes in the distribution of costs and benefits of agricultural policy.

A. Gracia and **L.M. Albisu**, Unidad de Economía y Sociología Agrarias, Servicio de Investigación Agraria, Zaragoza, Spain — *A cross-section analysis of socio-demographic factors affecting food expenditure in Spain.*

This study examines the influence of socio-demographic factors on Spanish food consumption. Engel curves for food expenditures have been estimated. Data from the National Expenditure Survey conducted by the National Statistics Institute, in 1990–91 have been used. The large number of available observations have been aggregated into cohorts of representative households with common characteristics. Cohort averages have been taken to estimate a Working Leser model. The dependent variable has been the budget share for seven food products: (1) meat, (2) bread and cereals, (3) fish, (4) dairy, eggs and cheese, (5) fats and oils, (6) fruits, vegetables, pulses and potatoes and (7) other foodstuff. Per capita food expenditure has been introduced as a proxy for purchasing power because of the weak separability assumption. A set of socio-demographic variables (household size and composition, town size, seasonality and sex) have been incorporated into the model by the translation method. Estimations show that meat and fish are luxury products and cereals and dairy products, eggs and cheese are necessities. Sociodemographic variables revealed important determinants of food demand. Some economies of scale can be observed in meat, fish, bread and cereals and dairy products, eggs and cheese.

Jose Maria Sumpsi, Universidad Politecnica De Madrid, Spain; **Francisco Amador**, Universidad de Cordoba, Spain and **Carlos Romera**, Universidad Politecnica de Madrid, Spain — *On farmers objectives: the case of family farms in Andalusia Spain.*

In this paper a multi-criteria methodology aimed at researching the objectives actually followed by a farmer or by a homogeneous group of farmers is analyzed and used to predict the behaviour of family farms in 'Vega de Cordoba' (Spain). The proposed methodology has an algorithmic structure and is articulated within a goal programming formulation. The results obtained seem to corroborate previous findings in the literature which conjecture that the actual behaviour of farmers cannot be explained by the optimization of a single objective but by a compromise between multiple objectives. Some of the policy implications found are highlighted in the discussion.

Brent M. Swallow, International Livestock Centre for Africa, Nairobi, Kenya — *Economic analysis of techniques for controlling African animal trypanosomiasis.*

African animal trypanosomiasis can be controlled by a number of techniques: drugs can be given to protect or cure animals; trypanotolerant breeds of livestock can be raised; traps, targets or pour-ons can be used to suppress the tsetse flies that transmit the disease. Besides considering their total benefits and costs, research and policy regarding disease control need to also consider the excludability, security, multiplicity and externality attributes of the benefits and costs. In one area of south Ethiopia where targets were used, we focused our research on the local public good and insecurity attributes of the benefits. We used contingent valuation to assess people's willingness to contribute time and/or money. In a nearby area we used market and non-market surveys to assess the multiplicity and mixed public-private nature of the benefits derived by a pour-on.

Hamath A. Sy, Merle D. Faminow, Gary V. Johnson and Gary Crow, University of Manitoba, Canada — *Estimating the value of cattle characteristics using an ordered probit.*

Economists interested in the value of product characteristics have generally used hedonic analysis. However, in cases where market prices are not available a survey-based methodology called conjoint analysis can be used to value product characteristics. In this study, this technique is applied to beef cattle to appraise the value of genetic characteristics commonly used in beef improvement programmes. The conjoint analysis was conducted using an ordered probit model. Data from a beef producer survey in Manitoba, Canada were analysed to determine the relative values of reproduction traits (e.g., milking ability, calving ease) and final traits (e.g., carcass yield, feed efficiency).

Mayada Baydas, Ohio State University, USA — *Capital structure determinants among non-farm enterprises: the case study of developing financial markets in The Gambia.*

The focus of this study is the capital structure of non-farm manufacturing enterprises in low income countries. The study examined the importance of different sources of financing, internal and external, in the capital structure of the firm and factors explaining entrepreneurial behaviour in using different financial contracts. The capital structure was modelled by considering a one-period world within a deterministic approach. A set of testable hypotheses derived from this model was applied to a sample of 153 micro, small and medium scale manufacturing enterprises in The Gambia. The findings of this study support the hypotheses that the characteristics of the enterprise, attributes of the entrepreneur, rates of return, interest rates, transaction costs of alternative sources of financing and the respective share of these securities simultaneously determine the capital structure of the enterprise.

C. Marian, University of Craiova, Romania — *Current analysis of agricultural produce markets in Romania.*

The author deals with problems in the distribution network for agricultural produce in Romania. Farmers and economic dealers involved in these networks face problems caused by aspects of the present social and economic conditions. In particular, there are frequent contradictions in economic signals and imbalances in agricultural yields. It is of particular importance that the transition should be as quick and profitable as possible and lead to high proficiency rates for farmers, processing and economic units. Consumers should also benefit from these changes. Details of expenditures are given for the agricultural distribution network in the district of Dolj.

Abebe Teferi, Ethiopian Tourism Commission — *Grain marketing structures and integration in Ethiopia.*

In the Ethiopian traditional society, market prices were determined traditionally and they had traditional trade connections. But in the past one and half decades the grain marketing system and the marketing was disrupted. Before the 1974 Revolution and before strong government intervention in the grain market, the grain market was positively integrated.

Prices were formed on the basis of market focus. Grains moved where the prices were highest. After the overthrow of the Marxist government, the disrupted market structures came back to normal. The formation of prices is based on market forces.

Ching-Kai Hsiao, National Chung Hsing University, Taiwan — *Analysis of demand for aquacultural water in Taiwan.*

The purpose in this paper is to construct a model of the demand for water by aquaculture, and to identify the technological relationship between output and inputs by estimating a production function for cultural fishery. The parameters of the models were estimated with data collected from a field survey of water use by different types of aquaculture in selected districts of Taiwan during 1991 and conducted the survey on the summer of 1992.

Jyrki Niemi, Agricultural Economics Research Institute, Finland — *Interrelated demands for factors of milk production in Finland.*

A multi-input translog cost function is applied to investigate the structure of Finnish milk production. The method allows a quantitative assessment of partial elasticities of substitution between inputs and the own- and cross price elasticities of input demand. The results suggest that the method used provides a reasonable framework for empirical analysis.

Amin Ismail Aboud, National Research Centre, Egypt — *Economic efficiency of human labour and nitrogenous fertilizers use in Egyptian new and old lands.*

Dramatic dispersion for levels of both labour and chemical fertilizer use was revealed, approaching 90 percent in new lands. Only 7 percent of producers there were close to efficient use based on equating the value of marginal product with the input's price. The corresponding estimate for old lands reached a maximum of 28 percent, inferring more serious need for efficient agricultural extension in new lands where experience is still young. Much lower applications revealed for larger farms and crop areas may be due to obligatory reliance upon hired labour and production requisites black markets.

Andrea Fantini, Institute of Agricultural Economics University Bari, Italy — *AGRISIM: farm simulation teaching model.*

A dynamic simulation model has been constructed to represent a livestock farm in the Marche region of Italy. Changes in the managerial environment are emphasized. These include increasing price instability following CAP reform and also the increasing importance of environmental constraints. The model is programmed using widely available spreadsheet software. Herd development and fixed equipment investment are modelled so that the user can see the effect of alternative strategies under different policy regimes. The program can be used as a business management simulator in order to instruct students in the management of farms or to train extension advisers when policy changes take place. Experience to date indicates that, after using the model, trainees can often construct their own versions of the models for application to the specific conditions of individual clients.

David Coleman, University of Manchester, UK — *Problems of measuring price distortion and price transmission: framework for analysis.*

In the contemporary condition where IMF and IBRD lending policies to less-developed countries involve imposing conditions for agricultural price and trade policy reform, and where the reform requirements are based on measures of price distortion and protection, this poster examines aspects of the robustness of these measures. It presents a framework for deriving measures of price distortion and price transmission. Using this, it considers the links between both types of results which can be expected. It also considers general aspects of the relationship of African and international prices, and argues that many studies use or assume, measures of price distortion and transmission which are flawed.

David D. Mainland, Economics Department, SAC Auchincruive, Ayr — *An approach to increasing dairy farm economic efficiency with reference to Scotland.*

If economic efficiency is to be achieved then it is necessary that farmers know and understand the concepts of marginality employed in economics. Current managerial techniques generally work in averages which is not at all helpful in achieving satisfactory economic outcomes. Instead a decision support system (DSS) is better suited to the task. Such a model is described and a derivative is used to analyse dairy herd production in Scotland since 1975 to compare actual feeding rates of concentrate feed against the economic optimum. Actual feeding rates were very much higher than the optimum until the introduction of quota brought more economic reality into dairy farm management. The model is further used so as to examine typical Scottish dairy farming problems in terms of marginality analysis.

K.L. Sharma, The University of the South Pacific, Western Samoa — *Acreage and yield responses in sugarcane production in the Fiji islands.*

This paper attempts to estimate the Nerlovian acreage and the neoclassical yield responses in sugarcane production to changes in price and non-price variables in the Fiji Islands during the period 1960–92. The results indicate that sugarcane farmers do respond positively to price changes. A favourable price regime is required to increase sugarcane production. Further, both the short-run acreage elasticity and the yield elasticity need to be considered to avoid underestimating the total supply elasticity.

R. Canero, University of Almeria, Spain and **J. Calatrava**, Department of Agricultural Economics, Granada, Spain — *Influence of the functional form and the estimation methods in frontier function efficiency analysis: the case of plastic covered horticulture in south-eastern Spain.*

Numerous studies have been carried out on productive efficiency in agriculture using production frontiers, particularly since 1980. However, the great majority of these limited themselves to using only one functional form and one or two frontier kinds. The aim in the present study is to analyse the effect that the choice of functional form and frontier kind has on the measurement of efficiency. Data obtained from horticultural businesses in south-eastern Spain have been used. Finally, conclusions regarding the above-mentioned effect are drawn.

Research, Technology and Innovation

Manuel Rapùn Gárate and **Belén Iráizoz Apezteguín**, Universidad Publica de Navarra Campus de Arrosadia , España — *Technical efficiency on the cereal sector and other by-products for the human consumption in Navarra.*

In this document we intend to carry out an estimation of the technical efficiency (TE) on the cereal subsector and other by-products for the human consumption, an outstanding feature in the regional economy because it accounts for the 14 percent of the employment of the agrofood industry in Navarra. Farrell's methodology has been applied in this case.

Hrabrin Bachev, Institute of Agricultural Economics in Sofia, Bulgaria and **Snehana Bacheva**, University of National and World Economy in Sofia, Bulgaria — *Agricultural research during transitional period.*

The paper examines the problems of organization and management of agricultural research in the transitional economies of Eastern Europe. The crisis created by the centralized bureaucratic management system of agricultural research in Bulgaria is analysed. The process of research management has been described from a formal structural aspect. The different models of agricultural research management have been analysed. A model for organization and management of agricultural research during the transitional economic period has been developed. The most effective governance structures for development of transactions in innovative cycle during transitional period have been designed. The new system should be based on the establishment of the National Council of Agrarian Research, responsible for setting the priorities of agrarian research and development, and the National Centre for Agricultural Research, carrying the organization and management of the State agricultural research system, research and a System of Agricultural Extension. Reorganization should involve formation of institutions with considerable autonomy, preventing revival of the monopoly in research management. Different and more flexible ways of financing agricultural research and mechanisms for developing private sector research (privatization and pseudo-privatization) have been proposed for the period of reorganization.

Heinrich Hockmann, University of Gottingen, Germany — *Price distortions and welfare effects of agricultural research activities.*

When government intervention leads to a distortion of market prices, the production enhancing effects of research and development induce positive (increase in producer rents) as well as negative (increase in dead weight losses) welfare effects. Partial equilibrium theory is used to derive a simple rule for estimating whether welfare gains or losses will occur. The sign of the welfare change depends on the elasticity of domestic supply, the demand elasticity in the world market, and the amount of price distortion. Technical change and the export share influence the amount of the overall welfare effect, but not its sign. The rule is applied to the development of hybrid rye in Germany. Since the demand in the world market is assumed to be elastic, this innovation has induced a positive net welfare effect.

Peter Karunga, University of Witwatersrand, South Africa, **Joseph Salvacruz** and **Michael Reed**, University of Kentucky, USA — *Technological progress and competitiveness in the food processing industry.*

A market share measure of international competitiveness in the world food market was determined for the USA and a group of less developed Southeast Asian countries (ASEAN LDCs) in 1970–89. The total factor productivity index in processed food was also computed and served as proxy measure for productivity competitiveness or technological progress. Research and development expenditures and market power were found to be driving technological progress in the USA, while poor market power was the only significant determinant of technological progress among the ASEAN LDCs. Results of regressing international marketing competitiveness against endogenous technology revealed a significant positive relationship between these two competitiveness measures.

Pareena G. Lawrence, University of Minnesota, USA and **John H. Sanders**, Purdue University, USA — *The impact of agricultural and household technologies on farm and female incomes in Burkina Faso.*

This paper investigates the impact of agricultural and household technologies on the income of the farm household and women for the Solenzo region in Burkina Faso. The Women in Development literature asserts that agricultural technologies can have an adverse effect on the income of women. This assertion, if true, creates a serious gender equity problem. Using the household decision-making theory and a programming model, this study shows that the impact of agricultural technologies depends upon the type of decision-making practised by the household. In contrast, household technologies increase the incomes of women independent of the type of household decision-making. Empirical evidence from various field studies suggests bargaining as the most prevalent form of household behaviour. According to model results, with bargaining, agricultural technologies benefit women, but women benefit most when both technologies are simultaneously introduced. The study also briefly examines the household investment decision in household technologies.

Shiva S. Makki and **Luther G. Tweeten**, Ohio State University, USA and **Cameron S. Thraen** — *Evaluating payoffs to research investments in agriculture: a co-integration approach.*

This paper examines the returns to USA agricultural research investments for the years 1930 through 1990 using the cointegration technique. Most previous research is based on time series regression analysis to evaluate the returns to research investments without correcting the data non-stationarity. According to Granger and Newbold, regressions estimated from nonstationary series frequently are seriously biased towards accepting spurious relationships. The cointegration approach corrects for data non-stationarity and provides a better estimate of the long run dynamic relationship among the time series variables. Results in this study indicate that agricultural productivity, public and private research investments, farmers' education, terms of trade, and commodity programs are cointegrated. The estimated internal rates of return are 27 percent for public research and 6 percent for private research in 1990 dollars. These estimates are from the most

comprehensive and timely data assembled to date and indicate that returns to public agricultural research compare favourably to real returns on alternative long-run.

Mywish K. Maredia and **Carl K. Eicher**, Michigan State University, USA and **Derek Byerlee**, The World Bank, Washington, D.C. — *Strategies for increasing the efficiency of national wheat research programs in developing countries.*

Because of severe budget constraints, many National Agricultural Research Systems (NARSs) in developing countries have been forced to make hard scientific and financial decisions on the number, size and type of research programs. A cost-benefit model is used to determine the profitability of 71 wheat improvement programs in 35 developing countries. Many of these programs were found to be operating at uneconomic levels. NARSs can increase their research efficiency by consolidating wheat research programs, improving their capacity to import wheat technology, increasing collaborative regional research programs and relying more heavily on importing wheat from CIMMYT/NARS international collaborative breeding effort.

Paul W. Heisey, CIMMYT, Mexico — *What is a green revolution?*

Research reported here takes the following working definition of a 'Green Revolution'. Higher yielding, more input-responsive crop varieties based on a recognizable genetic innovation such as use of dwarfing genes in wheat, use of dwarfing genes or hybridization in rice, or hybridization in maize, are developed. Diffusion among farmers is observable. Yield-increasing technical change of this kind is thought to be more likely in land scarce countries. This research reviews historical data on periods of rapid yield increase for selected developing and developed countries and asks whether they are related to diffusion of high yielding varieties and increased input use. In general they are, but yield increases in countries that are not obviously land scarce, yield increases not easily ascribed to varietal improvement of the type defined, and varietal contributions to productivity that do not translate directly to rapid yield gains, are all cases requiring further study.

Duncan Boughton and **John M. Staatz**, Michigan State University, USA — *Using the commodity subsector approach to design agricultural research: the case of maize in Mali.*

This paper applies a subsector perspective to analyzing the design of agricultural production and processing technologies. The framework stresses how conditions at one level of a subsector influence constraints and opportunities for technical and institutional innovations at other levels. The paper also stresses the need to combine insights from the subsector and farming systems perspective when developing an agricultural research agenda. These points are illustrated by drawing on results from a recent maize subsector study in Mali.

Terrence S. Veeman and **Krishna B. Hamal**, University of Alberta, Canada — *Total factor productivity growth in the nepalese crop sector: an empirical analysis.*

Improved Crop Output and productivity is vitally important to Nepal, yet too little is known about agricultural productivity. In this paper, total factor productivity (TFP)

growth is estimated and assessed in the Nepalese crop sector from 1961–62 to 1987–88. Two estimation procedures for TFP are used and compared; geometric aggregation, using factor shares and flexible weight aggregation, based on Tornqvist-Theil index numbers. Productivity in the crops sector in Nepal is estimated to have declined moderately over the period as a whole, at some 0.2 to 0.5 percent per year. However, crop productivity performance in the more recent sub-period of the 1980s has considerably strengthened with TFP growing at approximately one percent per annum. Since area is constrained, future crop output increases in Nepal will have to come largely from yield increases based upon improvements in technology and price policy.

Ronny Sibanda, MATAPOS Research Station, Bulawayo, Zimbabwe and **Benedict White**, University of Newcastle Upon Tyne, UK — *An economic evaluation of research and development expenditure on communal area livestock systems in Zimbabwe.*

The research aims to assess the uptake of new cattle breeds by small farmers in the communal areas of Southern Zimbabwe. Two sources of data are employed, the first is a survey of small farms, the second is data on breed potential trials carried out at Matopos Research Station. The representative farm models based on the survey data indicate only 21 percent of the farms in the survey would adopt the new breeds and these were the medium to large size farms. The resource base on most farms in the region was insufficient to support the requirements of breeds which had higher nutritional requirements than the unimproved breeds. The new breeds were also less well adapted to the multi-purpose role of cattle in the communal areas which includes draft power and milk production as well as meat production.

Policy and Infrastructure for and Performance of Smallholder Farms

Benon Gazinski, Agricultural University, Poland — *Between efficiency and equity: Indian agricultural policy seen from a Polish perspective.*

The objective in this paper is to give an overview of dilemmas of Indian agricultural policy from Independence to the 1990s. Four stages of agricultural policies were identified: land reforms and the Community Development Programme — late 1940s to early 1960s; intensive development and the 'Green Revolution' — early 1960s to mid 1970s; the Integrated Rural Development Programme and related programmes — mid 1970s to late 1980s, and emerging new economic policy and market reforms — 1990s. It is shown that the economic system of India as framed by Nehru in the 1950s remained virtually unchanged until the end of the 1980s. Many elements of the Nehru vision typical of the Soviet-type socialist economy are cited. These include: the principle of central planning; priority to industry, excessive centralization, emphasis on the public sector etc. The objective of rural policy — to obtain growth with justice and to eradicate poverty — has remained unattainable and the inefficiency of the system has increased, leading to the shift toward the market economy reforms.

Nicholas T. Christodoulou, Development Bank of Southern Africa and **Joan C. Van Rooyen**, Republic of South Africa — *Shaping the impact of small farmer support programs (FSPs) in South Africa.*

Black smallholder farmers in South Africa emerged as a separate group operating without the benefit of Government assistance enjoyed by white commercial farmers. The FSP was formally introduced in South Africa by the Development Bank of Southern Africa (DBSA) in 1987 as one of the major agricultural development strategies to support black farmers who have been historically denied access to basic support services. This paper examines the events leading to the conceptualization and introduction of the FSP and subsequent implementation problems experienced. It also analyses changes in the orientation of the FSP approach and the DBSA management systems and funding arrangements which helped to reshape and improve the impact of the FSP to address existing and future development challenges in South Africa.

Barry I. Shapiro, ILCA, Ethiopia, and **John H. Sanders**, Purdue University, USA — *Intensification of improved integration of livestock with crops in the savannas of sub-Saharan Africa?*

Intensification occurs where high man-land ratios and access to urban markets exist. Opportunities for livestock intensification in mixed systems include animal traction, fattening of small ruminants, intensified milk production with crossbreeds or improved breeds, and strategic fattening to meet demand peaks. Like improved crops, forages to overcome the critical feed constraint require increased soil fertility through purchased inputs in the savannas. Potential for improved integration of mixed systems is thus limited.

Specialized systems occur where livestock profitability is higher than for crops, either near urban markets or where crops cannot thrive. Specialized, intensified peri-urban dairy and finishing operations present important, but limited development opportunities. In drier areas, on-going currency devaluation results in increased, but still highly variable livestock income. Future research will be needed to cut livestock losses and stabilize prices, and provide better market opportunities and information. Migration due to low income potential in marginal smallholder mixed systems will ultimately lead to improved larger scale livestock operations.

Saa Dittoh, University for Development Studies, Ghana — *No magic in markets: evidence from the agricultural sector of Nigeria.*

Exchange rate deregulation and other structural adjustment policies were instituted in the Nigerian economy to stem distortions in the economy, increase productivity (especially in the agricultural sector) and improve the standards of living of the people. However, analyses and arguments in this paper show that the policies had little positive effect on the production and export of cocoa, palm kernel and rubber, as well as the production of food and other agricultural products. Market forces actually had the effect of pauperizing farmers and being an 'invisible exploiter'. The paper argues for a more holistic approach to the analysis of the agricultural sectors of developing economies. Macroeconomic analyses should be strongly supported by microeconomic, sociological and other analyses if effective development policies are to be arrived at.

Jozsef Popp, Hungary — *Hungarian experience with adjustment and transition in the agrifood sector and the development of market economies.*

The Hungarian agriculture and food industry has a dominant role in domestic food supply, exports and rural development. Difficult decisions have been made about very complex issues such as: collective farm reforms; privatization, compensation and market regulation. Most of the market institutions have been established. There has been successful change of ownership, with private property becoming predominant, although there have been delays in the compensation process. The transformation of co-operatives to strengthen the diverse co-operative sector continues. Investment has increased from rock bottom. Improved market conditions are necessary for a progress in investment. Financial 'obligations' accumulated in the food sector are substantial, with credit in the sector influenced by preferential interest rates and state guarantees.

K.N. Ninan, Institute for Social and Economic Change, Bangalore, India — *Agricultural growth, institutional intervention and rural poverty trends in India: their linkages in the context of structural adjustment and liberalization.*

Against the background of Structural Adjustment Programme (SAP) and Liberalization, the paper analyses the trends and factors behind rural poverty in India from 1957–58 to 1986–87. It notes that, contrary to earlier findings, not only are there distinct time trends in the incidence of rural poverty in India and for most states, but also while these trends were positive and significant in period I (1957–58 to 1968–69), they were negative and significant in period II (1969–70 to 1986–87). Also, the rate of decline in the incidence of rural poverty in the latter period was much higher than that in the preceding period for both all-India and across states, using alternate measures of poverty. It then probes into the role of agricultural growth, inflation, access to subsidized food through the public distribution system, population pressure on environmental resources, rural consumption levels and inequality and infrastructure development on rural poverty using time series and cross-section data. Its findings suggest that policies to accelerate agricultural growth, infrastructure development and provide better access to subsidized food, along with measures to control inflation and population growth as also promoting environmental conservation promise to be most effective in reducing rural poverty in India. It then assesses the implications of SAP and other policy reforms in India and suggests that if the poor are to be protected and agricultural growth accelerated and sustained public investment will need to be stepped up, which however, conflicts with SAP's objective to reduce public expenditures.

Pramod K. Mishra, University of Sussex, UK — *Crop insurance and crop credit: impact of India's comprehensive crop insurance scheme on co-operative credit in Gujarat 1985–91.*

Discussions in the analytical literature hold out only a limited role for crop insurance in improving the flow of agricultural credit. On the basis of empirical data from Gujarat, this paper examines the impact of India's Comprehensive Crop Insurance Scheme (CCIS) on production credit to farmers, especially small farmers. The findings show that there is a significant increase in the flow of credit to insured farmers after the introduction of the CCIS. There is an increase in the number of borrowers, and also in credit per borrower, as

well as per hectare. The share of small farmers in total loans increased from 19 percent to 27 percent. There is significant increase in the repayment of loans in absolute terms — repayment per farmer and repayment per hectare, but it is not clear if the propensity to repay improved. The expansion of credit is due to a collateral effect.

Donald W. Larson, Douglas H. Graham, Ohio State University, USA and **Fernandez Zaque** — *Why users prefer informal financial market services: the case of Mozambique.*

Informal financial matters (IFMs) are controversial, widely discussed, growing rapidly and poorly understood in Mozambique as well as in many other developing countries. The controversy results from views held by many people that IFMs are monopolistic, exploitative, illegal, usurious and unproductive marginal enterprises. Government intervention leading to repression of the formal financial institutions contributes to the growing importance of IFMs in Mozambique and other countries. Because IFMs demonstrate considerable flexibility in their operations, many users prefer their financial services. Their diversity and flexibility has allowed IFMs to serve far more clients than are served by formal financial markets and institutions in spite of the hostility often expressed by formal sector agents and by policy makers and government officials charged with financial sector regulation. Even if the formal financial system were operating efficiently in a free market environment IFMs would exist. Thus attempts to eliminate IFMs by government regulators would appear to be neither possible nor desirable.

Mark Wenner, John Holtzman and Gary Ender, ABT Associates Inc, USA — *Agribusiness promotion in developing countries: policy regimes and institutional support.*

This paper reviews the economic and institutional policies needed to launch and sustain an agribusiness export promotion campaign. It is directed to policy makers in small open economies, as well as donor officials who work in such countries who accept an outward oriented growth strategy as appropriate. It examines first and second-best economic policy instruments and discusses the most appropriate roles for public and private sector actors in supporting agribusiness development. The main policy objectives are (1) a flexible and realistic exchange rate; (2) a liberal trade regime; (3) competitive primary input markets; (4) competitive financial markets; (5) non-discriminatory tax system; and (6) a transparent and rational regulatory system. Institutionally, the goal is to foster a set of units that collaborate in a consistent manner and deliver timely, useful services thus contributing to an enabling environment.

Antoon G. Vergroesen, Deutsche Gesellschaft fuer Technische Zusammenarbeit (GTZ) in co-operation with the Ministry of Lands and Housing German Assisted Settlement Project, Kenya — *Integrated rural development in settlement schemes in the Coast Province in Kenya; guidelines and criteria for community participation and project selection towards a sustainable settlement policy.*

The main focus in the paper is on the the lessons learned from a 10 year settlement experience in the Coast Province of Kenya. The guidelines show the need for: integrated physical planning for all departments; a clear definition of community borders; the timely

demarcation of plots; the promotion of cluster settlement, the need to avoid balloting of plots but the emphasis on block-wise land development on a communal basis and; the proper selection of community development projects for integration of new farmers in settlement schemes. The set up of village development committees allows settlers and local residents to take responsibility for community life and projects in settlement schemes. Successful implementation of community development projects requires proper ex-ante project evaluation according to at least three described criteria. Only technically sound, economically feasible and socially acceptable projects chosen by the settlers and implemented through community participation will result in the sustainable development of settlement schemes.

Yony Sampaio and **Ana Lucia Petry**, University Federal de Pernambuco, Brazil — *The economics of scarcity: food consumption effects of the Cruzado Plan in Brazil.*

The macroeconomic policy called Cruzado Plan involved a price and wage freeze that ended up leading to scarcity and black markets. The income and scarcity effects on consumption of some important food commodities are studied, along with the total effect on caloric and protein consumption. It is concluded that consumption by low income families increased and that by higher income families decreased.

D. Sheikh, Small Ruminant Programme, Nairobi and **C. Valdivia**, University of Missouri, USA — *Gender roles in the production of dual purpose goats.*

This study addresses differences in adoptive behaviour among male and female farm operators with respect to the Dual Purpose Goat technological (DPGT) package. The study also addresses access and control of resources and tries to find out whether this can explain the differential adoptive behaviour.

Mohamed A. Elfeil and **John Davis**, Queen's University, UK — *The economic constraints on producing field crops in the Northern Province of Sudan: an econometric approach.*

This research set out to determine the main economic constraints in the production of field crops in the Northern Province of Sudan. Results indicated the most important constraints as being the low level of application of inputs, especially, irrigation and chemical fertilizer and the unavailability of credit.

Ali Nguisa, **Slim Zekri** and **Moncef Ben Said**, University of Tunis — *Evolution and performance of family farming: a case study in Northern Tunisia.*

The paper analyses the evolution over the last 15 years of a homogeneous group of family farmers located in a region close to the Tunisian capital. The methodology used is based on cluster analysis and multiobjective programming. The results obtained showed that the farmers invested only in stables. On average they increased the housing capacity by 75 percent. They still depend on hired machinery, and reduced their dependence on loans. The compromise solution showed, on the other hand, that these farmers should better use the stable housing capacity and specialize in dairy cows. The gross margin will improve by 76 percent and the number of crops should be reduced considerably.

T.S. Jayne, Michigan State University, USA, **Tobias Takavarasha, E.A. Attwood**, Ministry of Lands, Agriculture and Water Development, Zimbabwe, **Bernard Kupfuma**, Michigan State University and **Mandivamba Rukuni**, University of Zimbabwe — *Postscript to Zimbabwe's maize success story: policy lessons for eastern and southern Africa.*

Since independence, Zimbabwe has received wide international acclaim for the rapid growth in smallholder maize production. However, there has been a largely unnoticed structural decline in production since 1985, associated with a contraction of public sector support programs that had contributed to the dramatic rise in smallholder production during the early 1980s but involved large treasury outlays. However, the adverse effects of this production decline on urban food security appear to have been considerably mitigated by recent maize marketing reforms that have reduced distribution and milling costs of staple maize meal available to consumers. The experience of Zimbabwe raises important policy issues for potential economic transition in South Africa: (1) how to restructure (rather than abandon under budget pressure) key public sector programs and policies to raise agricultural productivity and meet the needs of a vastly expanded agricultural client base in a sustainable way; (2) how to capture potential gains from market liberalization without exposing producers, consumers and government to the economic, nutritional and political costs of price instability; and (3) how to allow the preferences of lower-income consumers to be better articulated through the food marketing system to promote food security.

Mulugetta Mekuria, University of the North, Republic of South Africa and **Eric W. Crawford**, Michigan State University, USA — *Economic analysis of constraints and opportunities to increase smallholder wheat production in Ethiopia.*

In Ethiopia, wheat is an important crop and half of the wheat consumed is imported. Yields are lower than in other African countries. Probit analysis identified critical variables influencing farmers' decisions to use different fertilizer rates. Partial budget and marginal returns analysis confirmed the profitability of recommended production packages.

Naomi Ngwira and **Scott Swinton**, Michigan State University, USA — *Managing maize production risk using horticultural crops: a new approach to solving household food insecurity in Malawi.*

The potential of non-rainfed cultivation to improve food security is investigated using safety first Target MOTAD to model farmers' risk avoidance behaviour. Results indicate that stable, high yields of non-rainfed crops can enhance adoption of fertilizer and hybrid maize varieties leading to higher mean maize harvests and income.

Memoona R. Khan and **James F. Oekmke**, Michigan State University — *Commercial and institutional infrastructure at the village level in Punjab.*

Village access to 13 key indicators of physical transport, commercial, institutional, administrative and social infrastructural services are measured. Cluster analysis indicated that most sample villages enjoy reasonably good access to infrastructural services. Off-

farm labour allocation differed significantly across villages with more and less accessible infrastructure.

Sureah Babu, IFPRI, Malawi, **Arne Hallam**, Iowa State University, USA, and **B. Rajasekaran** — *Agroforestry and household food security interactions: implications for multi-disciplinary research policy.*

A general framework is developed in this paper to study the interactions between agroforestry and household food security. The contribution of various components of agroforestry to the dynamics of household food security of smallholder farmers is discussed in a growth theoretical framework. Recognising the slow adoption of an agroforestry system by resource-poor farmers, conditions for switching between systems of monocropping and agroforestry are derived using model results. Policy implications for multi-disciplinary research are derived.

T.O. Williams, International Livestock Centre for Africa, Niger, **Fernandez-Rivera** and **J.M. Powell**, Sahelian Centre, Niamey, Niger — *A risk programming model of crop-live-stock production alternatives in the Sahel.*

Integrated crop and livestock production is growing in importance in semi-arid West Africa as previously independent pastoral and crop production systems are becoming less relevant. Realistic economic assessments of the complex interactions between crop and livestock production are needed in order to determine the complementarities and trade-offs inherent in the production system and how best to exploit these to improve the welfare of producers. This paper uses a MOTAD programming model to evaluate (a) the impact of integrating crop and livestock production on farm income, and (b) the implications of farmers' risk aversion for long-term farm profitability. The results indicate that farmers can make significant economic gains by integrating crop and livestock production, but inadequate working capital and farmers' risk aversion are major constraints to maximizing income from crop-livestock production activities. Opportunities exist for raising farm income if the liquidity position of the farmer at the beginning of the growing season can be improved. In an average rainfall year, an increase in cash availability would enable the farmer to purchase fertilizer, hire labour and buy replacement breeding animals — all of which would serve to increase farm incomes and rural welfare in the long run.

G. Schiefer, University of Bonn, Germany and **C.H. Gotsch**, Stanford University, USA — *Computer supported policy advisory systems for developing countries: background, potential and development framework.*

The (market) policy decision situation in developing countries and the emerging market economies in Eastern Europe makes these countries especially dependent on the availability of appropriate policy information and decision support systems. New developments in information requirements analysis, information systems research, and information technology have demonstrated their potential for executive decision support in corporate environments of industrial countries. The paper reviews these developments and relates them to the specific conditions in policy institutions in development environments. It is argued (and supported by early empirical evidence) that these developments, if appropriately applied and administered, could initiate a major thrust towards the emergence

of computer-based policy support systems with substantial potential for executive policy support in developing countries. The paper is summarized in a 10-step development framework which is being used in on-going system development efforts and could serve as a guide to similar activities elsewhere.

Agriculture and Sustainable Development

Hosein Shapouri and **James Duffield**, USDA — *Biomass energy outlook for developing countries.*

Energy use in developing countries is expected to increase more rapidly in the future. Traditionally, these countries have relied on imported oil for their increased energy needs. However, with current economic conditions and expected higher oil prices it may be beneficial to invest in alternative domestic sources of energy. Biomass energy is the primary feedstock for energy in developing countries. Agricultural and forestry residues, animal dung, by-products from agribusiness industries, such as sugar cane, pulp and paper, and municipal solid waste, are readily available energy sources in developing countries. There are many simple technologies that could be introduced to increase the efficiencies of biomass energy use in rural areas, and some advanced technologies for industries. These technologies have the potential of saving energy, diminishing adverse environmental effects, improving living standards and reducing energy dependency.

Javier Calatrava, Department of Agricultural Economics, Granada, Spain — *Contingent analysis of the scenic value of sugar cane in the subtropical coast of Granada (Spain). Some factors related to willingness to pay (WTP).*

Natural resources valuation is currently receiving increasing attention from agricultural economists. An application of the contingent value method (CVM) to estimation of the scenic value of sugar cane on the subtropical coast of Granada (Spain) is presented here.

Bruno Barbierpost-doc, Washington D.C. and **Michel Benoit-Cattin**, CIRAD, France — *Modelling agricultural sustainability at the village level in West Africa.*

Linear programming is used in a recursive way to discuss the medium and long term perspectives of agricultural systems in cotton zones of western Africa. Interactions between population growth, land fertility management, needs for food and energy, cattle, trees, crops, and evolution of prices are included in the model and discussed according to different scenarios.

K.J. Thomson and **D. Psaltopoulos**, University of Aberdeen, Scotland, UK — *Forestry and rural development in agriculturally over-extended areas: the cases of Scotland and Ireland.*

The objective of this paper is to provide estimates of the impact of forestry, as a land-use alternative to agriculture, on rural development in areas of Scotland and Ireland characterized by depopulation, remoteness from main population centres, and adverse soil and climatic conditions. It describes work conducted at and from Aberdeen as part of tripartite 1991–94 CEC CAMAR¹ study of Afforestation in Rural Development in

Scotland, Northern Ireland and the Republic of Ireland. In particular, two aspects of this work are focussed upon: (i) the interrelationships between the forestry sector and other components of the rural economy investigated through surveys of forestry sub-sectors and input–output analysis, and (ii) analysis of alternative afforestation scenarios over the next several decades. The study as a whole is intended to throw light on the implications of afforestation for economy-wide output, job creation and income levels.

A. Alvarez, A.C. Herruzo, University of Cordoba, Spain and **S. Zekri**, University of Tunis — *Intertemporal profits from soil conservation practices in Mediterranean dry farming.*

An approach to compare conventional (non-soil conserving) practices with conservation practices in Mediterranean dry farming is presented. This approach involves the application of an economic damage function to determine the present value of the net income stream lost from maintaining conventional tillage practices instead of adopting reduced tillage techniques (direct drilling systems). The GAMES model is used to estimate soil erosion rates under both conservation and non-conservation practices. A soil productivity index is then used to quantify the relation between soil erosion and soil productivity. Finally, production costs and yields under both tillage systems are estimated to calculate the erosion damage function. The results of the analysis indicate the profitability of conservation tillage for the growing conditions of the area.

Gamini Herath, La Trobe University, Australia — *The algal bloom problem in Australian waterways: some control issues.*

Algal blooms have created considerable concern in Australia in recent years. Australia experienced the worst algal bloom in the Darling-Barwon River System in 1990. The Government has appointed a Task Force to study the algal bloom problem and to develop appropriate control measures. Simultaneously control measures are being taken in several fronts. The lion's share of attention seems to have gone to technological solutions such as upgrading sewage plants. There is considerable potential for institutional measures such as community education, informal group formation etc. to enhance the effectiveness of government control measures. The effort in these areas appears to be inadequate and if this is not overcome the effectiveness of technological solutions may be lowered. Control of detergent phosphorus appears to be an area needing attention and there is potential to reduce phosphorous considerably if this aspect is carefully worked out.

Habibullah Khan, National University of Singapore — *Strategies for sustainable development in a city-state economy: the case of Singapore.*

The paper provides a theoretical framework for analysing sustainable growth and development in city-state economies, which are, by definition, small in size and deficient in land and natural resources. For illustration, the case of Singapore is highlighted. Growth and environmental objectives were fulfilled in an integrated fashion, as suggested by the theory, through an efficient physical planning system in Singapore. The government played an important role in implementing sustainable growth strategies but the interventionist measures did not hinder the process of market mechanism, as argued in the paper.

Guillermo Flichman, Institut Agronomique Méditerranéen de Montpellier, France, **Consuelo Varela-Ortega** and **Aberto Garrido**, Universidad Politécnica de Madrid, Spain — *Agricultural policy, choice of technologies and environmental impacts under uncertainty and market imperfections: a regional comparison in southern Europe.*

This paper analysis the effects of the reform of the Common Agricultural Policy (CAP) on the choice of technologies, crop pattern and environmental damage. We consider 2 regions of southern Europe, South West France and Andalucía in Spain. The methodology used is based on the integration of an agronomic model (AM) with a mathematical programming model (MPM). The AM allows us to generate a wide specification of techniques, both actual and potential, overcoming the lack of information on potential techniques that may be feasible as a response to drastic changes in the price structure. The MPM is recursive and takes into account risk and uncertainty. The results are presented for a period of 5 years for 2 different scenarios, one that assumes a continuation of the previous policy and the other that considers implementation of the CAP reform.

Danilo Tomic and **Zorica Vasiljevic**, Institute of Agricultural Economics, Belgrade, Yugoslavia, and **Miladin Sevarlic**, University of Belgrade, Yugoslavia — *The land degradation processes, causes and consequences: the case of Yugoslavia.*

In this paper the authors analyse land potentials in some selected countries which are important food producers and consumers. First, this analysis refers to cultivable areas per resident as well as per economically active agricultural producer (farmer). It includes some countries characterized by cultivable area as a factor 'in abundance', others with cultivable area as a 'limiting' factor, and some with satisfactory available land potential. Imbalance between decrease incultivable and arable areas on one side, and growth of population number on the other are pointed out. The paper includes analysis of degradation of soil caused by: a) water and wind erosion; b) chemicals and fertilizer application; c) irrigation; d) utilization of heavy mechanization. Particular attention is been paid to the causes and consequences of soil compaction. It is pointed out that there is a need for more rational land utilization, first of all by increased utilization of organic substances and manure, decreased utilization of chemicals, as well as by subsoiling, having respect to the crop rotation etc. Particular attention is paid to the mentioned problems in Yugoslav agriculture.

Philip Szmedra, Economic Research Service, USDA — *Pesticides in sub-Sahara Africa.*

The use of agricultural pesticides in the SSA region has increased with the growth in area devoted to cash crops for export. Prevailing agricultural development philosophies by donor groups influenced the SSA nations in establishing subsidy structures which promoted the use of chemical pesticides. Institutional structures to regulate the distribution and use of these materials are either absent or lack sufficient financial and technical resources. Though many nations have accepted the concept of IPM as an important aspect of agricultural policy, adoption of alternative pest control methods has been sporadic. This paper details the pesticide use situation in the region including data for the 1992 harvest year for Cote D'Ivoire, Kenya and Zimbabwe. Use trends in important pesticide market crops such as cotton, coffee, cocoa, and tobacco are described. Regulatory environments

are evaluated with implications for future use of chemical and non-chemical pest control methods.

Policy Reform and Transition in Rural Economies

G.C.G. Fraser, University of Fort Hare, and **Alice G.G. Antrobus**, Rhodes University — *The availability of commercial farm land for redistribution via the market in the Eastern Cape province of South Africa.*

The intention of the South African Government to establish a significant number of black farmers as commercial producers could be achieved in part through the purchase of land on the open market. The paper attempts to establish the extent to which this would be possible by examining the transfers of rural immovable property in the Eastern Cape province over a period of time. A greater proportion of smaller properties change hands each year than larger properties. Many of these are in the vicinity of the metropolitan areas (Port Elizabeth and East London) and not all can be considered as viable units for full-time farming. While smaller properties are more expensive per unit area, more extensive farms are generally situated in areas unsuited to subdivision into small scale units. It is concluded that the amount of land becoming available each year without intervention on the part of the State would be insufficient to establish a significant number of black commercial farmers in the Eastern Cape. Opportunities for livestock intensification in mixed systems include animal traction, fattening of small ruminants, intensified milk production with crossbreeds or improved breeds, and strategic fattening to meet demand peaks. Like improved crops, forages to overcome the critical feed constraint require increased soil fertility through purchased inputs in the savannas. The potential for improved integration of mixed systems is thus limited. Specialized systems occur where profitability is higher for livestock than for crops, either near urban markets or where crops cannot thrive. Specialized, intensified peri-urban dairy and finishing operations present important, but limited development opportunities. In drier areas, on-going currency devaluation results in increased, but still highly variable livestock income. Future research will be needed to cut livestock losses and stabilize prices, and provide better market opportunities and information. Migration due to low income potential in marginal smallholder mixed systems will ultimately lead to improved larger scale livestock operations.

Katalin Daubner, Budapest University of Economic Sciences, Hungary, and **Donald B. Erickson**, Kansas State University, USA — *New policies and forms of co-operation for Hungarian agricultural transition.*

Economic forces strongly favour privatization. Production efficiency provided by private farms is clearly evident. Presently agriculture has a surplus of resources that will have to be corrected over time based on accurate costs and returns. The length of time required to make the transition to a free market economy will depend on politicians' and farmers' willingness to change. Marketing regulations have been established to handle production flows and price fluctuations resulting from the transition to a free market. Support from the Ministry of Agriculture and the Product Councils will establish regulated agricultural markets that are specific to each product. Marketing surplus products will be toward Western Europe but tariffs and restrictive quotas entering the European Common Community will prevent major expansions. The transition to a free market economy in

Hungary should be faster with fewer disruptions than in most of the other centrally planned economies.

Xavier Bejarano, David R. Lee and Duty Greene, Panamerican Agricultural School, Honduras, Cornell University, USA and Agricultural Policy Institute, Ecuador — *Exchange rate reform and agricultural export response in Ecuador.*

Real exchange rate devaluation has been a centerpiece of macroeconomic reforms in many developing countries in the 1980s and 1990s. This paper analyzes the effects of variations in the real exchange rate, export prices, and other factors on the performance of three major agricultural export markets (coffee, cocoa, bananas) in Ecuador for the period 1978–89, over which significant macroeconomic changes occurred. Exchange rate and price transmission models and export supply models are estimated to analyze the structure of price determination and export responsiveness. The empirical results demonstrate that: (1) the real exchange rate is a primary determinant and world prices are a secondary determinant of export responsiveness; (2) measures of market segmentation and integration can be used to assess the domestic market effects of variations in the real exchange rate, world prices, and border prices and (3) unique structural characteristics of individual export markets influence price and exchange rate pass-through at different levels.

Peter Calkins, Frederic Martin and Sylvain Lariviere, Laval University, Canada — *Identifying and involving the poor in structural adjustment and transition auto- and exo-perceptions from rural Burkina Faso.*

Subjective (auto) perceptions of well-being, solicited from rural residents through focus-groups and voting exercises, included not just material goods like food, but public goods like health and ethical values like family harmony. Spearman-rank correlations among young, old; male, female; and favoured, disfavoured villagers demonstrated that all ranked children's welfare, cattle, health, clothing, better harvests and enhanced women's contributions above money. Guttman scales were also developed to rank households' well-being by objectively observable (exo) perceptions. Extension and relief workers can use ploughs, primary school registers, and bicycles to distinguish rapidly and accurately among comfortable, vulnerable, poor and destitute households, even in villages that have never been visited before. Regression analysis further determined that government could reduce poverty by promoting a larger workforce per household, more off-season employment, investment in new technology and intensification of the cropping index. Special attention should be given to female-headed households and those belonging to certain religious communities.

M.R.G. Daroch and D.F. van der Riet, University of Natal, Republic of South Africa — *Impact on land values of deregulation in the South African sugar industry.*

Much uncertainty surrounds the direction of future land values in the South African sugar industry following proposals to abolish sucrose production quotas and set a new tariff on raw sugar imports. Results of an econometric model of sugar quota land values show that expected real net realization revenue per hectare and real interest rates drive real quota land values. Acceptance of the new tariff, and successful lobbying by growers for a bigger

share of sugar sales proceeds, will prevent farm income and hence sugar land value from falling to the extent expected if quota abolition alone occurred. Using representative North Coast area data, a net 10 percent fall in real sugar farm income per hectare sugar land value per hectare by an estimated 5.5 percent, *ceteris paribus*. Given the prospect of sugar quota land owners incurring asset value losses, it is entirely predictable that the Industry proposes to phase in only partial deregulation and growers will lobby for compensation to reduce this economic shock.

Natalija Kazlauskiene, Lithuania Institute of Agrarian Economy and **William H. Meyers**, Iowa, USA — *Macroeconomic adjustment and the economic transition in agriculture: the case of Lithuania.*

Experience in transition economies have shown that the simultaneity of macroeconomic and sectoral reforms is important to the success of both. In Lithuania, macroeconomic, agrarian and other sectoral reforms were implemented concurrently. Real wages and income have declined sharply. Inflation has been reduced to low single digit levels, the real exchange rate has appreciated substantially and stabilized, and the real value of foreign trade and trade dependence on the East has fallen substantially. Restructuring and privatization of state and collective farms has been progressing rapidly, and the privatization of other enterprises in the food and agricultural chain has been going at a slower pace. Input prices and retail prices have increased in real terms while real farm prices have declined. The food and agricultural sector has contracted and in a market economy will likely remain far less dependent on imported inputs and on export markets for products.

John Omiti, Simeon Ehui, Kevin Parton and **Sagary Nokoe**, International Livestock Centre for Africa, Ethiopia (for all but Kevin Parton who is with the University of New England, Australia) — *Changing farm resource use systems from socialist to partially liberalized agrarian structure in the Ethiopian highlands.*

The military (1974–91) government nationalized and redistributed all agricultural land amongst peasants following the Land Reform Proclamation in 1975 in Ethiopia. Land redistribution was meant to achieve equal land size per household and improve agricultural performance. Sale of land and hiring of agricultural labour were prohibited. Following the ousting of the military regime in 1991, there has been a reduction of imperfections in rural factor markets. Selling/hiring, renting and exchanging of agricultural land, farm labour and animal traction are increasing. These changes will influence agricultural production in many ways if government policies with respect to rural factor markets and infrastructural development are encouraged and implemented. Policy reform regarding land tenure would be of utmost importance in guiding agricultural productivity.

Korotoumou Oattara, Carlos E. Cuevas, and **Douglas H. Graham**, Ohio State University, USA — *Financial innovation and donor intervention in Africa: village savings and credit associations in The Gambia.*

This paper documents the unusual performance of the Village Savings and Credit Association (VISACAs) in The Gambia. Important organizational and operational technologies are highlighted in successfully supplying a range of financial services to their

members. The important issue of the appropriate type of donor intervention is also explored.

Johan van Rooyen, Johan van Zyl, University of Pretoria, Republic of South Africa, **Thedi Matsetela and Masipula Mbongwa**, Development Bank of Southern Africa — *A framework for agricultural land redistribution in South Africa.*

A complex set of factors will influence agricultural land reform in South Africa. These include the nature of agriculture, political and social considerations, institutional arrangements, macroeconomic policy and spatial dimensions. This complexity requires a multi-pronged approach to land reform. A framework for land redistribution is discussed where various redistribution models are linked to dimensions of the 'South African land issue' and the present status of land. Models range from private land acquisition through market purchases to expropriation by the state. Land use models for land reform are also discussed. Land status ranges from tribal land to private land. Land subject to forced removals and disputed claims is also considered in the framework.

Prafulla Chandra Sarkar and Annil Bhuijali, University of North Bengal — *The required reforms of agricultural cooperative credit societies of West Bengal.*

The study shows that an agricultural co-operative credit society with unlimited liability is infinitely superior to the one with limited liability. Yet Acts on co-operative societies in West Bengal have prevented the growth in West Bengal of agricultural co-operative societies with unlimited liability. Revision of legislation is, therefore, urgent. The merit of the Raiffeisen model of agricultural co-operative credit society (or an agricultural co-operative society with unlimited liability) is two-fold. Firstly, since the members' liability is not limited to their amounts of shares, the savers who open accounts with or deposits money for a longer term at the society feel that their savings are insured without the existence of an external deposit insurance corporation. Secondly, since the inefficient management of funds might cause sudden depletion of their personal assets, the members are obliged to be ever vigilant to make sure that their society does not commit errors. A measurement of the institutional power of this type of agricultural co-operative credit societies is relevant.

Anikó Souphanthong, Hungarian Development Foundation — *The agricultural restructuring programme of the Hungarian Development Foundation.*

Agriculture in Hungary is undergoing major and complex change. Important factors arisen over the past years include: the return of ownership of agricultural land and assets to individuals, which is pressuring state farms and co-operatives to split up into smaller operating units; the loss of the former guaranteed COMECON markets for agricultural produce; lack of capital, limited availability of loan finance and interest rates that are too high for the sector, and the removal of many subsidies. Recognising these factors, the Hungarian Development Foundation has developed a Restructuring programme to support the transformation of agro-businesses. The goal of the Restructuring Programme overall is to enable enterprise managers to take more effective control of their businesses and plan and implement a range of measures to improve performance and profitability. The programme started in June 1993 has been delivered flexibly to meet the needs of the

participating enterprizes and adapted to specific enterprize requirements as needed. Based on our experiences to date in addition to the objectives set as a result, we see other positive outcomes of the programma. These include: establishing of contact between the organizations; ensuring that the process of decentralization follows business sense, keeping in mind future operational ability, providing small entrepreneurs with guidelines to become contributors to supporters of larger companies and promotion of regional level agrarian strategies.