

**STRENGTHENING FOOD SECURITY BY FOSTERING INVESTMENTS IN
IMPROVED LOGISTICS AND ECONOMIC COORDINATION:
ILLUSTRATIONS FROM AFRICA**

T.S. Jayne, John M. Staatz, Michael T. Weber, and David Soroko

**Paper presented at the World Food Prize Conference
Des Moines, Iowa
October 18, 1999**

October 1999

This paper is published by the Department of Agricultural Economics and the Department of Economics, Michigan State University (MSU). Funding for this research was provided by the Food Security II Cooperative Agreement (AEP-5459-A-00-2041-00) between Michigan State University and the United States Agency for International Development, through the Africa Bureau's Office of Sustainable Development, Africa Bureau, AID/Washington.

STRENGTHENING FOOD SECURITY BY FOSTERING INVESTMENTS IN IMPROVED LOGISTICS AND ECONOMIC COORDINATION: ILLUSTRATIONS FROM AFRICA

T.S. Jayne, John M. Staatz, Michael T. Weber, and David Soroko

In the late 1980s, the logistical system for the processing of maize (the main staple) in most of Eastern and Southern Africa was set up in a way that produced a high-cost, nutritionally inferior product that raised the price of maize meal to consumers by 30% or more. The system, although appearing “modern”, worked against the food security of the poor. Through a series of policy reforms in the early 1990s, the private sector was given a new set of incentives to modify the logistical system, saving consumers \$11 million and \$8 million per year in Kenya and Zimbabwe, respectively. These changes in the logistical system significantly improved the food security of millions of low-income consumers in the region.

How and why did such situations arise and what led to their solution? Understanding the answer to these questions involves looking at the relationship between economic coordination and food system logistics.

1. INTRODUCTION

A major goal of food policy in Africa is to alleviate poverty and food insecurity. This will involve major investments in logistical systems and production processes. But what types of logistical investments, where, and by whom? How can food policy help induce the right kinds of investments that make the most productive contributions to food security? The main issue addressed in this paper is the role of economic coordination in inducing these needed investments in logistics and production to alleviate the widespread poverty and food insecurity currently found in Africa. Economic coordination is the hidden part of the logistical system. It refers to how participants in a system harmonize their activities and transactions among each other, and involves pricing arrangements, processes for dealing with risks and uncertainty, and the procedures for dealing with the effects of each others' actions. These coordination arrangements hence affect how costs and risks are borne among the various actors in the system, which affects the rate and pattern of investment in logistics, both by the private sector (e.g., mills, silos, outgrower schemes) and by the public sector (through the effect of production growth on the tax base). Applied to issues of food security and development, economic coordination involves how to develop market/legal arrangements that reduce firms' risks and costs of investing in

productivity-enhancing logistical systems and production processes. A key issue is identifying appropriate activities for the public sector to improve economic coordination.

This paper discusses the kinds of government actions that can promote the development of logistical systems through improved economic coordination. We then provide three illustrations from research in Southern Africa showing how public policy decisions affected the ability of private marketing firms to invest in cost-reducing technologies and operations, and how these new patterns of investment affected the food security status of millions of households.

Africa's failure to utilize the agricultural production and marketing technologies being successfully used in many other parts of the world does not necessarily reflect an inherent inappropriateness of these technologies in Africa. While some technologies may not be compatible with the relative costs of labor and capital in a particular country, other technological and logistical investments are impeded in some way by incompatibility with the current structure of incentives. Identifying the factors restricting productive investments and those providing increased security for private investment and innovation represent low-cost, high-return public investments. To make an enterprise system work, investing in developing the details of the rules of the economic game and a strategy for public investments needs to be at the top of the list.

The paper then addresses some of the challenges facing African countries in developing an on-going process to strengthen logistical systems and the associated arrangements for food system coordination as their economies evolve in the future. As African economies grow and become increasingly interconnected with international markets, more complex coordination arrangements are becoming necessary to provide the stability of returns needed to justify major private investments in productivity-enhancing physical and logistical facilities. In this regard, market reform policy should be regarded as a continuous process of searching for alternative institutional arrangements, adapted to local conditions, capable of promoting new investment and productivity growth throughout the food system.

2. CONCEPTUAL ISSUES

The concept of food systems includes (1) the physical distribution of economic inputs and products (often called logistics); and (2) the arrangements of coordinating production and distribution. One might usefully think of economic coordination as the software that makes the logistical hardware operate. Coordination of economic activity takes place through transactions among participants in a system. Transactions take place across markets and within organizations such as firms, households, communities, and government agencies. As the transition from a

traditional, rural economy to a more scientifically-based agricultural and industrial economy progresses, a larger percentage of activities in the system takes place outside of farms in the production of knowledge, technical inputs, processing, and distribution (Shaffer et al. 1985). This process requires specialization, division of labor, and investment in technological inputs (which often require a larger scale of operation to be productive and profitable). Specialization requires greater coordination between the production of farm inputs, farming, assembly, processing, storage, transport and wholesaling, and retailing. More sophisticated exchange arrangements (e.g., contingent contracts -- those that specify partners' obligations and rights contingent upon a future outcome like the weather or price level) arise to reduce the risks and transaction costs of participating in more specialized and efficient sequences of production and distribution. Coordination becomes increasingly critical to performance (Shaffer et al 1985).

But this progression toward specialization and commercialization isn't automatic. The market may fail to provide effective coordination with economic growth and food security as outcomes for many reasons – high transaction costs, uncertain investment environment, opportunistic behavior, rent seeking and uneven implementation of government policy. If information were perfect, there would be little problem in coordination, but the real world is very uncertain.

3. ECONOMIC AND LOGISTICAL COORDINATION OF THE FOOD SYSTEM IN THE POST-REFORM PERIOD

Structural adjustment and agricultural policy reform have been implemented throughout the world since the 1980s in order to alleviate these constraints on private investment and growth. The reforms have in general benefitted most rural and urban households, and the reform process is clearly an ongoing process. But so far, liberalization and privatization have replaced often unreliable, high-cost, and centralized forms of state marketing with private markets that are competitive but often lacking in information, infrastructure, and poorly coordinated with other functions in the food system.

The institutional challenges in alleviating poverty over the long run can be seen by contrasting marketing systems in high-income countries like the U.S. with those in sub-Saharan Africa. In many high-income countries, policies and infrastructure have lowered the risks and transaction costs of engaging in commercialized agriculture through:

- futures and options markets to shift and absorb market risks associated with production and investment;

- commodity exchanges to enable participants to lock in quantities for sale or purchase to facilitate advance planning in production decisions;
- specialized insurance to reduce many types of risks;
- low-cost market information accessible on a daily basis, linked to national and global information systems utilizing modern communication technology.
- large volumes handled by marketing and processing firms, which allows them to spread their fixed costs and hence reduce the risks of sunk-cost investments;
- globalized trading networks to reduce covariant supply risks and reduce search costs;
- well-specified grades and standards to allow for remote contracting by commodity specification rather than by visual inspection;
- sophisticated contracting arrangements that reduce the risks of specialized investments with large sunk costs by locking in the terms of exchange over a relatively long time period;
- well-established legal systems to accommodate more sophisticated contracting arrangements and contract disputes;
- rules addressing problems of concentration of wealth and power (e.g., anti-trust legislation);
- rights of farmers to organize to act collectively in the market and politically;
- the establishment of collateral to encourage the development of credit systems; and
- competitive financial systems serving rural areas to reduce credit-related constraints on crop input use; local financial intermediaries linked to, and having access to, international capital.

By contrast, agricultural marketing systems in most of Africa are generally characterized by the following:

- spot market transactions and small volumes, which involve relatively high transaction costs per unit traded;
- small percentages of production sold off the farm; relatively thin markets;
- high-cost and unreliable transport and communications infrastructure;
- Relatively high levels of price uncertainty;
- Few mechanisms for hedging production and price risks;
- Property rights and their enforcement are often uncertain. Contracting arrangements and contract enforcement become more important as firms increase their reliance on more capital-intensive, specialized, and productive production processes;

- Limited coordination between input delivery, farm finance, and crop sale. Most grain traders tend to be passive, accepting the surpluses that farmers bring to their store rather than developing markets through supplying credit, inputs, and management advice to farmers;
- Weakly functioning agricultural credit systems, in which non-repayment is a ubiquitous problem;
- Limited public market information;
- Limited product grades and standards, and implicit “let the buyer beware” rules

Coordination and investment in technology and logistical systems

High market risks and ineffective coordination depress incentives to invest in productivity-enhancing technology. When the market environment is risky (e.g., because of uncertainty over future government actions), traders and potential marketing agents do not perceive it to be profitable to invest in the logistical operations that help create reliable markets for small farmers. Markets remain thin and risky. Each participant works hard in his or her own perceived interest, prices are more or less competitive, but the aggregate consequences are much less production and consumption than the system could provide with greater specialization and improved coordination (Shaffer et al. 1985).

This problem is exemplified by Ethiopia’s food price instability problem. With 80% of a normal crop of grains consumed on farms, a 20% increase in output increases potential domestic marketed supply by 100%. Price fluctuations can be very large and political pressure develops to do something about price instability. Uncertain future grain prices reduce the demand for inputs, which in turn constrains the development of coordinated systems of farm credit and input supply. Although a major increase in fertilizer use would most likely promote farm productivity and food security, fertilizer use in the current system is constrained by failure to develop institutional arrangements for dealing with the price and output risks of farmers, risks of non-repayment of credit for lenders, and the resulting risks to input suppliers of holding unsalable inventories. An attempt in 1996 to solve the problem through marketing board support prices was ineffective and expensive (Alemu and Jayne 1997).¹

Such coordination will become even more critical as research information becomes more and more important in the generation of agricultural products. The rising importance of biotechnology in agriculture is creating a variety of new functions in the vertical system for applying new scientific

¹ For a similar analysis for Mali, see Staatz, Dioné, and Dembélé (1989).

discoveries toward practical use in the food and fiber system. Such applications will require working out intellectual property rights for the product that balance the need for allowing creators of new material to capture adequate returns to maintain incentives with the desire to minimize the capturing of windfall profits through exclusion of competition over the long run (Zilberman et al. 1997). The competitiveness of African farmers may increasingly depend on the ability of local research and marketing systems to utilize, adapt and distribute newly engineered agricultural material. An important implication for research is that social scientists and technical scientists need to work together from the beginning in the design and diffusion of “improved technology” (Staatz 1989; Boughton et al 1995).

These points illustrate that the rate of technical change and productivity growth are not simply a function of technological innovation or investments in physical infrastructure. Uncertainty and transaction costs influence whether investment in new technology is profitable (Boughton et al. 1995). This is the dilemma currently being faced by the Sasakawa-Global 2000 programs implemented in several African countries. A major contribution of the SG-2000 programs has been to demonstrate that in certain regions and for certain crops, production can grow rapidly if farmers are given a conducive set of incentives, including access to a viable technical package, credit, and management information. However, the SG-2000 experiments have also demonstrated how such gains can be short lived if input delivery, credit access, and output markets cannot be coordinated in a sustainable manner (Putterman 1995; Howard et al. 1998). Greater attention to the institutional details and coordination mechanisms and their interactions with technology is crucial to develop markets so that they act as a catalyst to farm technology investment and productivity growth.

Coordination challenges in linking African farmers to foreign markets

With inelastic demand in local markets, African agriculture faces the dilemma that success in raising agricultural production would jeopardize continued profitability through a drop in output prices (Delgado 1992). Trade offers the potential to expand agricultural production without depressing domestic output prices, a key issue in sustaining long-run profitability and productivity in the sector. Penetration into global markets is increasing tied to understanding the complexities of food laws in major importing countries. African-based agribusiness and processing firms need to understand and comply with the proliferating and continuously changing pattern of laws controlling food import into the North American, European, and Asian markets.

Moreover, African marketing firms will increasingly need to establish partnerships with foreign firms operating in potential importing countries in order to ensure demand for their products. Multinational firms have a major advantage in international trade in that they can invest in the

complex coordination of input supply, production, processing, and marketing with the assurance of a ready retail market in another country through coordination with a subsidiary distributor in that country. Developing a vertically coordinated system of production/marketing that bridges across countries substantially reduces the risks and costs of engaging in international trade

4. SUCCESSES AND CHALLENGES OF LOGISTICAL COORDINATION: SELECTED EXPERIENCES FROM SOUTHERN AFRICA

Case 1: How policy change in Zimbabwe led to the development of a lower-cost logistical system for supplying grain to rural consumers

The formerly controlled marketing systems in Eastern and Southern Africa featured a one-way flow of grain from farmers to the marketing boards, onward to large-scale processors in urban areas, and then to consumers in rural and urban areas (Kirsten and von Bach 1992; Jayne and Chisvo 1991; Mukumbu 1992). This marketing structure, which characterized Zimbabwe, Kenya, Zambia, and South Africa prior to the reforms, created a circuitous and expensive flow of grain from rural areas to urban areas to be milled by high-cost large-scale processors, only to be transported back to rural areas for consumption by grain-deficit households. While a modern, large-scale logistical system had been developed to handle distribution, it imposed unnecessary marketing costs on farmers and consumers. The suppression of private trade (to assure the dominance of the controlled marketing system) inhibited the development of direct trade from surplus to deficit rural areas. This made households largely dependent on relatively expensive refined maize meal distributed through the official market channel.

The system was based on the implicit assumption that rural areas, and most farmers, were self-sufficient in grain. On the surface, this assumption seemed plausible enough, because grain sales normally rose rapidly in smallholder areas where marketing board infrastructure was developed (Bryceson 1993; Rohrbach 1989). This provided some evidence of a "surplus" in excess of a particular area's consumption requirements. However, micro-level research had shown that grain deliveries to the marketing boards did not necessarily indicate a "surplus" from a given region, over and above consumption requirements, since sales from a small segment of well-equipped farmers often masked considerable grain deficits among a large proportion of the rural population. Official restrictions on private trade and weak market infrastructure often made it easier for surplus farmers to sell to the Boards rather than their deficit neighbors a few kilometers away (Jayne and Chisvo 1991).

Increased recognition of the food purchasing status of many rural households and political pressure for reform heightened decision makers' awareness of the need for more decentralized and efficient food distribution networks serving the semi-arid areas. In 1993, controls on private grain movement, initially imposed by earlier colonial governments, were relaxed, and were later eliminated. The logistical facilities of the official marketing system swiftly became underutilized, and one of the four major processors was forced to liquidate its assets. In its place has risen a more decentralized pattern of grain trade and processing, featuring greater reliance on intra-rural trade. The emerging picture is that the legalization of inter-district grain movement in Zimbabwe has reduced the difference between prices realized by producers and those paid by consumers for maize meal by 25% or more. This reduction in marketing costs has been achieved primarily through the expanded role of small-scale trading and milling networks in fulfilling the residual grain needs of rural households. Research findings indicated that these policy reforms have, other factors constant, increased the disposable cash incomes of low-income rural households by up to 30% (Jayne et al. 1995). This case underscores the responsiveness of the logistical system and its organization to policies affecting coordination incentives.

Case 2: How policy change in Zimbabwe and Kenya led to changes in processing technology investment patterns and the types of consumer products available, thus creating a lower-cost logistical system and improved urban food security

As mentioned above, prior to the reforms, urban maize milling in each country was dominated by several large registered firms using roller mill technology. In Zimbabwe, for example, the largest miller handled 65% of all industrial meal sales prior to reform, while the largest two handled 85%. These millers purchased maize from the state marketing boards, often at subsidized prices, processed it, and distributed meal to retailers at government-controlled margins that were substantially higher than margins observed by the informal small-scale mills for whole meal. In Kenya, South Africa, Zambia and Zimbabwe, the processing margins awarded to the registered roller millers over the 1985-1993 period were from two to nine times higher than the margins charged by unregistered small-scale mills (Jayne et al. 1995).² However, controls on private grain movement restricted the volume of grain accessible to unregistered millers and traders. The system of controls provided the registered millers with a de facto monopoly on maize meal sales to urban consumers.

In the early 1990s, private marketing of grain in urban areas was liberalized. Subsidies on roller-milled meal were eliminated in Zambia, Kenya, and Zimbabwe. In each case, the large-scale

² Not counting the opportunity cost of time for waiting in the milling queue or travel costs.

millers swiftly lost a major part of their market to small informal hammer mills, whose numbers rapidly expanded in urban areas.³ Widely viewed during the control period as a product having negligible demand, whole maize meal now accounts for 40%-55% of total urban meal consumption in Zimbabwe, Kenya, and Zambia (Jayne et al 1995). The increased availability of whole meal at 60% to 75% the cost of roller meal has partially or fully offset the adverse effect of eliminating consumer subsidies in these countries. Household surveys indicate that low-income consumers in particular shifted quickly to hammer-milled meal (Rubey 1995; Republic of Zambia 1995; Argwings-Kodhek and Jayne 1996). These reforms have saved urban consumers in the city of Nairobi alone over \$10.5 million annually (Jayne and Argwings-Kodhek 1996).

Case 3: How failure to provide incentives for economic coordination has impeded smallholder incomes and productivity in Zambia

In many parts of Africa, cash crops such as cotton and coffee play a vital role in raising farm productivity and incomes, and hence help ensure these households' food security. In 1992, a change in governments in Zambia heralded economic reforms that gave the private sector a much larger role in agricultural production and marketing. The privatization of parastatals such as Lintco (which formerly purchased cotton from farmers and marketed it) provided opportunities for private marketing firms and ginners to invest in the system. Several firms, including Lonrho Ltd., decided to expand their operations beyond ginning (which Lonrho had undertaken in Zambia since 1985). Lonrho's decision was largely based on an objective of raising capacity utilization of its gins, and this was perceived to require a larger production base. Lonrho thus invested in developing a farmer outgrower scheme, involving its own extension system to improve small farmers' husbandry practices, improved seed multiplication and distribution (which took five years to develop), and marketing activities that were integrated across many stages (procurement and distribution of fertilizer and chemicals on credit to its registered farmers, which was to be recouped upon the sale of the crop at harvest).

Lonrho management accepted that the initial investments would lose money for the first few years as the production base was developed. Lonrho had registered some 85,000 cotton farmers, 95% of whom cultivate under 5 hectares of land (CTS 1996). The firm claims that small farmer cotton yields have increased 30% between 1993 and 1996. National cotton production had increased impressively between 1993 and 1997 (from 47,000 tons to 110,000 tons). While

³ The number of hammer mills operating in the capital cities of Nairobi, Harare, and Lusaka has risen by 80%, 57%, and 40% in the past several years (Jayne et al 1995; Republic of Zambia 1995).

Lonrho has undertaken these investments with its own long-run interests in mind, its activities in support of the cotton sector have been clearly compatible with government objectives of smallholder incomes and farm productivity growth.

However, Lonrho's success in promoting cotton production began to attract other firms into the procurement of cotton. Many of these firms have no development costs to recoup (such as running outgrower schemes, maintaining seed quality, distributing chemicals or extension services) and hence they have been able to offer farmers higher prices than Lonrho, enticing Lonrho-supported farmers away from Lonrho. There are also reports that farmers with immediate and pressing needs for cash are sometimes willing to default on their loans and take cash from other traders even at lower prices than offered by Lonrho (CTS 1996). These competitors can profit off of Lonrho's development investments in support of cotton production growth by "poaching" farmers supported by Lonrho. This has resulted in Lonrho not receiving the increased cotton ginning throughput benefit of their development investments as well as exacerbating their credit default problem. In 1999, after losing approximately \$2 million annually in unrecovered loans and other investments, Lonrho has announced that it will liquidate its outgrower and extension systems and concentrate on ginning.

Superficially, the existence of other buyers would lead one to believe that Lonrho Cotton's retreat from cotton production promotion would not significantly affect production as other firms could simply fill the void left by Lonrho's departure. However, Lonrho's seed multiplication and distribution, chemical credit, and marketing services will all be virtually impossible to replace in the short term, and most other domestic marketing firms have shown no interest in doing so. Lonrho's seed multiplication capacity took five years to develop and it contributes to the productivity of the Zambian cotton sector. Chemical distribution and marketing require establishing good relations with chemical suppliers, borrowing money to finance inputs on credit, and administrative and extension capacity. Lonrho's exit from direct liaison with farmers may also jeopardize the productivity of other crops. For example, the Zimbabwe Seed Cooperative had reached an agreement with Lonrho to distribute improved hybrid maize seed in Zambia using Lonrho's distribution and extension system for small farmers. According to Lonrho, this partnership would have offered the Seed Coop an extremely low-cost way of getting its seed available in rural areas as it would be covered under virtually the same overhead as Lonrho's cotton seed distribution. Lonrho saw the advantage of being able to support the use of hybrid maize by small cotton farmers to improve their food security.

Lonrho's announced exit from cotton production promotion represents a variant of the "tragedy of the commons" problem, in which opportunities for small farmer income growth have been squandered due to failure to adequately coordinate incentives among the actors in the system.

Some firms may be willing to serve as “active coordinators” that can help catalyze a commodity subsector, but arrangements must be developed to ensure that these firms can recover their up-front investment costs.

What could have been done? Side selling and a lack of credit repayment could have been reduced with more effective credit repayment enforcement mechanisms. Government support may be necessary to help traders broker agreements with ginners to reduce sideselling. Several ideas have been floated, including the creation of geographic cotton buying concessions and a donor-capitalized cotton marketing revolving fund where the onus for agricultural credit recovery and revolving fund repayment would be placed on the ginners, thereby giving them the incentive to work out the side selling issue amongst themselves.

The case of Zambia’s cotton sector shows how market liberalization can open up opportunities for private investment in infrastructure and logistics that support food security and productivity growth, but there are no assurances that this will actually happen. Unless adequate attention is given to coordination arrangements within the system -- an issue of public policy -- private sector response can be impeded (or only result in limited types of private sector response). The key is how to attract investors that are willing and capable of incurring the up-front investment costs necessary to build up the sector’s productive potential, and not allow this process to be undermined.

5. CONCLUSIONS

The situation of relatively low levels of productivity in Africa co-existing with the widespread use of technical knowledge in many other parts of the world indicates that lack of technology itself is not a sufficient explanation for the degree of poverty and underdevelopment in Africa. The policy environment is very important in determining how the food industry will be coordinated (i.e., the “*software*”) which in turn affects the type of logistical system that evolves (i.e., the “*hardware*” of the industry). Getting food from where it is produced to those who need it requires a well-functioning logistical system. But physical infrastructure is not enough. Roads, storage facilities, and market places make food more accessible to the hungry only if policies are in place that induce the private and public sectors to: (a) handle the coordinating functions in the food system efficiently (setting prices, enforcing contracts, financing, sharing information and risk, etc.); (b) produce the types of low-cost products that low-income consumers prefer, given their income constraints; and (c) invest in the appropriate types of logistical improvements. The payoff to investing in improved logistics thus depends critically on the policy environment in which it takes place.

This paper summarizes the relationships between the technology of physical infrastructure, policy choices, and food security outcomes and illustrates these points with selected examples from Africa. For example, the paper discusses how market reforms in Eastern and Southern Africa had major effects on the pattern of investment in grain processing technology and transportation. These changes in investment patterns had enduring and wide-ranging benefits on food security in both urban and rural areas. Three critical challenges are addressed and illustrated: (a) how appropriate policies can lead the private sector to invest in technologies that produce a mix of products that give low-income consumers a broader set of options to assure their food security; (b) how those policy choices also influence the capacity of the food system to serve both urban and rural low-income consumers; and (c) the potential for achieving higher incomes and food security for small farmers through improved logistics and coordination for key cash crops.

Approaching Market Reform as a Continuous Process

Market reform is not a short-run process of handing over activities to the private sector, but rather a continuous process of finding more efficient ways to coordinate the various stages in accomplishing tasks within a market-oriented system. The tendency to regard market reform as a short-run process (completed when the state hands over activities to the private trade) reflects an over-emphasis in policy discussions on who will carry out particular marketing functions and an under-emphasis on how to cost-effectively promote the kinds of investments that raise the productivity of the system. While a specific goal of policy is to reduce marketing costs, the evolution of more productive economies over the past two-hundred years has featured the development of more complex and costly marketing and contracting arrangements. These more complex and costly marketing arrangements have successfully reduced risks and transaction costs of investment in more technically efficient production processes and have hence proven valuable because they have encouraged productivity growth at other stages of the system (North 1994). A complex contracting mechanism between a farmer out-grower company and an international marketing firm may involve high costs in terms of negotiation, legal services, monitoring, and related public resources to enforce contracts and rights if necessary, but such mechanisms may provide the stability of returns to justify major investments in new technology that lead to productivity gains throughout the food system. The evolution of more productive economic systems may involve higher marketing costs, not less.⁴ In this regard, market reform policy

⁴ With better coordination, for a given set of services, unit costs of marketing/distribution should fall, although total costs may increase due to an increase in volume handled. (2) But what

should be regarded as a continuous process of searching for alternative ways of organizing the industry, adapted to local conditions, capable of promoting new investment and productivity growth throughout the food industry.

REFERENCES

- Alemu, A. and T.S. Jayne. 1997. "Cereal Price Stabilization in Ethiopia: Effects on Production and Income Distribution." Grain Market Research Project Working Paper, Ministry of Economic Development and Cooperation. Addis Ababa:Government of Ethiopia.
- Boughton, Duncan, Eric Crawford, Julie Howard, James Oehmke, James Shaffer, and John Staatz. 1995. "A Strategic Approach to Agricultural Program Planning in Sub-Saharan Africa." Department of Agricultural Economics, Food Security II Cooperative Agreement International Development Working Paper No. 49. East Lansing:Michigan State University.
- Bryceson, D., "Urban Bias Revisited: Staple Food Pricing in Tanzania," in *Real Markets: Social and Political Issues of Food Policy Reform*, Hewitt de Alcantara, C. (ed.), London: Frank Cass, 1993.
- Delgado, C. 1992. "Why Domestic Food Prices Matter to Growth Strategy in Semi-Open West African Agriculture". In *Journal of African Economies* 1.3 (November):446-71.
- Jayne, T., L. Rubey, F. Lupi, D. Tschirley, and M. Weber. 1996. "Estimating Consumer Response to Food Market Reform Using Stated Preference Data: Evidence from Eastern and Southern Africa." In *American Journal of Agricultural Economics*, Vol. 78, 3:820-824.
- Jayne, T.S. and G. Argwings-Kodhek. 1997. "Consumer Response to Maize Market Liberalization in Urban Kenya." In *Food Policy* (November).
- Jayne, T.S., and M. Chisvo, "Unravelling Zimbabwe's Food Insecurity Paradox," *Food Policy*, Vol. 16, No. 5 (1991), pp. 319-329.
- North, Douglass C. 1994. "Institutions and Credible Commitment." In *Journal of Institutional and Theoretical Economics*, Vol. 84, No. 3 (June): 11-22.

also happens in the transition to higher-income systems is that more functions are now provided by the marketing system (e.g., more processing and preparation), so that even unit marketing margins may increase, but this marketing margin now covers a much greater set of services provided to the final consumer.

- Putterman, L. 1995. "Economic Reform and Smallholder Agriculture in Tanzania: A Discussion of Recent Market Liberalization, Road Rehabilitation, and Technology Dissemination Efforts." In *World Development*, Vol. 23, No. 2:311-326.
- Republic of Zambia, "A Review of Maize Marketing Liberalization During 1994: The Transition Programme 1995/96" (Lusaka: Food Security Division, Ministry of Agriculture, Food and Fisheries, 1995).
- Rohrbach, D.D., "The Economics of Smallholder Maize Production in Zimbabwe: Implications for Food Security," International Development Paper No. 11 (E. Lansing: Michigan State Univ., 1989).
- Rubey, L., "Maize Market Reform in Zimbabwe: Linkages between Consumer Preferences, Small Enterprise Development and Alternative Market Channels," Ph.D. diss. (E. Lansing: Michigan State Univ, 1995).
- Shaffer, James D., Michael Weber, Harold Riley, and John Staatz,. 1985. "Influencing the Design of Marketing Systems to Promote Development in Third World Countries." In *Agricultural Markets in the Semi-Arid Tropics: Proceedings of the Intl. Workshop, Oct. 1983* (Pantacheru: ICRISAT).
- Staatz, John M. 1989. "The Role of Market Conditions in Influencing the Adoption of New Agricultural Technologies in Mali." Report to USAID/Mali. Department of Agricultural Economics Staff Paper no. 89-109 (October). East Lansing:Michigan State University.
- Zilberman, D., C. Yarkin, and A. Heiman, 1997. "Agricultural Biotechnology: Economic and International Implications." Invited paper presented at the International Agricultural Economics Association Meeting, Sacramento (August).