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## RISK AND AGRICULTURAL INPUT USE: ANALYSIS AND MITIGATION

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Risk and uncertainty remain major constraints on the adoption of improved production technologies. Risks are faced by farmers (who must specialize and rely on input and output markets) and by marketing and processing agents. Farmers in industrialized countries have many options for dealing with risks: for example, market and weather information, price supports, insurance, financial services, futures markets and production contracts. These options are generally unavailable to farmers in developing countries.

The objective of the symposium was to explore promising analytical tools and institutional innovations to reduce or mitigate agricultural risk in developing countries. The organizers acted as presenters, along with Sushil Pandey, Kees van der Meer, Vijay Kalavakonda, Ron Phillips, Mulat Demeke, Dismas Okello and Paul Seward. The four sub-topics were: (1) links between risk, technology adoption and poverty; (2) improving methods/institutions to decrease production risk; (3) designing cost-effective institutions to reduce marketing risk and uncertainty; and (4) field perspectives on methods/institutions currently used.

### *Risk, technology adoption and poverty*

Participants first discussed the theoretical and empirical evidence linking risk to agricultural technology adoption and poverty. Coping mechanisms used by the rural poor result in the erosion of assets (for example, livestock sold at low prices, children kept out of school). As the poor grow poorer they become less willing to adopt technology.

The group reflected on the most appropriate approaches to risk mitigation in different situations. Might some risk management tools be better suited to poverty reduction objectives and others to promoting agricultural transformation? Are some more appropriate at different stages of development? In sub-Saharan Africa, could basic interventions (links to markets, better infrastructure, access to savings, and improved research and extension) provide more cost-effective risk reduction in the short run than price stabilization schemes and crop insurance?

*Reducing production risk*

Suggestions for dealing with production risk included research and extension programmes that offer farmers a menu of choices to help address particular risk problems, rather than a fixed technology package; use of simple budgets and biophysical models to predict technology performance and profitability; and rainfall-based insurance. Recent work in Asia has shown that research and extension is more effective when (a) risk mitigation occurs at the household rather than crop level; (b) researchers are rewarded for technology adoption; (c) extension addresses risk perceptions by providing farmers with more information; and (d) decentralized, adaptive research is carried out in collaboration with farmer associations and NGOs. Training extension agents to help farmers with simple budgets is critical for increasing knowledge about technology profitability. The key for improving biophysical–socioeconomic modelling is to build databases (soil, temperature, rain, solar radiation), to make them available to researchers and to develop modelling skills.

By relying on objective measurements (level and distribution of rainfall, monitoring of catastrophic weather events), rainfall-based insurance could avoid the moral hazard problems that plague crop insurance programmes. Participants expressed concerns about the cost of implementation and monitoring, and of developing crop- and region-specific models that would indicate suitable rainfall patterns.

*Reducing marketing risk and uncertainty*

Discussion focused on the use of commodity markets and hedging, and the role of regulatory reform and contract enforcement, in reducing input and output market risks. Price risk is important for both export crops (such as cotton, coffee, tea or cocoa) and non-tradeable cereal crops (such as millet and sorghum). In the post-liberalization period the former, still sold through marketing boards, are more likely to benefit from price stabilization schemes and hedging on commodity futures markets than the latter, usually sold by individual farmers or farmer associations. Greater price stability for export crops can result in farmers using inputs such as fertilizer on export crops rather than on food crops.

Risks posed by weak, unstable or missing input markets have become a serious constraint on technology adoption. This has been particularly true in sub-Saharan Africa (SSA) following the dissolution of parastatals, and the reluctance of the private sector to step into this environment of fluctuating prices, low profitability and uncertainty about government intervention.

Government policies and programmes can create risks that discourage private sector investment and participation with insufficient supply of public goods (for example, infrastructure, regulations, access to certifications, licences and permits, loan guarantees, law enforcement); undesirable interventions, such as disruption of production or reduced competition in trade of private goods; and sudden changes in policies related to input subsidies, export/import taxes or subsidies, and food safety regulations.

*Field experiences with programmes to reduce agricultural risk and uncertainty*

The public and private sectors should work in unison to reduce the risks that discourage technology adoption and private sector participation in new markets. Several innovative efforts were discussed: the MOA/SG2000 scheme in Ethiopia, the CLUSA programme in Zambia, the SCODP mini-fertilizer pack distribution in Kenya, and an input voucher effort designed for Zambia. These emphasize reducing risks by identifying technologies that increase farmer yields and profits and emphasize active farmer participation in technology development; giving farmers information about a variety of technologies rather than fixed packages; and reducing the transactions costs for the private sector in exchange for commitments to serve poorer or more remote farmers.

The discussion showed that risks are affected by such factors as climate (drought in Ethiopia, late rains in Zambia), marketing conditions (shortage of improved seed in Ethiopia, a bidding war for paprika that increased side-marketing and reduced loan repayment in Zambia), and programme conditions (lack of extension agents to support rapid expansion of the Ethiopia SG2000 programme). Programmes that encouraged local decision making, offered technology/commodity options and provided continuing education to farmers on business and agricultural practices seemed most promising.