

HOW CAN AFRICAN AGRICULTURE ADAPT TO CLIMATE CHANGE? INSIGHTS FROM ETHIOPIA AND SOUTH AFRICA

Risk Aversion in Low-Income Countries

Experimental Evidence from Ethiopia

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Agricultural production in low-income developing countries is generally poorly diversified, focusing on rainfed staple crop production and raising livestock—activities that are inherently risky. Because of poorly developed or absent credit and insurance markets, it is difficult for farm households to pass any of these risks to a third party. Consequently, farm households base their investment and production decisions, in part, on the perceived risk of failure. A ramification of this is that households tend to be reluctant to adopt new agricultural technologies even when expected net returns are high. As such, a better understanding of risk behavior is essential for identifying appropriate farm-level strategies for adaptation to climate change by low-income farmers.

This brief is based on a study that estimates the magnitude and nature of farm household risk aversion in this context. Using an experimental approach, the authors examine the attitudes of Ethiopian smallholder farmers toward risk and suggest policy recommendations.

RISK IN AGRICULTURAL PRODUCTION IN DEVELOPING COUNTRIES

Households engaged in agricultural production in low-income countries face a number of risks, including crop yield risks due to variance in rainfall timing and level, animal mortality due to infectious livestock diseases, and changing output prices. Agricultural production is also affected by crop diseases, flooding, frost, illness of household members, war, and crime, all of which can have major effects on rural livelihoods.

The existence of such risks has been found to alter household behavior in ways that at first glance seem suboptimal. For example, it has been found that farm households use less fertilizer, fewer improved seed varieties, and lower levels of other production inputs than would have been the case had they simply maximized expected profits. Farmers' decisions to forgo welfare-improving opportunities because of perceptions of risk have significant policy implications. In rural areas of low-income countries, futures and insurance markets do not exist for most types of agricultural risk. Additionally, credit markets, which allow debtors and creditors to share risk, are thin. One policy response, therefore, is to develop or improve these markets by ensuring that insurance is available and by strengthening rural credit markets. Other measures could be to

provide new technologies or inputs, together with long-term support through extension services.

Some advances have been made in these areas. Microcredit schemes abound in the developing world, allowing villagers to pursue production opportunities with less risk. Initiatives are also under way in Sub-Saharan Africa to develop crop insurance markets under the auspices of the World Bank and the World Food Programme.

While the existence of agricultural risk and its effects on low-income countries are well known, there are few empirical estimations of the magnitude and nature of household risk aversion in this context. Further, little is known about the basic household factors affecting risk behavior. Within low-income countries, there may be important linkages between risk aversion on the part of farm households and seemingly disparate elements such as household fertility, educational attainment, and gender dynamics. Working on these elements could thus improve outcomes for technology adoption.

To shed further light on this issue, the study uses an experimental approach to examine key determinants of risk aversion in smallholder agricultural production in Ethiopia. The experiment was administered as part of a 2002 survey of 1,522 households in 12 villages in the Ethiopian highlands of Amhara. The villages studied are typical of rural Ethiopia and representative of the nation as a whole. More than 70 percent of households sampled are illiterate, mean farm size is 1 hectare, and nearly all the households in the study rely heavily on agriculture to meet their consumption needs. The average household income in the sample is US\$170, most of which is derived from agricultural production. Annual liquid cash availability is estimated at US\$42, implying significant cash scarcity.

FACTORS THAT AFFECT RISK AVERSION

The study reveals a number of factors that affect households' reactions to risk when faced with new agricultural technologies. Some of these factors relate to the nature of the change in agricultural production, whereas others relate to households' past experiences and characteristics.

Results indicate that households are more sensitive to potential losses than they are to gains. Respondents who stand to

lose as well as gain from adopting a new technology—even if the potential gain more than offsets the loss—are significantly more risk averse than those that face potential gains only. This finding strongly suggests agricultural extension efforts involving losses as well as gains may face systematic resistance by farmers in low-income, high-risk environments. However, once initial successes convince farmers that technologies are viable, risk aversion declines.

The study also identifies a positive relationship between the size of the expected payoff and the degree of risk aversion—that is, households are more risk averse the greater the expected return (even without the possibility of loss). Moreover, lower income households are more sensitive to risk than higher income households. Wealth—whether in the form of oxen, domestic animals, cash, or land—seems to reduce risk aversion.

In terms of past experiences, the study finds that farm households are more willing to accept risk if they have experienced successful past harvests. Similarly, households encountering a series of droughts may be more reluctant to undertake risky investment decisions.

Other factors that affect households' reaction to risk include household fertility (though not total household size), as well as the age and sex of the household head. The study suggests that families with a large number of dependents are more likely to avoid risky but potentially high-value technologies, such as improved seed varieties and chemical fertilizers. Furthermore, older household heads are more likely to avoid risk. Finally, male household heads—prevalent in Ethiopian farm households—were found to be less risk averse than female household heads.

POLICY IMPLICATIONS OF RISK ADVERSE BEHAVIOR OF FARMERS

In an effort to promote productivity-enhancing agricultural technologies in low-income countries like Ethiopia, the study

makes several policy recommendations. First, the sensitivity of farm households to loss suggests that promoting technology with downside risks—even if potential gains are large—should be combined with insurance or other supporting measures. This support could be temporary, however. Once successes have convinced farmers that technologies are viable, risk aversion declines. Thus, the promotion of household-level technologies for adaptation to climate change must rely on proven methods that provide large gains and few losses, if any.

Second, the significant difference in risk-averting behavior between relatively poor and wealthy farm households suggests that as wealth accumulates, households are willing to take on more risk in exchange for higher returns. While early successes seem to be important, households should also be allowed to accumulate assets before they are challenged or tempted to take on more risky ventures. Further, the finding that households are more risk averse when the expected payoff is larger suggests that agricultural extension should start modestly before asking households to make larger changes.

In the longer run, of course, the development of private markets to spread risk is crucial. Indeed, broad-based economic development, including the development of credit and insurance markets, is the most certain way to reduce levels of risk aversion among farmers. Most practitioners would agree, however, that such developments are many years away, suggesting that interim risk mitigation solutions to promote rural development in low-income countries may be important for some time.

FOR FURTHER READING

Yesuf, M., and R. Bluffstone, *Risk Aversion in Low-Income Countries: Experimental Evidence from Ethiopia*, IFPRI Discussion Paper No. 715 (Washington, DC: International Food Policy Research Institute, 2007).

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This series of IFPRI Research Briefs is based on research supported by the Federal Ministry for Economic Cooperation and Development, Germany, under the project "Food and Water Security under Global Change: Developing Adaptive Capacity with a Focus on Rural Africa," which forms part of the CGIAR Challenge Program on Water and Food. Through collaboration with the Center for Environmental Economics and Policy in Africa, the Ethiopian Development Research Institute, the Ethiopian Economics Association, and the University of Hamburg, the project aims to provide policymakers and stakeholders in Ethiopia and South Africa with tools to better understand and analyze the consequences of global change—in particular climate change—and to form policy decisions that facilitate adaptation in these countries and beyond.

Financial Contributors and Partners

IFPRI's research, capacity strengthening, and communications work is made possible by its financial contributors and partners. IFPRI receives its principal funding from governments, private foundations, and international and regional organizations, most of which are members of the Consultative Group on International Agricultural Research (CGIAR). IFPRI gratefully acknowledges the generous unrestricted funding from Australia, Canada, China, Finland, France, Germany, India, Ireland, Italy, Japan, Netherlands, Norway, South Africa, Sweden, Switzerland, United Kingdom, United States, and World Bank.

Printed on alternative-fiber paper manufactured from agriculturally sustainable resources that are processed chlorine-free (PCF).

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