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CLIMATE CHANGE, COLLECTIVE ACTION, & WOMEN'S ASSETS

Enhancing Women's Assets to Manage Risk under Climate Change

POTENTIAL FOR GROUP-BASED APPROACHES

EDITED BY CLAUDIA RINGLER, AGNES R. QUISUMBING, ELIZABETH BRYAN, AND RUTH MEINZEN-DICK

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International Food Policy Research Institute
2033 K Street, NW
Washington, DC 20006-1002, USA
Telephone: +1-202-862-5600
www.ifpri.org

Project manager: John Whitehead
Copyeditors: Mary Jane Banks, Sandra Ward, Elizabeth Bryan, Thea Nielsen, and Claudia Ringler
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Gender, Climate Change, and Group-Based Approaches to Adaptation

Julia A. Behrman, Elizabeth Bryan, and Amelia Goh

CLIMATE CHANGE POSES GREAT CHALLENGES FOR POOR RURAL PEOPLE IN DEVELOPING COUNTRIES, MOST OF whom rely on natural resources for their livelihoods and have limited capacity to adapt to climate change. It has become clear that even serious efforts to mitigate climate change will be inadequate to prevent devastating impacts that threaten to erode or reverse recent economic gains in the developing world. Individuals, communities, and policymakers must adapt to a new reality and become resilient to the negative impacts of future climate changes. Research has demonstrated that assets, broadly defined to include natural, physical, financial, human, social, and political capital, play a fundamental role in increasing incomes, reducing vulnerability, and providing pathways out of poverty. Assets are essential to poor peoples' ability to cope with climatic shocks and to adapt to the long-term impacts of climate change. Physical assets can be sold to help households cope with shocks, and other assets—such as secure land and water rights, agricultural technologies, livestock, knowledge, and social capital—can assist households in adapting to greater variability in agricultural production resulting from climate changes.

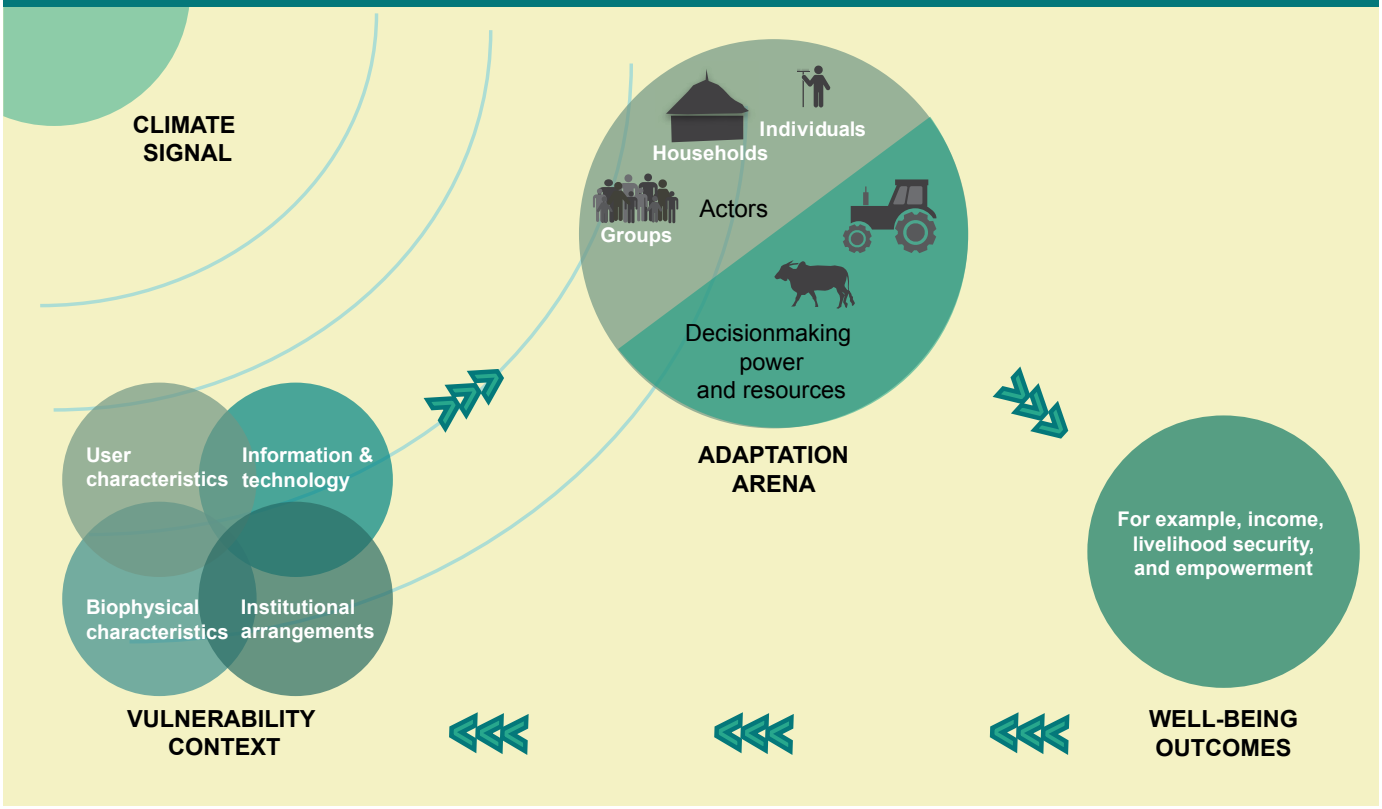
Evidence indicates that disparities exist between men's and women's access to and control over key assets. Rural women in developing countries generally have fewer assets and rights than do men; they are more vulnerable to losing their assets and rights due to separation, divorce, or widowhood; and they have less access to capital, extension services, inputs, and other resources related to agricultural production. Nevertheless, women's asset holdings often have positive effects on important development outcomes, including household food security and human capital formation. Consequently, helping women gain greater access to and control over key assets can increase resilience of households and communities to climate change. Moreover, while the ability of individuals and households to adapt to climate change is essential, it is not a sufficient response to the challenge. The international community has emphasized the need for adaptation and has made more funding available for this purpose. Most of these efforts, however, have focused on top-down approaches and policy solutions. Community-level adaptation strategies are also critical given the location-specific nature of climate change impacts, appropriate responses, and (to some extent) adaptive capacity. Such efforts also provide greater resilience to climate change by strengthening and expanding social networks and links with supporting institutions.

This policy note summarizes the findings of two literature reviews on the gender-differentiated impacts of climate change and the scope for community-based adaptation. It also outlines the framework used to guide these analyses and the other papers summarized in this series.

A FRAMEWORK FOR GENDERED ADAPTATION TO CLIMATE CHANGE

The policy notes in this series explore the connections among climate change, gender, assets, and collective action. A framework was developed to incorporate these components, drawing on the Sustainable Livelihoods Framework of the UK Department for International Development; the Institutional Analysis and Development Framework, pioneered by Elinor and Vincent Ostrom (both now deceased); the Gender and Assets Framework of the International Food Policy Research Institute (IFPRI); and the climate change framework of the Third Assessment Report of the Intergovernmental Panel on Climate Change (see Figure 1 for how this framework is conceptualized). This consolidated framework illustrates the path-

FIGURE 1 An integrated framework on gender and climate change



Source: Authors.

ways through which climate change affects well-being at the individual, household, and community levels. It can be used to promote an understanding of the differential impacts of climate change on men and women and, similarly, an understanding of men's and women's differential responses. In the context of vulnerability to climate change and the process of adaptation, this framework emphasizes the value of information, livelihood resilience, institutions, and asset accumulation.

The Climate Signal

The climate signal encompasses long-term changes in average climate conditions, as well as changes in climate variability, such the timing, intensity, and duration of precipitation, and extreme weather events like droughts and floods. The response of actors and systems depends on the characteristics of the climate stimulus, including the degree of exposure to the stress, and the scale and magnitude of climate-related events.

The Vulnerability Context

The impact of climate change on the well-being of individuals, households, and communities, and their ability to respond to those changes, depends on the context in which climate change occurs. This encompasses all the factors that determine climate change vulnerability at the individual, household, group, or community levels. The climate change literature often defines vulnerability in terms of exposure, sensitivity, and adaptive capacity; a perspective that is more suitable for a broad, top-down view of vulnerability in terms of sectors, systems, and regions. In efforts to sharpen the focus on human vulnerability, however, this new framework draws on the Sustainable Livelihoods Framework and Institutional Analysis and Development Framework to describe the determinants of livelihood vulnerability, as well as their interlinkages.

The framework categorizes the main components of vulnerability as biophysical characteristics, user characteristics, information and technology, and institutional arrangements, all of which are dynamically interrelated. Each of these components is further defined below.

- **User Characteristics.** Some actors or groups can be considered more vulnerable to climate change impacts given their livelihood activities, assets, social characteristics, and cognitive ability. For example, those that rely on natural resources for their livelihoods may be more sensitive to climate change impacts. Other users may face difficulties in pursuing particular adaptation options by a lack of access

to or control over assets or by the inherent constraints of their social status. Gender, in particular, is one user characteristic that may have profound impacts on the ability of individuals to cope with climate change. The vulnerability and adaptive capacity of particular users also depends on cognitive factors—for example, the ability to perceive the risks posed by climate change and the willingness to accept the need to take action to respond—and normative factors—such as social or cultural norms of behavior or beliefs that may limit action despite awareness and knowledge of the risks.

- **Biophysical Characteristics.** Biophysical characteristics refer to the sensitivity of physical and ecological systems that define the natural limits of adaptation. Such limitations are often viewed as thresholds beyond which change becomes irreversible and the ability to adapt becomes limited. Climate change may alter ecosystems beyond the point at which human activities can be supported. For example, water availability may decline to an extent that makes certain types of agricultural production nearly impossible. These changes in biophysical systems have profound effects on the individuals, households, or communities that access and depend on those resources. Moreover, climate change may exacerbate tensions between environmental conservation and ecosystem services on the one hand, and agricultural production and food security concerns on the other.
- **Information & Technology.** The ability and nature of the adaptation response depends on an individual's, household's, or community's access to information about climate risks and the appropriate responses to those risks. While many communities have developed their own systems for monitoring climate conditions, this information may not be adequate to inform adaptation if the climate changes in unprecedented ways. Furthermore, climate uncertainty often results in reluctance by farmers to make investments in production technologies, such as fertilizer, which would enable them to improve their well-being over the long run. Access to climate information and technologies for adaptation is, therefore, essential to enable actors to anticipate long-term risks and make the appropriate adjustments to increase their resilience. However, despite significant scientific gains in predicting the climate, climate information is often lacking at the local level due to uncertainty in climate projections and seasonal forecasts or lack of information on particular climate indicators, such as rainfall variability. Even when climate information is available, incorporation of scientific climate information into local decisionmaking may not occur very often because of poor communication of such information.
- **Institutional Arrangements.** Adaptation capacity depends on access to assets, information, and biophysical characteristics but must also be viewed within the institutional context in which it takes place. Institutions, including markets, laws, policies, organizations, and social and cultural norms, influence how an individual, household, or community perceives, is affected by, and responds to climate change. That is, institutions have a large influence on how climate risks and impacts are distributed across different social groups and populations, and they affect the roles governing access to and control over the resources and assets necessary for adaptation. Adaptation also depends on institutional capacity, in the sense of the degree of social capital; the ability of community members to work collectively; and their ability to access resources and information from higher-level institutions, such as government agencies and nongovernmental organizations. However, social and cultural norms, and other rules governing behavior, influence the extent to which individuals and groups within a community are able to participate in and benefit from collective adaptation.

The Adaptation Arena

Adaptation can improve well-being outcomes, while at the same time reducing vulnerability to future climate changes by increasing the ability of actors to withstand change and cope with its adverse effects. Actors at multiple scales—from the individual to the community—have different perceptions, needs, and preferences, and make adaptation decisions based on their decisionmaking power and access to/control over resources (such as assets, time, lifestyle, values, and so on). In this integrated framework, the adaptation arena is dynamic. Well-being improvements resulting from adaptation decisions taken today may reduce future vulnerability to climate change and variability and give actors more freedom to implement future decisions. On the other hand, the inability to take protective measures against future climate change and extreme events may reduce well-being and increase vulnerability over time. In addition, the changing external environment in which adaptation decisions are made, which encompasses policy shifts, changing social networks, and the availability of new technologies and information, also affects the scope of responses available to actors.

The Well-Being Outcomes

Adaptation decisions affect the well-being outcomes of individuals, households, groups, and communities—for example,

in terms of their basic needs, income levels, livelihood sustainability, personal and property-related security, and the degree of empowerment. The effect of actions taken to adapt depends on the type of responses available and those chosen. For instance, strategies that increase resilience to climate risks before shocks actually occur, such as diversifying livelihoods or taking out insurance, are likely to have positive outcomes on well-being, but coping strategies adopted after shocks are experienced, such as selling assets, keeping children home from school, or expanding agricultural production unsustainably, may have negative outcomes, including reduced incomes, resource degradation, and loss of empowerment over time. Well-being outcomes also affect future vulnerability to climate change and, thus, future adaptation options.

THE DIFFERENTIAL EFFECT OF CLIMATE SHOCKS ON MEN'S AND WOMEN'S WELL-BEING AND ASSETS

A review of the literature suggests that considerable differences exist in the ways that climate change and climate shocks affect men and women in the areas of agricultural production, food security, human health, natural resources, conflict and migration, and natural disasters. The gender-differentiated impacts of climate change are neither straightforward nor predictable. They vary by context and are mediated by a host of sociocultural, economic, ecological, and political factors.

In terms of agricultural production, increasing climate variability tends to lower agricultural production and has different impacts on women's and men's well-being and assets, including land, livestock, financial, and social capital. The extent to which crop losses result in asset and livelihood losses for both women and men depends on the context, as well as on men's and women's household roles and asset holdings. Increasing climate variability causes both women and men to invest more time and labor in agricultural production, but women's workloads tend to be heavier because of their additional domestic commitments. Women, however, have less access to agricultural technologies and inputs, which puts them at a disadvantage in adapting to climate change impacts.

The literature suggests that climate change may also affect men's, women's, and children's food security differently, but women and children are often more affected in terms of their health and development. In times of stress, as in the case of climate shocks, women often reduce their own food intake or sell assets, such as jewelry or livestock, to ensure their household's food security, while men seek additional income-earning opportunities. The differential impacts on women's and men's physical health are not clear in the literature, apart from one study suggesting that the indirect effects of malnutrition put women and children at higher risk of contracting diseases in postdisaster situations. There is limited evidence of the differential impacts of climate-related events on men's and women's physical, psychological, and emotional health, but women often report more psychological and emotional distress following climate shocks.

Climate variability increases the scarcity of basic household resources, such as water, fuel, and fodder, and in turn increases women's workloads in terms of the time and the energy required to source, collect, and carry these resources to meet household needs. The additional time devoted to this single activity is also likely to have negative impacts on the longer term health and well-being of women and girls, and can erode their economic opportunities to participate in education, training, and income-earning activities. Natural resource scarcity precipitated by climate change may also increase conflicts over available resources. Evidence is still patchy, but better methods and approaches to investigating the impact of climate change on human security and conflict are being developed. It is likely that climate-induced migration of men in search of work has consequences for both men and women, albeit in different ways.

The immediate impact of climate-related disasters such as hurricanes and floods on individuals is determined by their ability to evacuate to safety in time. Sociocultural factors, such as social norms that prevent women from moving freely in the community or learning to swim, and access to information, such as early warning systems, determine who survives natural disasters. Women tend to be more vulnerable and have less access to resources, assistance, and support than do men in the aftermath of extreme climate events.

COMMUNITY-BASED ADAPTATION

Community-based adaptation includes any group-based approach that

- requires collective action and social capital,
- incorporates information about long-term climate changes and their anticipated impacts into planning processes,
- integrates local knowledge and perceptions of climate change and risk-management strategies,
- emphasizes local decisionmaking processes,
- accords with community priorities and needs, and
- provides poverty reducing or livelihood benefits.

The literature on collective action and participatory development suggests that community-based adaptation depends on the ability of communities to work collectively through social networks to manage the risks of climate change. Some of the preconditions of successful community-based adaptation include well-defined rules that conform to local conditions (for example, those dealing with the appropriation and provision of resources, conflict resolution, monitoring mechanisms, and sanctions for violators of the rules). Moreover, external agencies must recognize the right of communities to organize, and local organizations should have strong linkages to other supporting institutions and governance structures, such as agencies and organizations involved in economic development, social protection, and risk management. Another important principle for effective collective action is that all members of the group participate in decisionmaking and rule-setting. In practice, however, the extent to which the needs, interests, and priorities of all members of the community are incorporated depends on local power structures. Several other factors may also affect the success of collective action depending on the local context, including group size, the heterogeneity of group members, and the adaptability of the institution to change.

While lessons from the literature are useful in guiding community-based adaptation, climate change may complicate collective action by introducing new shocks into communities or by intensifying existing ones. For example, communities may use collective action to build resilience to drought that occurs every decade but may be unprepared for severe droughts that occur more frequently than that. In addition, collective adaptation requires location-specific information on anticipated climate changes and appropriate responses, which may not be available in many communities. In many cases, climate change may introduce a considerable degree of uncertainty that complicates collective decisionmaking.

THE GENDER IMPLICATIONS OF COMMUNITY-BASED ADAPTATION

The broader impact of community-based adaptation ultimately depends on who is able to participate. Given a growing body of evidence indicating that climate change and climate shocks differentially affect men and women, gender should be an important consideration in the adaptation process. The literature indicates that adaptation is an inherently "political" process that produces "winners" and "losers." The scope of participation may differ among members taking part in community-based adaptation. In many contexts, women lack access to the assets necessary for participation, such as land, financial capital, information, or social capital. Women, especially from poor households, are also more likely to face time constraints that limit their ability to participate.

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The literature also points to gender differences in setting priorities through group-based approaches to adaptation. Women often have greater responsibility for household food production and preparation, whereas men have greater involvement in market-oriented production. Thus, women may prioritize community-based strategies that promote long-term food and nutrition security, such as community-level projects, trainings, and facilities focused on food storage and preservation or the development of community gardens with micronutrient-rich food. Similarly, given women's focus on household consumption of water, fuel, and fodder (as previously discussed), women may prioritize community-level investments in domestic water supplies, such as rainwater collection or other types of community water storage, and alternative energy sources, such as biomass, biogas, solar power, improved stoves, and battery-operated lamps. Moreover, given women's domestic workloads, including caring for children, the sick, and the elderly, they are likely to prefer community-based adaptation strategies that allow them to stay close to home.

FOR FURTHER READING

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Julia A. Behrman *(julia.behrman@gmail.com) is a doctoral student in the Department of Sociology of New York University, New York.* ***Elizabeth Bryan*** *(e.bryan@cgiar.org) is a senior research analyst in the Environment and Production Technology Division of the International Food Policy Research Institute, Washington, DC.* ***Amelia Goh*** *(huixinamelia@gmail.com) is an associate knowledge management officer in the Environment, Social and Governance Department of the International Finance Corporation, Washington, DC.*

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The Policy Landscape for Climate Change Adaptation

A Cross-Country Comparison of Stakeholder Networks

Noora-Lisa Aberman, Regina Birner, Eric Haglund, Marther Ngigi, Snigdha Ali, Barrack Okoba, Daouda Koné, and Tekie Alemu

CLIMATE CHANGE IS AMONG THE MOST SIGNIFICANT CHALLENGES FACING AGRICULTURE IN THE 21ST century, and the rural poor in developing countries are among the most vulnerable to its adverse impacts. An increasing body of research is focusing on the question of how poor agricultural households will both perceive and be affected by climate change. In view of its predicted effects, the need to identify effective adaptation strategies is urgent. Against this background, the International Food Policy Research Institute (IFPRI) and partner organizations in the four study countries—Bangladesh, Ethiopia, Kenya, and Mali—embarked on research to support policymakers and development agencies in strengthening the capacity of male and female smallholder farmers, livestock keepers, and fishermen and women to manage climate-related risks. This policy note summarizes research designed to identify key actors engaging in climate change adaptation in the four study countries in order to disseminate research results more effectively in those countries.

CONTEXT OF THE STUDY

Agricultural technologies and sustainable natural resource management practices—such as the selection of appropriate varieties and soil and water conservation practices—help reduce climate change–induced risks to agriculture. Many organizations working in these fields use group-based approaches. Examples include agricultural extension groups, water user associations, groups practicing community-based natural resource management, microcredit groups, and groups associated with weather-based insurance schemes. Research has shown that group-based approaches can be particularly effective in assisting poor rural households to build assets; however, such approaches may also be vulnerable to elite capture, resulting in the exclusion of both poor households and female household members (for more information, see the companion policy note by Behrman, Bryan, and Goh).

As a first step, the research focused on identifying the key actors in the climate change arena in the four study countries through stakeholder analyses to determine potential partners in the research process, which organizations could make use of the research findings and implications for communications and outreach. A participatory mapping tool, Net-Map, was used to facilitate this process. Net-Map is a participatory interview technique that helps people understand, visualize, discuss, and improve situations in which many different actors influence outcomes. By creating maps, individuals and groups can clarify their own view of a situation, foster discussion, and develop a strategic approach to their networking activities. This process can also help outsiders understand and monitor complex multistakeholder situations, and allow stakeholders to examine both formal and informal interactions within the network.

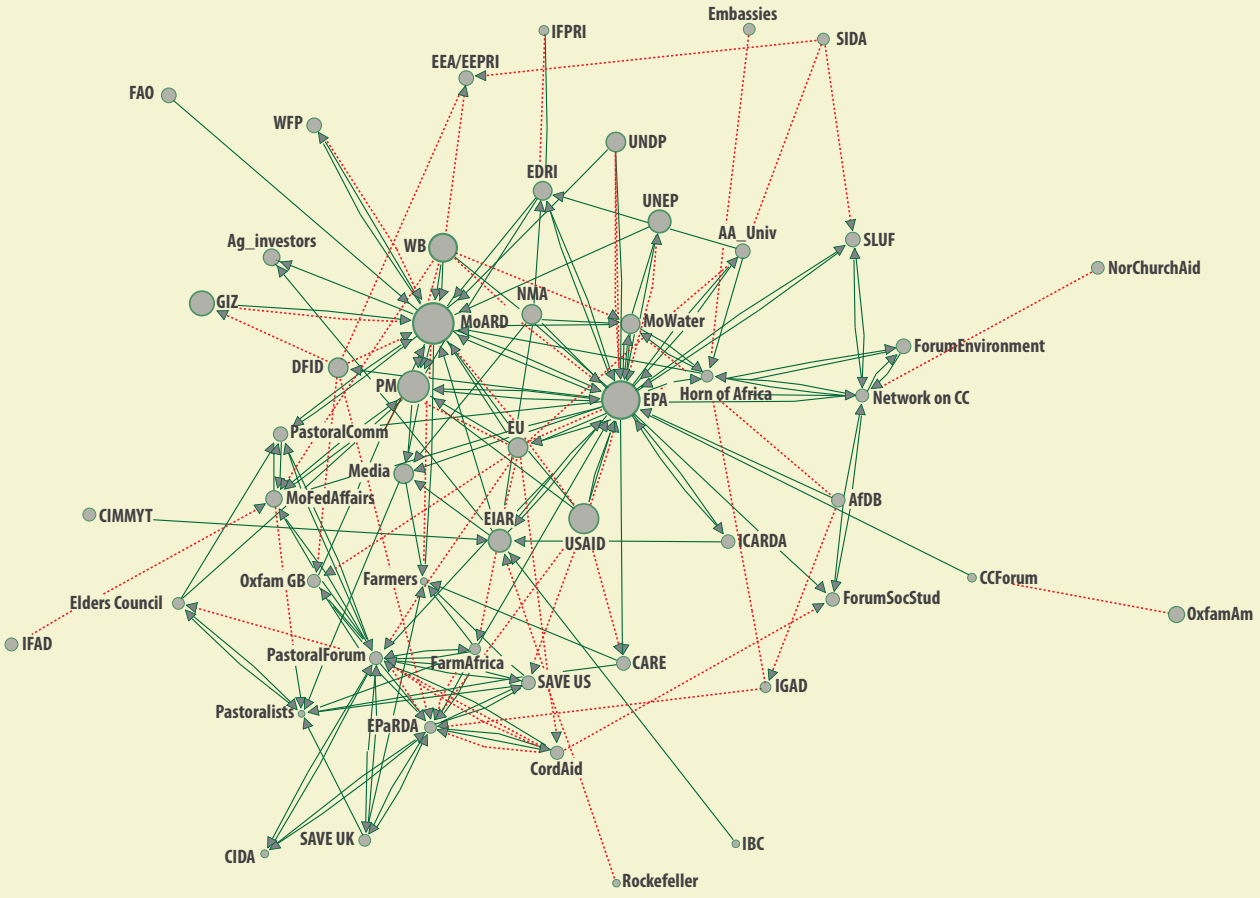
As part of this process, key actors were asked the following four questions: (1) What actors are involved in climate change adaptation? (2) Who is giving advice to whom among these actors? (3) How much influence does each actor have over improving the ability of farmers to adapt to climate impacts? (4) What are the priorities and core activities of each of these actors in terms of climate change adaptation? Answers were arrived at by group consensus. The results included visual depictions of the stakeholder network for climate change adaptation (Figure 1), notes from in-depth discussions during the process, analyses of network characteristics, and implications for communication and outreach strategies. Further

details are outlined in Aberman et al. 2014 (see For Further Reading).

NETWORK CHARACTERISTICS

While comparing results across countries has its limitations—primarily because the analysis is based on participatory interviews that elicited the differing contextual perceptions and ideas of the participants in each country—it does yield some interesting contrasts. Both Bangladesh and Ethiopia have similarly centralized networks wherein key government agencies constitute the network's hub. The high influence and prominent role of the key government agencies in Kenya implies a similar network structure. In contrast, the network in Mali has three distinct hubs or clusters of actors: government, research, and civil society. The perceived distribution of power across the countries also varies. In Bangladesh, Ethiopia, and Kenya, the high-level government actors are perceived as the

FIGURE 1 Stakeholder network for climate change adaption, Ethiopia



Source: Devised by authors using Net-Map data.
Notes: AA_Univ = Addis Ababa University; AfDB = African Development Bank; Ag_investors= agricultural investors; CCF = Climate Change Forum; CIDA = Canadian International Development Agency; CIMMYT = International Maize and Wheat Improvement Center; CordAid = Catholic Organization for Relief and Development; DFID = UK Department for International Development; EPaRDA = Enhancing Pastoralist Research and Development Alternatives; EDRI = Ethiopian Development Research Institute; EEA/EEPRI = Ethiopian Economic Association/Ethiopian Economic Policy Research Institute; EPA = Environmental Protection Authority; EIAR = Ethiopian Institute of Agricultural Research; Elders_council = Regional Elders Council; FAO = Food and Agricultural Organization of the United Nations; ForumEnvironment = Forum for Environment; ForumSocStud = Forum for Social Studies; GIZ = Gesellschaft für Internationale Zusammenarbeit; Horn of Africa = Horn of Africa Regional Environment Centre and Network; IBC = Institute for Biodiversity Conservation; ICARDA = International Center for Agricultural Research in the Dry Areas; IFAD = International Fund for Agricultural Development; IFPRI = International Food Policy Research Institute; IGAD = Intergovernmental Authority on Development; MoARD = Ministry of Agriculture and Rural Development; MoFedAffairs = Ministry of Federal Affairs; MoWater = Ministry of Water and Energy; Network on CC = Civil Society Network on Climate Change; NMA = National Meteorological Agency; NorChurchAid = Norwegian Church Aid; OxfamAm = Oxfam America; Oxfam GB = Oxfam Great Britain; PastoralForum = Pastoral Forum Ethiopia; PastoralComm = Pastoral Standing Committee in Parliament; PM = prime minster; Rockefeller = Rockefeller Foundation; SAVE US = Save the Children US; SAVE UK = Save the Children UK; SIDA = Swedish International Development Cooperation Agency; SLUF = Sustainable Land Use Forum; UNDP = United Nations Development Programme; UNEP = United Nations Environment Programme; USAID = United States Agency for International Development; WB = World Bank; WFP = World Food Programme. Solid lines indicate advice links; dotted lines indicate funding links. Actors are sized according to influence scores.

most influential (the Ministry of Food and Disaster Management in Bangladesh, the prime minister in Ethiopia, and the relevant ministries in Kenya). In Mali, however, the highest influence is with the lower-level National Directorate du Agriculture. Bangladesh and Mali both have a single, powerful, multilateral organization playing a key role in the network. In Bangladesh this is the US Agency for International Development, and in Mali it is the Food and Agriculture Organization of the United Nations. In Ethiopia and Kenya, outside entities are seen as being less influential, presumably due to stronger, central government agencies.

All four study countries have a variety of civil society and nongovernmental organizations (NGOs) engaging in climate change adaptation. Civil society organizations are also active in linking target groups with NGOs and even with decision-makers. Nevertheless, there were calls for more of this connectivity across all the countries, indicating the current level of engagement with target groups is insufficient to address complex, interlinked climate change–adaptation issues. There were also calls for better coordination among the many types of actors implementing programs on climate change adaptation so as to more efficiently and effectively address the challenges.

IMPLICATIONS FOR OUTREACH

Three of the four networks appeared to be highly centralized. A high degree of centralization indicates that control over network flows are concentrated in just a few actors, implying that the core or central actors in each network are likely the decisionmakers and gatekeepers of information and hence should be key partners in any outreach strategy. In Mali, the presence of a few prominent clusters indicates that, rather than reaching out to a single small group of actors, the strategy there should be multi-pronged. This may require different framing of the adaptation issue depending on the cluster. In addition, working to improve the connectivity among the clusters could feasibly shift the shape of the entire network to promote better flows of information, innovation, and a more cohesive and vibrant community for climate change adaptation. Likewise, in Bangladesh, Ethiopia and Kenya, smaller, less-influential clusters were observed, providing opportunities for quick dissemination of information within the clusters. Similar to Mali, if these small clusters can be supported to grow, it could add to the vibrancy and cohesiveness of the adaptation community.

Private-sector actors were not prominent in the discussions, except in Bangladesh and Kenya. In Kenya, private-sector actors were perceived as providing helpful services to support adaptation, whereas in Bangladesh they were seen to be acting in opposition to the needs and goals of smallholder farmers and fishermen and women. Either way, dissemination of findings in an appropriate format to these audiences could expand private-sector awareness of adaptation issues and improve outcomes for both the private sector and smallholders. *Multilateral organizations* appeared to play a more influential role in the policy landscapes of Bangladesh and Mali than in those of Ethiopia or Kenya. This should be considered when determining how much to emphasize the public role of these actors in dissemination events or other public consultations. While in some contexts the presence and support of these organizations could help leverage government action, in other contexts a different strategy may be advisable. *Research organizations* in each of the four networks were involved in some clusters in the network. In Bangladesh and Mali these were more dominant clusters. Not only can the particular research organizations specified be targeted for partnerships or for dissemination of results, the fact that they are part of clusters indicates that information will likely spread quickly through their clusters.

Panos/G. M. B. Akash

In making use of these networks to inform future research and outreach on climate change adaptation in these four countries, it will be essential to take into account both the network structure and the characteristics of the various actors. Actors with the highest degree of centrality have a high degree of control over the network's information flows. While the most central actors are often the most powerful, they also tend to be the least accessible. Actors whose location in the network creates the shortest path between any other two actors also tend to have significant control of information flows and can often act as a liaison or intermediary. Finally, the actors that would most quickly be able to reach everyone else in the network are key to the spread of information.

FOR FURTHER READING

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Noora-Lisa Aberman *(n.aberman@cgiar.org) is a Malawi-based country program coordinator in the Development Strategy and Governance Division of the International Food Policy Research Institute (IFPRI), Washington, DC.* ***Regina Birner*** *(regina.birner@uni-hohenheim.de) is chair of Social and Institutional Change in Agricultural Development at the University of Hohenheim, Stuttgart, Germany.* ***Eric Haglund*** *(eric.r.haglund@gmail.com) was a research analyst in the Environment and Production Technology Division of IFPRI, Washington, DC, at the time he contributed to this research; he is currently an international broadband analyst at SNL Kagan, Washington, DC.* ***Marther Ngigi*** *(martherngigi@gmail.com) is a doctoral student at the Institute of Agricultural Economics and Social Sciences in the Tropics and Subtropics at the University of Hohenheim, Stuttgart, Germany.* ***Snigdha Ali*** *(snigdha.ali@gmail.com) was an independent consultant based in Dhaka, Bangladesh, at the time she contributed to this research; she is currently the lead coordinator in the Communications Division of BRAC, Dhaka, Bangladesh.* ***Barrack Okoba*** *(okoba2000@yahoo.com) was a senior principal research scientist at the Kenya Agricultural and Livestock Research Organization, Nairobi, at the time he contributed to this research; he is currently on leave working for the Food and Agriculture Organization of the United Nations, Nairobi.* ***Daouda Koné*** *(dkone42780@gmail.com) is a researcher at the Institut d'Economie Rurale, Bamako, Mali.* ***Tekie Alemu*** *(tekiealemu@yahoo.com) is an assistant professor in the Department of Economics of Addis Ababa University, Ethiopia.*

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Organizational and Institutional Responses to Climate Change

Insights from Bangladesh, Ethiopia, Kenya, and Mali

Catherine Ragasa, Yan Sun, Elizabeth Bryan, Caroline Abate, Atlaw Alemu, and Mahamadou Namori Keita

RESPONDING TO CLIMATE CHANGE PLACES NEW DEMANDS ON GOVERNANCE STRUCTURES, REQUIRING THEM to work more effectively and to reform their existing structures and practices. At the same time, National Adaptation Programs of Action (NAPAs) and funding for climate change initiatives are providing greater opportunities for institutional, organizational, and human capacity strengthening. While a growing body of literature focuses on risk mitigation approaches and adaptation measures in various countries, little is known about the capacity of local institutions and organizations to manage their collective responses to climate change. This policy note summarizes research exploring the challenges and opportunities associated with building human, organizational, and institutional capacity to respond effectively to the adverse impacts of climate change as they relate to agriculture and rural livelihoods in developing countries. The findings offer insights into levels of awareness, practices, and organizational and institutional issues based on interviews with practitioners involved in climate change adaptation in government agencies, local and international organizations, and think tanks in Bangladesh, Ethiopia, Kenya, and Mali.

STUDY CONTEXT AND METHODOLOGY

The research involved the collection of data through a survey of 87 practitioners in Bangladesh, Ethiopia, Kenya, and Mali, adopting a "knowledge–attitude–practices" methodology, commonly used to develop understanding of the knowledge, capacity, activities, and perceptions of individuals and members of organizations or communities. An e-survey questionnaire focused on six areas of interest: (1) each organization's climate change–related activities, (2) factors considered in climate change–related initiatives, (3) perceptions of factors affecting the success of climate change–adaptation initiatives, (4) current skill sets and training needed on gender and climate change adaptation, (5) interactions and linkages, and (6) organizational issues. Face-to-face interviews were subsequently conducted, at which time organizations were categorized as government agencies; universities and research institutes; nongovernmental organizations and civil society organizations, including private companies and foundations; and international organizations. Respondents were asked to rate a predetermined set of indicators on a scale of 0 (not important) to 5 (very important). They were then asked to rate the actual emphasis their organizations gave each of these indicators. Further details can be found in Ragasa et al. 2013 (see *For Further Reading*).

GAPS BETWEEN ORGANIZATIONAL AWARENESS AND PRACTICE IN CLIMATE CHANGE ADAPTATION PROJECTS

The Design Stage. Elements related to project design were rated important or highly important by a majority of respondents in all four countries, indicating strong awareness of the key elements and considerations needed for designing and planning successful climate change activities. These are encouraging results, suggesting active discussions of the importance of key elements during development of NAPAs and other climate change strategies in those countries. A few organizations placed less importance on some of the key elements generally thought to be crucial for the successful design of climate change projects—such as acceptability of the activity to target groups, financial sustainability, environmental considerations, and gender issues—suggesting the need to strengthen awareness of these factors among

organizations. Likewise, some respondents' low emphasis on the importance of markets, profitability, and financial sustainability demonstrates the need to raise awareness of the effects of these factors on poor people and the need to incorporate strategies for income generation, livelihood diversification, and increasing market access into climate change adaptation projects. Despite strong awareness and recognition of the importance of various design considerations, many organizations do not integrate these considerations into their actual practices. Respondents reported that not much attention was given to the financial sustainability of climate change–related activities in their organizations, reflecting the heavy dependence on ad hoc and short-term projects; financial sustainability was rarely achieved beyond the period of project funding.

The Targeting Stage. Although most organizations said they employed vulnerability assessment, few specified the strategy used. Most reported using groups or organizations as their beneficiaries or partners, including cooperatives, farmers' organizations, farmer field schools, self-help groups, watershed associations, water user associations, and associations in general. The most consistently cited targeting criteria in the four countries were risk of drought or other extreme events; existence of hunger, food insecurity, or nutrition status; and poverty. Of the respondents in Bangladesh, 30–50 percent reported their organizations paid less attention to market access; the presence and capacity of service providers (extension, credit, and inputs); and hunger, food security, and nutrition criteria than they deemed appropriate, while 20 percent indicated that their organizations should pay more attention to drought risk, access to land, and political stability.

The Implementation Stage. The majority of respondents rated all the elements of project implementation as important or very important. The factors considered most important were acceptability of the project within the target community, availability of local groups within targeted communities to take on implementation, and active participation of target beneficiaries and intended users. All respondents in Ethiopia and Mali rated increasing participation of women in the project as very important.

The Monitoring and Evaluation Stage. The majority of respondents rated monitoring and evaluation (M&E) indicators as important or very important. The most highly rated factors were active participation by intended beneficiaries and measures of environmental sustainability. Factors rated as not important were changes in household income, changes in access to services and information, and changes in the productivity of plots. In Bangladesh and Ethiopia, one striking observation was that for almost all of the factors related to M&E, there was a large gap between what the respondents considered important and the actual practices within their organizations. All respondents in Kenya reported that their organizations placed less emphasis on strengthening social networks than was needed. In Mali, many respondents suggested that their organizations should pay greater attention to promoting active participation of beneficiaries in M&E and to tracking changes in food security.

ORGANIZATIONAL AND TRAINING ISSUES

Institutional Issues: All of the sample organizations had a clear idea of their mandates, but not all of them had an articulated strategy. While all the study countries had implemented or were in the process of initiating a NAPA, the sample organizations seemed to lack clear and measurable climate change targets or an M&E system to collect data and report on achievements. Responses indicated that many of the sample organizations, especially in Ethiopia and Mali, lacked adequate physical and financial resources to carry out their mandates. Some organizations also faced significant human resource capacity constraints.

Knowledge and Skills Gaps. The level of skills in and knowledge of climate change adaptation analysis, project design, implementation, and M&E vary across organizations and countries. Several respondents in Bangladesh reported having limited understanding of gender differentials in climate change impacts and adaptation and of how to engage policymakers and decisionmakers. In Ethiopia and Kenya, several respondents reported a lack of skills related to M&E of climate change projects, such as measuring indicators on inclusiveness and equity; mobilizing and organizing participatory processes with policymakers, partners, and stakeholders; and understanding the gender impacts of climate change. In Mali, several respondents reported that they lacked skills in organizing and working with groups.

Limited Attention to Gender Responsiveness. While almost all respondents reported that their organizations paid considerable attention to gender issues during the design and planning stages of projects, more than 70 percent of the organizations surveyed in Kenya and Ethiopia and almost 60 percent in Mali were not collecting, analyzing, or reporting gender-disaggregated data as part of their climate change activities (Table 1). About a quarter of respondents in Bangladesh reported that their organizations paid less attention to gender issues than was warranted. A large proportion of respondents in Kenya indicated they felt that greater attention and importance should be given to the difference in men's and women's mobility outside the home. In Mali, many respondents reported that their organizations did not pay

enough attention to differences in responsibilities of men and women in agriculture.

Collective Action and Group-Based Approaches. In all four countries, working with groups and adopting community-based approaches were considered important factors for the success of climate change activities. In Bangladesh, respondents said the use of group-based approaches was given less importance as a targeting criterion but more attention during the project's implementation. In Kenya, all respondents reported that organizations needed to pay greater attention to the importance of strengthening social networks during M&E. In Ethiopia and Mali, 17 and 25 percent of respondents, respectively, indicated that their organization should more often use and implement group-based approaches.

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KEY INSIGHTS AND CONCLUSIONS

The organizations surveyed were actively working on climate change issues. Responses revealed strong awareness of factors essential to the success of climate change initiatives. Despite this awareness and the presence of national strategies and action plans, there seemed to be no explicit and clearly defined strategies within the organizations to contribute to the national and collective efforts and, more importantly, no explicit and measurable targets or M&E systems to track progress and outcomes over time. This may be a reflection of the lack of clear, achievable targets on outcomes and impacts in NAPAs. Some of the gaps in skills, awareness, practices, and human resources could be addressed through training and learning programs, but some gaps were structural and organizational in nature. While organizational and management training could help, changes in management structure and practices, and in organizational culture, may also be needed.

Many organizations had a limited awareness of and emphasis on many key considerations at each stage of the project cycle, including the need for target groups and beneficiaries to participate in the design and planning stages; the importance of profitability, financial sustainability, and market access; and attention to gender, social, political, and cultural issues in the design and implementation of climate change projects. While attention to gender issues was perceived as important during the design and planning stage of projects, it generally received much less attention during implementation and even less during M&E. Given the greater vulnerability of women to climate change and the resulting implications for children's development, food security, and well-being, greater capacity building and resources are needed to improve gender-sensitive impact assessment moving forward.

Respondents also reported limited accountability of their organizations to the affected rural communities and a lack of M&E to track and report progress over time. Many of the M&E indicators perceived to be important or highly important by respondents were reportedly not emphasized within their organizations. Other organizational challenges reported by respondents included limited transparency; limited mobility to conduct work; lack of coordination among staff within the organization; inadequate resources to conduct work (especially in Kenya and Mali); and mismanagement or leakage of resources, which had a demotivating effect. These results suggest a need for organizational capacity strengthening for

TABLE 1 Use of gender-disaggregated data for monitoring and evaluation (%)

Activity	Bangladesh (14)	Ethiopia (26)	Kenya (36)	Mali (11)
Do not collect, analyze, or report gender-disaggregated data	25	76	72	59
Collect, analyze, or report data on women, men, girls, and boys in household	41	14	19	15
Collect, analyze, or report data on female-headed households and male-headed households	34	10	9	26

Source: Ragasa et al. (2013).
Note: Numbers in parentheses are the number of organizations involved in climate change adaptation who responded to this survey.

those local organizations working in and providing services to rural communities and groups and for improving M&E within these organizations, in addition to the more common technical training activities for climate change management and gender and social analysis. These efforts should be coupled with greater commitment from management and higher authorities to promote the organizational changes needed to improve the effectiveness of projects. More resources and training will not be enough to ensure the success of climate change efforts without a greater commitment and cultural change within the organizations themselves. Further empirical analyses are needed to explore detailed strategies to promote changes in organizational culture and to capture the complexity of organizational and institutional issues hindering climate change adaptation efforts.

FOR FURTHER READING

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Catherine Ragasa *(c.ragasa@cgiar.org) is a research fellow in the Development Strategy and Governance Division of the International Food Policy Research Institute (IFPRI), Washington, DC.* ***Yan Sun*** *(yansun@gwmail.gwu.edu) was a research analyst in the Environment and Production Technology Division of IFPRI, Washington, DC, at the time she contributed to this research; she is currently a consultant at the World Bank, Washington, DC.* ***Elizabeth Bryan*** *(e.bryan@cgiar.org) is a senior research analyst in the Environment and Production Technology Division of IFPRI, Washington, DC.* ***Caroline Abate*** *(cabate@students.usiu.ac.ke) is an independent research consultant based in Nairobi.* ***Atlaw Alemu*** *(atlawalemu@yahoo.com) is an independent research consultant based in Addis Ababa, Ethiopia.* ***Mahamadou Namori Keita*** *(Mohakeita@hotmail.com) is an independent research consultant based in Bamako, Mali.*

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IFPRI CLIMATE CHANGE, COLLECTIVE ACTION, & WOMEN'S ASSETS

POLICY NOTE

Gender, Collective Action, and Climate Change

Qualitative Insights from Bangladesh, Ethiopia, Kenya, and Mali

Noora-Lisa Aberman, Snigdha Ali, Julia A. Behrman, Elizabeth Bryan, Peter Davis, Aiveen Donnelly, Violet Gathaara, Daouda Koné, Teresiah Nganga, Jane Ngugi, Barrack Okoba, and Carla Roncoli

PEOPLE WHO RELY ON NATURAL RESOURCES FOR THEIR LIVELIHOODS ARE MORE VULNERABLE TO THE adverse impacts of climate change and are more limited in their capacity to adapt. This vulnerability is exacerbated when assets are limited or insecure. The gender dynamics of climate change adaptation are important because women typically control fewer assets compared with men, and women's assets are more likely to be disposed of in times of crises, such as negative climate-related events or "shocks." This policy note summarizes research designed to contribute to the understanding of men's and women's perceptions of (1) climate change, (2) adaptive approaches, and (3) the degree to which assets and group participation affect adaptation strategies. A series of qualitative studies were undertaken in four countries highly vulnerable to the adverse effects of climate change: Bangladesh, Ethiopia, Kenya, and Mali. The research focused on how gender, information and technology, and institutional capacity—represented by participation in farmer groups—play a role in determining adaptive approaches and how men's and women's asset base and decisionmaking power mediate their ability to adapt effectively.

CONTEXT OF THE STUDY

Adaptation to climate change is a complex, multidimensional, and multi-scale process. A framework was developed to comprehensively integrate these components, borrowing aspects from useful existing frameworks (see the companion policy note by Behrman, Bryan, and Goh). Bangladesh, Ethiopia, Kenya, and Mali were chosen as cases studies because of the climate change–related challenges they face. Gender-disaggregated group interviews were undertaken in each of these countries using a participatory rural appraisal approach (Table 1). The interviews included modules on signs and impacts of climate change, asset control and ownership, participation in community groups, adaptive approaches, and constraints to adaptation, each of which is discussed in the following sections. While characteristics like cultural norms and institutional context vary across the countries, all four are seen as being particularly vulnerable to the adverse impacts of climate change as a result of exposure, sensitivity, and a low level of adaptive capacity.

CLIMATE SIGNALS AND IMPACTS

The main sign of climate change raised by respondents across all four countries was the irregularity of weather, primarily rainfall. This highlights the dependence on rainfed agriculture, making the predictability of rainfall and other weather patterns a critical factor in agricultural productivity and food security. While specific characteristics of rainfall changes varied across countries, overall such changes resulted in a lack of ability to plan for the agricultural season due to variability in the onset of the rainy season or increased challenges associated with accessing water for agriculture. In Kenya and Mali, early rains with subsequent dry spells were mentioned as a reason germinated seeds died. Other signs across countries were temperature increases, noted in Bangladesh, Ethiopia, and Kenya, and increased prevalence of extreme weather events in Bangladesh.

Perceived impacts of climate change largely centered on water scarcity and tended to differ by gender, with men emphasizing crop-related impacts and women emphasizing scarcity of water resources for household use. Some second-

TABLE 1 Study country characteristics

Characteristic	Bangladesh	Ethiopia	Kenya	Mali
Employment in agriculture[a]	21 percent	38 percent	32 percent	19 percent
Agriculture as a percentage of GDP[b]	18 percent	49 percent	30 percent	42 percent
Agricultural focus	Rainfed and groundwater-irrigated rice production Dependence on high-yielding varieties relying on groundwater irrigation Fisheries, livestock and forestry sectors are also important	Largely rainfed agriculture Predominantly small-scale mixed crop and livestock production Dependence on traditional farming techniques, overgrazing and deforestation lead to depleted soils	Largely rainfed agriculture Livestock production also plays a major role in food security and livelihoods Conflict exacerbates climate vulnerability	Largely rainfed agriculture Developing improved cultivars in high rainfall zones Conflicts over natural resources common, especially between farmers and pastoralists
Key climate change vulnerabilities	Extreme flood frequency Encroachment of salt water in coastal areas, depleting groundwater aquifers	Variable/unpredictable rainfall and droughts	Variable/unpredictable temperature and rainfall Terrestrial surface water resources are very vulnerable to the impacts of climate change	Declining soil productivity and population growth Two-thirds of the country falls within the Sahara desert
Group interview details	30 group and 30 key-informant interviews in 15 villages across 7 agroecological zones (approximately 300 participants in total)	12 group interviews at 6 sites in 2 regions across agroecological zones (90 participants in total)	10 group interviews in 5 districts (140 participants in total)	10 group interviews in 5 villages in 2 production systems (approximately 100 participants in total)

Source: Compiled by authors (see Aberman et al. 2014 for full source list).
[a] Employment in agriculture computed with FAOSTAT 2011 country data (economically active population in agriculture as share of total population, http://faostat3.fao.org/).
[b] Agriculture value added as a share of Gross Domestic Product from World Data Bank indicators for 2012 (http://data.worldbank.org/indicator/NV.AGR.TOTL.ZS).

ary impacts of climate change were also raised. In Ethiopia participants linked the decreasing crop yields to malnutrition and famine, whereas in Bangladesh and Kenya heavy rains and floods were linked to water-borne disease. In addition, in Bangladesh, Kenya, and Mali, scarce water resources were linked to increasing inter- and intracommunity conflicts. In Mali, participants emphasized these adverse social impacts, including the negative effects of mass migration and the breakdown of the family structure and family values.

ASSET USE IN ADAPTATION

Across countries, jewelry and small animals tend to be owned or controlled by women. In Mali, women were also described as controlling vegetable gardens, but female control of land is tenuous, with ownership remaining with the husband (or, upon the husband's death, his brothers). Assets owned by women were typically gifted at marriage (for example, jewelry and, in Ethiopia, trees) or purchased by the women themselves. Main crops and large livestock were considered the property of men by default. In Ethiopia, moreover, women control some less important grains, whereas men control the staple grains and any marketable crops. In all cases, women's assets were seen as the most suitable for sale in the case of climate change–related shocks.

ADAPTATION APPROACHES

All participants discussed the use of varieties suited to new climatic conditions, such as drought-resistant varieties (Kenya) and early maturing varieties for shorter rainy seasons (Kenya and Mali). In Bangladesh and Ethiopia, participants noted changing planting patterns, such as planting fruit trees and traditional plants that were better able to withstand rainfall variation. The need to take up or intensify irrigation was noted in Bangladesh and Kenya, as well as applying soil conservation and other water management practices. All countries discussed attempts to diversify livelihoods through the production of fruits, vegetables, dairy, or livestock for sale, or through urban and international migration. In Bangladesh and Kenya, women said they now purchased clean water, whereas in the past they were able to access suitable water from wells, rivers, and other free sources. In Ethiopia, participants mentioned now having to boil water for consumption. In Bangladesh, people were also paying more for irrigation water because using traditional methods to access shallow ground-

water were no longer effective due to lowered groundwater levels.

Farming cooperatives and other community groups were discussed in all countries as mechanisms for accessing credit, agricultural inputs, and trainings on new agricultural practices. In Bangladesh, interviewees also noted turning to groups for help with natural resource management and community conflict resolution. In Ethiopia, they emphasized soil conservation and water management. In Kenya, men stressed that group participation allowed people to stand up to crime and corruption without fear of repercussions, and women felt that groups ensured greater accountability and transparency in the distribution of food aid.

Participants across the four countries described selling households' assets to cope with climatic shocks. Assets controlled by women were considered the most suitable to sell in such situations. Other longer term ex ante coping strategies included decreasing food intake.

CONSTRAINTS TO ADAPTATION

Barriers to adaptation included the inability to afford appropriate improved inputs, such as drought-tolerant seed. In Bangladesh and Kenya, respondents emphasized the need for financing to invest in income-diversifying options, such as small businesses and kiosks. The need to improve the capacity to adapt through trainings was raised in all countries, including trainings and tools for traditional agricultural practices (Ethiopia); seed production (Mali); tree planting (Mali and Kenya); value-addition and marketing (Kenya); and income-diversification skills, such as woodwork, market gardening, and production of other crops such as peanuts (Mali). Some contextual factors, including corruption, crime, drug trafficking, and lack of security due to ethnic and political violence, were identified in Kenya as consequences of climate change-related stresses and barriers to climate change adaptation. Bangladesh respondents described elite capture as a constraint—for example, the tendency of wealthy or well-connected households to monopolize water resources in times of drought.

CONCLUDING COMMENTS

Participants in group discussions were starkly aware of subtle climatic changes—and their impacts, such as the reduced ability to access sufficient clean water. Some groups pointed out a diminishing ability to cope with this reality as they are forced to sell limited physical assets to cope with negative climate-related events (shocks), leaving them even more vulnerable. Those with a stronger asset base—whether in terms of financial assets or skills or training—were in a better position to respond to climate-related changes and shocks. Most of the agriculture-related adaptive approaches taken, and those desired, were largely based on new technologies, such as drought-tolerant or early maturing seeds or new irrigation technologies. At the same time, people were choosing to return to more "traditional" practices, such as planting older, less marketable but more drought-tolerant, crops; however, information on these traditional practices had become less accessible. Increased pressure on critical resources had changed social and cultural norms related to resource access. For instance, Kenyan women noted that cattle herders now chased them off water points in times of drought; participants in Mali lamented the disintegration of the traditional family structure as young people emigrated and adopted foreign values; and in Bangladesh participants mentioned intra- and intercommunity conflict over natural resources, and a tendency for elite capture in times of scarcity.

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These types of social conflicts could be addressed to some extent through developing the institutional capacity of the communities through group participation and trainings. In Bangladesh, some respondents noted that group participation was helping community members to work together more effectively and to manage conflict within and across communities, and in Kenya, people pointed to group participation as a way of standing up to crime and corruption.

Group participation was seen as an important mechanism for enabling adaptation activities and asset development by both men and women. In particular, it was seen as a mechanism for developing human capital and for group investments in expensive technologies. Women noted that groups offered opportunities for loans. In some groups, men pointed to women's loans as a means of coping with shocks.

Participants also noted the secondary impacts of climate change on other sectors, such as education, health, and nutrition. For instance, adverse climate impacts may lead to lack of resources to invest in medical treatment, nutrition, or education, whereas poor health, nutritional status, and human capital limit the extent to which people can invest energy and resources in alternative adaptive strategies. Thus, coping with climatic shocks and adapting to long-term climate change is based on complex social interactions among men and women and their differing—and independent—priorities and decision-making processes. Nevertheless, while it is important to take into account the gender-specific dynamics of climate change–adaptation strategies and their implications for overall well-being outcomes, the results of this research also illuminate the degree to which women's and men's adaptive approaches are inherently intertwined.

FOR FURTHER READING

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Noora-Lisa Aberman *(n.aberman@cgiar.org) is a Malawi-based country program coordinator in the Development Strategy and Governance Division of the International Food Policy Research Institute (IFPRI), Washington, DC.* ***Snigdha Ali*** *(snigdha.ali@gmail.com) is the lead coordinator in the Communications Division of BRAC, Dhaka, Bangladesh.* ***Julia A. Behrman*** *(julia.behrman@gmail.com) is a doctoral student in the Department of Sociology of New York University, New York.* ***Elizabeth Bryan*** *(e.bryan@cgiar.org) is a senior research analyst in the Environment and Production Technology Division of IFPRI, Washington, DC.* ***Peter Davis*** *(p.r.davis@sdri.org.uk) is SDRI coordinator and a research fellow at the Social Development Research Initiative (SDRI), Bath, UK.* ***Aiveen Donnelly*** *(aiveendonnelly@hotmail.com) was a student at Justus Liebig University, Giessen, Germany, at the time she contributed to this research.* ***Violet Gathaara*** *(vgathaara@gmail.com) is a researcher at the Kenya Agricultural and Livestock Research Organization (KALRO), Nairobi.* ***Teresiah Nganga*** *(treazahwnganga@yahoo.com) is a researcher at KALRO, Nairobi.* ***Jane Ngugi*** *(ngugijane19@yahoo.com) is a researcher at KALRO, Nairobi.* ***Barrack Okoba*** *(okoba2000@yahoo.com) was a senior principal research scientist at KALRO, Nairobi, at the time he contributed to this research; he is currently on leave working for the Food and Agriculture Organization of the United Nations, Nairobi.* ***Carla Roncoli*** *(carla.roncoli@emory.edu) is a senior research scientist at Emory University, Atlanta.*

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Gender, Assets, and Climate Variability and Change

Climate Shocks, Livestock Assets, and Consumption Dynamics

Evidence from Rural Ethiopia

Tekie Alemu and Hailu Elias

NATURAL PHENOMENA LIKE RAINFALL VARIABILITY AND DROUGHT NEGATIVELY AFFECT ENTIRE COMMUNITIES. When such events (or shocks) occur in poor agricultural communities–like those found in rural Ethiopia–most households have no choice but to sell assets to smooth consumption. In doing so they drive down the prices of those assets, reduce their future asset holdings, and compromise their ability to cope with potential future shocks. Moreover, certain characteristics may predispose households to shocks, such as having a high proportion of vulnerable (for example, elderly, young, or sick) members. When households have limited options to protect their most vulnerable members, shocks can have even longer term costs; for example, households may be forced to keep children home from school to assist with domestic or farm activities, compromising the next generation's opportunities to raise themselves out of poverty and locking households into a downward cycle of generational poverty. This policy note summarizes research that analyzed the adverse impact of climate-related shocks on farm households' real per capita consumption and asset ownership over time, as well as factors that exacerbate or ameliorate those adverse impacts.

CONTEXT, DATA, AND SAMPLE DESCRIPTIVES

The research aimed to investigate rural household exposure to rainfall variability and drought shocks in four regions of Ethiopia—Amhara, Oromia, the Southern Nations, Nationalities, and Peoples' region, and Tigray—by examining the effect of rainfall variability and drought shocks on household consumption and asset accumulation over time. The goal was to provide insights for the design and targeting of policy interventions to support poor households in building their asset base and becoming less vulnerable to climate-related and other shocks.

The study utilized nationally representative household-level panel data from the 2004 and 2009 rounds of the Ethiopian Rural Household Survey (ERHS), along with the corresponding rainfall data from adjacent meteorological stations. This enabled an examination of changes in household status in response to recent climate-related shocks. Table 1 summarizes some of the characteristics of the sample households.

RESULTS

Household size, schooling of the household head, social status of the household, household landholdings, and the ability of the head to raise cash from various sources in case of emergency all had a statistically significant effect on household asset accumulation. Although a larger household size can have a negative effect on asset accumulation in urban settings, larger family size had a significantly positive impact in rural Ethiopia. This may be because healthy and active household members of working age can participate in the household's agricultural activities. In contrast, household size had a significantly negative effect on per capita household consumption: real per capita consumption declined by 11 percent when household size increased by one person (keeping other factors constant).

Results also showed that asset values and livestock holdings were higher among households with high social status and strong social networks compared to households with lower social status and those with weak social networks. This may mean that social networks serve as an informal insurance against climatic shocks in situations where the formal rural

insurance market is absent, such as in Ethiopia. Variability in rainfall levels had a negative impact on the value of household assets. A higher variability from median levels decreased livestock assets by 65 percent between 2004 and 2009. Livestock asset values among households that had experienced a drought in 2004, or just before, had decreased by about 42 percent by 2009. Furthermore, the real per capita consumption of households that had experienced drought had declined by 22 percent by 2009, indicating that households were depleting their livestock assets in response to climatic shocks but not managing to maintain their consumption levels. Moreover, experiencing drought and owning a larger plot of land has a greater negative effect on the value of livestock. This could be due to the fact that households with more land are more strongly affected by a drought because they tend to be primarily dependent on agriculture and thus need to sell livestock in times of drought.

These findings are consistent with the literature on Ethiopia's exposure to climatic shocks, especially to rainfall shocks. Male-headed households had higher per capita consumption levels compared with female-headed households, indicating gender disparity in adaptive capacity and household welfare. This is also consistent with prior literature and the context of rural Ethiopia indicating that female-headed households usually lack access to resources and are more vulnerable to climatic shocks. Households whose heads had some primary education had 15 percent higher real per capita consumption, implying the positive role of education in improving household welfare.

CONCLUSIONS AND POLICY IMPLICATIONS

Shocks have a serious adverse effect on the real per capita consumption and asset accumulation of rural households in Ethiopia, but having a larger-sized household, higher status

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in the community, and strong social networks can positively affect a household's ability to build assets over time. Exposure to shocks also depends on the agroecological and socioeconomic conditions, production levels, base level of assets, and coping strategies chosen. Social status, education levels, and the gender of the household head also affect real per capita consumption.

The findings of this research have two important policy implications. First, in the context of rural Ethiopia, building local social networks can play a positive role where the insurance market is incomplete. This implies that understanding the socioeconomic context is crucial in designing community-based climate change–adaptation strategies to enhance households' adaptive capacity and welfare. Second, in times of drought households draw down assets and consume less. This calls for continued safety net program support or investments in irrigation infrastructure or other drought-mitigating measures to prevent rural households from entering downward poverty spirals as a result of droughts, which are expected to increase in frequency and intensity as a result of climate change.

TABLE 1 Average characteristics of sample households, 2004 and 2009

Characteristic	2004	2009
Household size (persons)	5.86	5.80
Age of household head (years)	50.08	52.10
Schooling of household head (years)	3.82	5.26
Share of households headed by men (%)	72.0	65.0
Real per capita consumption (birr)	87.30	54.21
Landholdings (ha)	1.50	0.64
Average household perception of well-being status (from best [10] to worst [0])	4.44	4.52
Share of households able to raise 100 birr in case of an emergency (%)	59.3	73.8
Share of households affected by drought in 2004 or just prior to 2004 (%)	60.0	

Source: Compiled by authors from IFPRI (2011).
Notes: ha = hectares. 1 birr = US$0.11 in 2009 (see www.freecurrencyrates.com).

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Tekie Alemu *(tekiealemu@yahoo.com) is an assistant professor in the Department of Economics of Addis Ababa University, Ethiopia.* ***Hailu Elias*** *(hailu.econ@gmail.com) is a lecturer in economics and a doctoral student in the Department of Economics of Addis Ababa University, Ethiopia.*

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The Impact of Shocks on Gender-Differentiated Asset Dynamics

Evidence from Bangladesh

Muntaha Rakib and Julia Anna Matz

HUSBANDS AND WIVES ACCUMULATE AND OWN ASSETS BOTH INDIVIDUALLY AND JOINTLY, AND THEY USE these assets differently to cope with adverse events, that is, shocks (for more information, see the companion policy note on this research by Quisumbing, Kumar, and Behrman). These dynamics are important because female control over assets positively affects household well-being, especially regarding children. It is important to consider the various types of assets involved in order to gain a comprehensive understanding of the impact of shocks on household assets. This policy note summarizes research that builds on existing studies on the gender-differentiated impacts of shocks on household asset holdings in Bangladesh, which is among the countries most vulnerable to climate change because of its densely populated coastal area and large population living below the poverty line.

CONTEXT, DATA, AND SAMPLE DESCRIPTIVES

An individual's asset base depends on assets brought to marriage and the ability to accumulate more, which is based on marital status, religion, ethnicity, and inheritance and property rights. For women, the accumulation of assets is especially context-dependent, in terms of social and traditional rules affecting their ability to participate in the labor force and inherit assets. In Bangladesh, women's asset composition changes, due to remittances, from agricultural tools to nonagricultural assets and poultry, while jewelry remains their primary means of storing value. Ownership of one type of asset may also facilitate access to another, such as the use of owned land as collateral in credit markets.

The data underlying this research took the form of a two-round, representative household survey panel dataset collected in 31 of Bangladesh's 64 districts in 2010 and 2012. For the purposes of the study, intrahousehold dynamics—especially as they relate to bargaining power—form the focus of the investigation rather than differences between households; hence the study sample was restricted to households comprising couples; female-headed households were excluded to ensure comparability across the sample.

The research covered an array of shocks, including climate shocks (floods, droughts, and cyclones), nonclimatic shocks (death, illness, and dowry payments and wedding expenses), as well as positive shocks (inheritances, remittance payments, and dowry receipts). Assets were categorized as natural capital (land holdings), physical capital, livestock holdings, and financial capital (measured as credit owed). Husbands and wives had a mean age of 46 and 38 years, respectively, during the baseline data collection and less than four years of schooling. Households had five members, on average, and owned 79 decimals (about 0.8 acres) of land valued at 598,938 taka (equivalent to US$7,394 in 2012) and nonland assets of 33,763 taka (US$417) in 2012.

The share of sample households affected by various shocks are presented in Table 1. Due to potential reporting bias, the incidence of shocks was determined based on both household and community-level reports.

RESULTS

In general, households were able to accumulate land, livestock, and nonland physical assets between the two survey rounds (Table 2). While women held fewer livestock and physical assets than their husbands, the most noticeable discrep-

TABLE 1 The share of households affected by shocks between 2010 and 2012

Type of shock	Mean
Share of households affected by climatic negative shocks	
Flood	0.38 [0.32]
Drought	0.45 [0.52]
Cyclone/tornado	0.31 [0.29]
Share of households affected by nonclimatic negative shocks	
Death or illness of a household member	0.26
Dowry or wedding expenses	0.05
Share of households affected by positive shocks	
Receipt of a remittance	0.20
Receipt of a dowry or inheritance	0.04

Source: Calculated by authors based on survey data.
Note: Covariate shocks were reported by households as well as community officials. The share of households affected according to the latter are given in brackets.

ancy was in land holdings, with husbands owning 96 percent of the households' total land area (Box 1).

Even though the value of women's nonland assets increased between the two survey rounds, the larger share of the monetary value of physical assets remained in the hands of the husbands. Results indicate clear differences, with men generally holding more assets, except for jewelry (Table 3). Overall, nonland assets were more equally distributed than land; however, livestock holdings were small (less than one tropical livestock unit). Although the majority of male household members older than 15 years reported agriculture as their main occupation in 2010, farmers in Bangladesh are more oriented to rice cultivation and fishing rather than rearing livestock.

The Impact of Shocks on Aggregate Asset Holdings

Surprisingly, experiencing a flood does not affect aggregate asset holdings. Cyclones and dowry payments reduce husbands' asset holdings, whereas death and illness lead to both spouses disposing of their individual assets, leaving their jointly owned assets unaffected. It is not surpris-

TABLE 2 Summary of major asset ownership

Assets by owner	Mean	
Husbands' assets	2010	2012
Plot size (decimals)	68	76
Livestock (TLU)	0.61	0.70
Physical assets	0.19	0.21
Outstanding credit (taka)	11,548	4,913
Wives' assets		
Plot size (decimals)	0.84	0.96
Livestock (TLU)	0.34	0.38
Physical assets	0.09	0.10
Outstanding credit (taka)	5,157	6,096
Jointly held assets		
Plot size (decimals)	2.50	1.38
Livestock (TLU)	0.09	0.09
Physical assets	0.13	0.15
Outstanding credit (taka)	5,980	6,792
Number of observations	678 households	

Source: Calculated by authors based on survey data.
Notes: TLU = tropical livestock units; 100 decimals = 1 acre; 1 US dollar corresponded to 81 Bangladeshi taka in September 2012, according to the International Monetary Fund's exchange rates. Physical assets are measured with the help of an index.

BOX 1 Patrilineal inheritance laws and customs in Bangladesh

Even though Muslim law allows daughters to inherit small shares of land in Bangladesh, daughters often forgo their inheritance to maintain good relationships with their brothers. Hindu women are not allowed to inherit property from their fathers, and although Hindu law has been reformed in neighboring countries, Bangladesh remains a patrilineal society. Another factor making land ownership difficult for women is that men are often reluctant to give inherited land to their sisters because they are afraid the land will be divided, impeding their privacy if land is subsequently sold. Hence, they prefer to pay their sisters rather than transfer the actual land. Muslim law stipulates that widows receive one-eighth of the deceased husbands' land and that the rest be distributed among their children. In practice, widows usually live in a son's household without owning land. Widows without offspring receive one-quarter of their husbands' land, and the rest is inherited by the brothers of the deceased.

ing that dowry payments mostly affect husbands' assets because wedding costs are traditionally the obligation of the bride's father. Poor people in Bangladesh may need to mortgage land or sell livestock to pay for dowries and wedding expenses; wives' individual and joint assets are also sold to meet these expenses, illustrating the immense financial burden of the tradition. Death and illness negatively affect husbands' land and nonland assets and have mixed effects on wives' land and nonland assets.

The Impact of Shocks on Natural, Physical, and Livestock Assets

Floods reduce wives' livestock holdings; droughts negatively affect jointly held nonland physical assets; and cyclones are associated with reducing husbands' physical assets, while increasing husbands' and jointly owned land holdings—which is surprising. While nonland physical assets are likely to be sold to cope with weather shocks, land holdings are not negatively affected, probably because land is difficult to reaccumulate once sold. Interestingly, remittances have a negative impact on husbands' land holdings, potentially due to the high costs of migration. Husbands may sell part of their land to facilitate their own or a child's migration in search of work; resulting remittances sent home are likely reflected in the positive impact on wives' livestock and other physical assets. Dowry payments reduce jointly owned livestock, which is traditionally acquired for the planned purpose of paying for wedding expenses.

The Impact of Shocks on Physical Assets

Cyclones are associated with a decrease in husbands' nonland physical assets due to the sale of consumer durables, while husbands maintain agricultural tools and vehicles, likely because of their importance in generating household income. Wives appear to accumulate jewelry and poultry,

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whereas husbands favor consumer goods and agricultural tools. Women seemingly prefer to invest in assets that obviously belong to them and over which they have some control, whereas men invest to improve the economic well-being of the whole family. Overall, weather shocks negatively affect husbands' physical assets, whereas other negative shocks affect physical assets held by both spouses.

POLICY IMPLICATIONS

Droughts are the most frequently experienced shock by Bangladeshi households across a wide range of agroclimatic environments. Shocks resulting from climatic variability generally reduce the total asset base of husbands, as well as wives' livestock holdings and jointly held physical assets; negative nonclimatic shocks adversely affect both husbands' and wives' assets. Livestock is commonly used as a coping mechanism, whereas land, husbands' vehicles, and agricultural tools—which are important for generating income—are not.

TABLE 3 Value of nonland assets by ownership, 2010 and 2012 (2010 taka)

	2010			2012			Percentage change		
Asset category	Husband	Wife	Joint	Husband	Wife	Joint	Husband	Wife	Joint
Consumer durables	4,056	382	914	4,034	264	918	–0.5	–30.9	0.4
Jewelry	5,147	4,566	4,398	5,814	6,519	5,858	13.0	43.0	33.2
Vehicles	4,542	180	154	2,604	495	265	–42.7	175.0	72.1
Agricultural tools	5,084	264	211	4,136	128	112	–18.7	–51.5	–46.9
Other assets	1,879	45	177	2,172	9	435	15.6	–80.0	145.8

Source: Calculated by authors based on survey data.

In general, spouses aim to keep their jointly owned assets intact, only selling them as part of a planned strategy for coping with anticipated shocks. Overall, the specific assets used to cope with shocks complement each other, highlighting the importance of a diverse asset portfolio.

Women's assets are generally beneficial to children's well-being in terms of health, education, and nutrition. This illustrates the importance of programs that aim to protect these assets and even encourage women's ownership of assets that are not readily sold to cope with shocks—for example, by reforming and enforcing inheritance laws. In turn, land ownership enables women to be more active in financial markets by providing them with collateral. Asset holdings and relative household bargaining power are interrelated, so protecting women's assets could have a positive impact on women's social and human capital, and vice versa. The payment of dowries constitutes a significant financial burden for poor people in Bangladesh; laws against the practice have been passed, but with little effect. Education on this subject, together with the provision of credit, could enhance the asset holdings of both spouses, but policy design needs to incorporate the protection of assets in the event of shocks, as well as gendered differences in the accumulation and sale of assets to cope with shocks.

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Muntaha Rakib *(mrakib@uni-bonn.de) is a junior researcher at the Center for Development Research (ZEF) at the University of Bonn, Germany.*
Julia Anna Matz *(jmatz@uni-bonn.de) is a senior researcher at ZEF at the University of Bonn, Germany.*

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Do Shocks Affect Men's and Women's Assets Differently?

Evidence from Bangladesh and Uganda

Agnes R. Quisumbing, Neha Kumar, and Julia A. Behrman

HOUSEHOLDS IN DEVELOPING COUNTRIES USE A VARIETY OF MECHANISMS TO COPE WITH SHOCKS, SUCH AS selling assets, accessing capital markets, reallocating labor, and receiving private or public transfers. Among these responses, selling assets is often a last resort because irreversible asset losses may put the household at risk of future poverty. This policy note summarizes research focusing on the extent to which various kinds of adverse events (that is, shocks) affect men's and women's behavior in relation to asset accumulation and divestiture and whether the different types of shocks result in men's and women's changing their stock of assets in different ways. If men and women hold different types of assets—men, for example, holding more land and agricultural equipment, and women holding more jewelry and small livestock—individuals' responses to shocks would be expected to have different impacts on different asset types, depending on their importance to household livelihood, who owns the asset, and how easily they can be acquired or sold. If women's assets are smaller and more readily disposed of, shocks could increase—rather than decrease—intrahousehold gender asset inequality.

CONTEXT OF THE STUDY

Bangladesh and Uganda were chosen, first, based on the availability of data from both countries before and after the 2007/08 food-price crisis (allowing the establishment of pre-crisis baseline values) and, second, because the two countries exhibit very different sociocultural traditions, implying that the gendered impacts of shocks in each country would be different.

Bangladesh. In 2005, almost half the Bangladeshi labor force was employed in agriculture, and women represented 34 percent of the agricultural labor force. Nevertheless, men still make most of the agricultural decisions and provide most of the field labor. Because of the perceived "invisibility" of women in agriculture, and because Islamic inheritance laws provide that daughters inherit half the share of sons, women have less land and fewer assets than men. Moreover, brides typically move to their husbands' villages, and in the Bangladeshi context the groom's family typically demands and controls dowries as part of marriage negotiations. These one-time costs are a large drain on families' resources and are highly correlated with their falling into poverty. Hence, men bring more assets to marriage and typically own most of the household's land, livestock, and productive equipment; jewelry, however, is considered a woman's asset.

Uganda. In Uganda, a considerable portion of the working population is engaged in agriculture (65 percent of the 2003 working population; 73 percent of the 2006 working population). In contrast to Bangladesh, more than half of all women actively participate in agriculture (roughly 60 percent in 2006). In Uganda, most agricultural production occurs on family farms, with men deciding the work pattern and allocation of resources and women having some say about *women's* crops. In most cases, women lack formal land ownership rights and therefore gain access to land through their husbands or other male relatives. Evidence indicates that the type of marital regime—whether customary, church marriage, or nonmarried cohabitation—strongly influences Ugandan women's rights with respect to control over land and other key assets. Prior to marriage, a bride-price—usually in the form of cattle or other livestock—is paid by the husband's family to the wife's family to compensate them for the resources needed to raise and educate the woman.

DATA AND SAMPLE DESCRIPTIVES

For Bangladesh, the study used data from the 2006/07 and 2010 rounds of the Chronic Poverty and Long Term Impact Study in Bangladesh. For Uganda, the analysis was based on two survey rounds in association with the HarvestPlus orange-fleshed sweet potato study. Specific country- and household-level characteristics are summarized in Table 1.

TABLE 1 Selected household characteristics by country, 2007 baseline levels

Characteristic		Bangladesh	Uganda
Husbands	Age (mean)	46 years	41 years
	Schooling (mean)	4 years	7 years
Wives	Age (mean)	38 years	32 years
	Schooling (mean)	3 years	4.5 years
Households	Size (mean)	4 people	7.5 people
	Land owned (mean)	74 decimals	2 acres
Number of observations		914 households	793 households

Sources: Calculated by authors from the Chronic Poverty and Long Term Impact Study in Bangladesh dataset (www.ifpri.org/dataset/chronic-poverty-and-long-term-impact-study-bangladesh) and HarvestPlus Reaching End Users Orange-Fleshed Sweet Potato Household Survey, Uganda 2007.
Note: 100 decimals = 1 acre.

In Bangladesh, close to 95 of the household's landholdings were owned by the husband, with wives owning less than 2 percent (Table 2). Women's share of jewelry fell from 35 percent in 2007 to 32 percent in 2010, and their share of livestock declined from 16 percent in 2007 to 10 percent in 2010. The decline in women's overall share of nonland assets, and in their shares of livestock and jewelry in particular—even as overall levels increased—is worth noting. Unlike Bangladesh, where most nonland assets are jointly held, in Uganda, the largest proportion of household nonland assets is held by the husband (Table 2). While women hold a very low share of nonland assets (9 percent), this is slightly larger than the share of the wives' exclusively held nonland assets in Bangladesh.

SHOCKS AND MEN'S AND WOMEN'S ASSETS

Bangladeshi households experienced between 0 and 5 shocks during 2007–2009. A very small proportion reported having experienced floods (less than 1 percent), but almost 3 percent reported being affected by droughts (Table 3). Reflecting the timing of the survey, 36 percent of households reported having been adversely affected by the 2007/08 global food price increase. Illness affected 11 percent of households, but death of an immediate household member only affected 1 percent. In Uganda, sample households experienced at least five shocks on average during 2007–2009, and at least two shocks in 2009 alone. Drought was the most prevalent shock,

TABLE 2 Asset holdings by owner, Bangladesh, 2007/2010, and Uganda, 2007/2009

	Bangladesh		Uganda	
Asset holdings (mean)	**2007**	**2010**	**2007**	**2009**
Units of land	Decimals		Acres	
Total household land owned	75.4	92.6	2.1	2.5
Jointly owned land	2.5	19.1	0.5	0.5
Land owned by husband	71.5	72.0	1.5	1.8
Land owned by wife	1.3	1.5	0.1	0.2
Share of land exclusively owned by wife	1.7%	1.6%	4.3%	6.0%
Asset holdings	**2007 taka**		**2007 Ugandan shillings**	
Total value of nonland assets	45,785.7	71,028.2	2,917,050	4,005,010
Jointly owned nonland assets	21,784.6	34,750.2	800,030	1,114,860
Nonland assets owned by husband	21,025.8	32,746.9	1,870,890	2,549,050
Nonland assets owned by wife	2,975.2	3,750.7	246,130	341,170
Share of nonland assets owned by wife	8.6%	7.6%	9%	9%

Sources: Calculated by authors from the Chronic Poverty and Long Term Impact Study in Bangladesh dataset (www.ifpri.org/dataset/chronic-poverty-and-long-term-impact-study-bangladesh) and the Bangladesh Food and Financial Crisis Impact Dataset, 2009–2010. Percentages were computed based on numbers before rounding up.
Note: 100 decimals = 1 acre

with almost 90 percent of households being affected, but the incidence of floods (47 percent) was also substantial (Table 3). As expected, a large share of the households (about two-thirds) was adversely affected by large increases in food prices in this period. Illness-related shocks were also important, affecting 38 percent of households, whereas 13 percent of households experienced the death of an immediate household member.

While weather-related shocks affected a large proportion of the sample households in both countries, flood-related shocks had a negligible impact on land and asset holdings in Bangladesh and actually had a positive effect on husbands' land assets in Uganda. This positive effect was possibly related to the 2007 flood, which generated aid from a number of organizations. In Bangladesh, the impacts of flood shocks on husbands' and wives' landholdings were small, possibly due to the very localized experience of the flood, effective emergency assistance, and households' desires to maintain their most productive asset. Drought shocks also had small impacts in Bangladesh but in Uganda had a negative and significant impact on wives' nonland assets. The small impact of weather-related shocks on wives' assets in Bangladesh may reflect a combination of (1) lower direct exposure to agricultural risk because, unlike in Uganda, women rarely cultivate land independently; (2) effective targeting of emergency assistance; and (3) the low level of women's ownership and control of agricultural assets in general.

TABLE 3 Prevalence of major shocks experienced by households in Bangladesh and Uganda, 2007–2010

Type of shock	Bangladesh	Uganda
	Share of households affected (%)	
Flood	<1	47
Drought	3	89
Food price increase	36	67
Illness of a household member	11	38
Death of a household member	1	13

Source: Compiled by authors from Bangladesh Food and Financial Crisis Impact Dataset, 2009–2010, and HarvestPlus Reaching End Users Orange-Fleshed Sweet Potato Household Survey, Uganda 2007 and 2009.

In Bangladesh, 37 percent of sample households experienced the food-price shock compared with 67 percent in Uganda. Landholdings were relatively unaffected by food-price increases in both countries, but jointly held nonland assets were negatively affected in Bangladesh, whereas both husbands' and wives' nonland assets were negatively affected in Uganda. In Bangladesh, the reduction in nonland assets apparently came largely through Bangladeshi husbands disposing of jointly held jewelry; in Uganda, food-price increases reduced the holdings of wives' and jointly owned durable goods. Reflecting country differences, illness had a large negative impact on wives' landholdings in Bangladesh, whereas the impact of the death of a family member in Uganda was borne largely by the husbands, through loss of nonland assets. The differences in the relative impact of shocks, and their impacts on different types of assets show that responses to shocks are context-specific, and that *gendered* responses to shocks are even more so.

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POLICY IMPLICATIONS

Knowing the types of shocks that affect men's and women's assets the most may assist in designing social protection schemes. For example, in Bangladesh, death had a larger impact on men's assets, whereas illness-related shocks took a toll on women's landholdings. In Uganda, drought-related shocks affected wives' but not husbands' assets. Weather-based insurance could potentially be marketed to wives in Uganda, whereas in Bangladesh, health insurance might be more readily taken up by wives. The design of social protection schemes should also take into account the prevalence of shocks, the severity of their impact, and whose assets are used to cope with them. While in Bangladesh the food-price shock between 2006 and 2010 emerged as the most important in quantitative terms, illness-related shocks during 1996–2006 were actually the most prevalent and had the most severe impact on women's assets.

Differences in the institution of marriage and cultural concepts of joint and individual ownership may affect the extent to which assets are used to cope with shocks. In Bangladesh, the results showing generally insignificant impacts on joint holdings (while individual assets were sacrificed at the margin) indicates that husbands and wives endeavor to pre-

serve the asset on which household livelihoods are based. In contrast, in Uganda, husbands' assets appear better insured than wives' or even joint assets. Policy interventions aiming to assist households in managing climate and other risk need both to take into account the degree of jointness of asset ownership and to ensure that social protection schemes do not—either intentionally or unintentionally—widen the gender asset gap.

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Agnes R. Quisumbing *(a.quisumbing@cgiar.org) is a senior research fellow in the Poverty, Health, and Nutrition Division of the International Food Policy Research Institute (IFPRI), Washington, DC.* ***Neha Kumar*** *(n.kumar@cgiar.org) is a research fellow in the Poverty, Health, and Nutrition Division of IFPRI, Washington, DC.* ***Julia A. Behrman*** *(julia.behrman@gmail.com) is a doctoral student in the Department of Sociology of New York University, New York.*

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POLICY NOTE

The Gender-Differentiated Impact of Climate Variability on Production Possibilities

Evidence from Cereal Production in Mali

Andrew Dillon and Joshua Gill

PRODUCTION VARIABILITY DUE TO CLIMATIC CONDITIONS IS A SIGNIFICANT SOURCE OF RISK IN AGRICULTURAL production, and a significant constraint to both agricultural growth and food security. In rainfed systems, changes in the timing and amount of rainfall have a significant impact—not only on crop growth, but also on marketed surplus levels, the proceeds of which can be used for food and nonfood expenses or invested in agricultural or other assets. Increasing evidence suggests that climate change is instigating long-term changes in rainfall and temperature levels, as well as greater frequency of droughts and floods. Climate variability directly and indirectly affects the production possibilities of both male and female farmers. The potential direct effects are greater output uncertainty and hence an increase in the costs associated with reducing risk; the potential indirect effects are the depletion of household assets to maintain subsistence consumption in response to poor harvests. This policy note summarizes research into the gender-differentiated impacts of climatic changes on farmers' production possibilities using a representative sample of farmers in rainfed and irrigated areas of the Segou region of Mali during the 2009 and 2012 growing seasons.

CONTEXT OF THE STUDY

How farmers reduce interseasonal risks and whether previous climatic variability affects current production possibilities is an open question. A farmer's "production possibility frontier"—meaning the best-case production scenario based on the combined impact of factors within and outside his or her control—depends in large part on the frequency and intensity of climatic changes and on mitigating factors such as agro-ecological zone, production system, water control technology, input use, and control of farm assets at critical points in the production process. Mitigating factors may allow farmers to respond more easily to climate fluctuations, and access to water control technologies and complementary inputs are likely to be key elements of "climate-smart" agricultural interventions.

Total production and marketed surplus are important outcome variables: total production levels provide insight into whether a household can produce enough to meet its minimum subsistence requirements, and marketed surplus indicates whether the household is producing a surplus that can be monetized. Differences in the effect of climatic variability on total production and marketed surplus provide some evidence that climate variability may induce risk-averse farmers to produce primarily subsistence crops, which has long-term implications for household welfare, poverty reduction, and agricultural development.

In the context of this study, two variables were utilized as proxies for climatic changes: (1) deviations from rainfall levels using 15 years of historical rainfall data and (2) deviations from 30-year historical trends in "degree days" (that is, days in which the temperature exceeds optimal growing conditions) within a given agricultural season. Men's and women's production possibility frontiers were econometrically estimated to quantify the effect of climate variability on farmers with different levels of access to assets and water control technologies.

DATA AND SAMPLE DESCRIPTIVES

The data underlying this research are a subset drawn from a long-term panel dataset collected as part of the Alatona

Irrigation Project impact evaluation, funded by the Millennium Challenge Corporation. A two-stage stratified sample was selected to be representative of rainfed and irrigated households in the Segou region of Mali. A baseline survey was conducted in 2009 and followed up in 2012. The survey questionnaire was designed to capture household production, asset holdings, and measures of well-being, among other topics. Detailed data were collected at the plot-manager and asset-owner level, permitting gender-disaggregated analysis of these variables. A detailed description of the data and methodology underlying the study can be found in Beaman et al. 2011 (see *For Further Reading*).

Descriptive statistics of gender-differentiated production value, marketed surplus value, irrigation access, and farm assets illustrate the predominant role of men in agriculture in Mali but also show the significant role of women in household agricultural production (Table 1). Women's production is more market-oriented, which is partially explained by production patterns, seasonality, and gender roles in agriculture in the Segou region of Mali. In the primary agricultural season, cereals are produced in both irrigated and rainfed zones, and men are primarily in charge. Women primarily produce vegetables and condiments for sauce in the secondary season and provide important labor inputs in the primary season, including transplanting rice seedlings in irrigated areas, weeding in rainfed areas, and harvesting and processing.

The percentage of households reporting drought conditions increased from 7.4 percent in the 2009 growing season to 24.8 percent in the 2012 agricultural season. This self-reported information was confirmed by linking the household survey data with meteorological data. Mean production and

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marketed surplus increased between the two agricultural seasons for both men and women, likely due to an expansion of irrigation between the two years. Because male cereal production generates more revenue and hence more surpluses, it is not surprising to find higher asset ownership among men.

RESULTS

Results show that climate variability in the form of increased deviations from mean degree days has a significantly negative effect on men's production frontiers but no effect on women's production frontiers. With respect to marketed surplus, deviations in degree days have a significantly negative effect on both men's and women's marketed surplus frontiers, but for women this effect varies based on the amount of land they farm. This is consistent with women's crop choices and the seasonality of production. In the dry season, women restrict their production to small gardens with access to a water source, but as the area of land they farm increases they become more exposed to the effects of changing temperatures.

TABLE 1 Gender-differentiated descriptive statistics, 2009 and 2012 growing seasons

	2009		2012	
Characteristic	**Men**	**Women**	**Men**	**Women**
Total value of production in CFA francs (mean)	954,113	85,208	1,089,577	192,465
Value of marketed surplus in CFA francs (mean)	257,432	48,897	460,915	92,222
Share with access to irrigation (%)	19.7	42.4	17.1	16.8
Share owning farm assets (%)				
Cart	48.5	4.0	49.7	4.4
Plow	49.9	1.0	50.6	0.6
Draft animals	44.7	4.4	51.5	5.1
Wheelbarrow	4.2	0.2	5.6	0.5
Tiller	2.6	0.2	3.8	0.2
Plot size (hectares)	4.3		4.2	
Standard deviation from mean daily high temperature	0.182		0.764	
Standard deviation from mean rainfall level	0.056		0.059	
Number of households	499		503	

Source: Compiled by authors.
Notes: CFA franc = West African currency. 1 US$ = 495 CFA francs, approximately, over the 2009–2012 period.

Comparing the effects of irrigation on men's and women's production frontiers and marketed surplus frontiers, results indicate that irrigation has a large, positive effect on agricultural production (which is expected), but that this effect is much larger for men's total production and marketed surplus than it is for women's. Irrigation allows men to increase the value of their total production almost enough to offset the negative impact of shocks caused by increased degree days. Women have much less access to irrigation, so they do not benefit from its offsetting effect. Similarly, certain farm assets (such as motorized tillers) have significantly positive effects on men's production frontiers but limited access to these same assets locks women out of this adaptation strategy as well. For assets like plows, which are more equally shared, the effect on production is similar across both men's and women's plots.

While overall production is lower in the secondary agricultural season, the seasonal division of gender-based plot management permits some agricultural production and marketed surplus to be controlled by women during the dry season, albeit to a much lesser degree than men's control during the primary agricultural season. It is important to note that the positive effects of both farm assets and irrigation access are substantially larger than the adverse impacts of climatic variability on production possibilities and marketed surplus. These results underscore the importance of inclusive, climate-smart agricultural interventions—such as access to farm assets and irrigation—that can reduce adverse effects of climate variability.

POLICY IMPLICATIONS

Evidence on the gender-differentiated production responses of farmers to climate variability and whether these effects vary by water control technology and control of farm assets is essential to the design of climate-smart interventions. Both irrigation and farm assets can potentially mitigate the effects of drought, but interventions designed to improve irrigation access may be more beneficial because access to irrigation could substantially increase both men's and women's production and marketed surplus frontiers. Further research may be required to gain understanding of how to increase women's access to irrigation and assets through climate-smart agricultural interventions.

Group-based approaches could be explored as a mechanism for expanding women's control of farm assets and ensuring access to irrigation, given that group solidarity may ensure sustained access. Nevertheless, group-based approaches could also result in asset-management conflicts or suboptimal use of farm assets if group conflicts do not result in the equitable allocation of these assets. The potential for climate-risk-reducing agricultural interventions requires attention to both the structure of potential interventions and the mechanisms through which climate variability can be addressed. As the research illustrated, not all farm assets reduced climate risk for men and women equally.

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Andrew Dillon *(dillona6@msu.edu) is an assistant professor in the Agricultural, Food, and Resource Economics Department of Michigan State University, East Lansing, US.* ***Joshua Gill*** *(gilljos1@msu.edu) is a graduate student in the Agricultural, Food, and Resource Economics Department of Michigan State University, East Lansing, US.*

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Innovations for Managing Climate Risks Faced by Men and Women

POLICY NOTE

What Values Motivate Farmers to Adopt Climate-Smart Practices?

Empirical Evidence from a Means-End Chain Analysis in Kenya

Marther Ngigi

FARMERS IN KENYA ARE VULNERABLE TO CLIMATE VARIABILITY AND EXTREME WEATHER EVENTS SUCH AS droughts and floods. The resilience of farming households and communities is thus dependent on their ability to adopt climate-smart agricultural practices, which sustain agricultural productivity and incomes, enable climate change adaptation, and reduce greenhouse gas emissions. Previous studies on adaptation to climate change have mostly focused on biophysical, socioeconomic, political, institutional, and governance factors. Only more recently has the role of cognitive processes—such as attitudes, belief systems, and perceptions about environmental shocks and climate change—begun to receive attention. Farmers' values and motivations are important to consider because they influence decisions concerning adaptation strategies in ways that can present opportunities as well as obstacles to sustainable adaptation. Additionally, because climate shocks can affect assets of male and female farmers differently, a gender perspective is important.

This brief presents the main insights from a study that assessed how the values and motivations of Kenyan farmers influence their adaptation of climate-smart practices in crop and livestock management. Through in-depth individual interviews using the "laddering" technique and a method known as "means-end-chain analysis" (see Figure 1), the study examined farmers' decisionmaking processes and goals as well as the values underpinning these decisions. It also considered gender-specific differences in motivation and underlying core values.

MOTIVATIONS FOR ADAPTING CLIMATE-SMART PRACTICES IN CROP AND LIVESTOCK MANAGEMENT

The study found that farmers pursue several climate-smart practices related to crop production: water and soil conservation practices, changes in crop variety, crop diversification, agroforestry, early planting, and changes in animal breeds and animal feed management. In choosing strategies that improved farm productivity, food security, and household income, farmers were motivated by intrinsic values, which include the desire to be independent as well as to lead a healthy, happy, comfortable, and secure life.

Divergence in male and female farmers' motivations for adopting strategies derives from differences in gender roles and responsibilities, as elaborated by women's predilection for practices that reduce their labor burden in livestock management. Female farmers also showed preferences for promoting food security and early planting, which stems from their role as main food provider. Men, in contrast, favored strategies for the development of agroforestry systems, a typically male domain. Notable as well, a higher percentage of men than women preferred to keep genetically improved cattle as an adaptation strategy. Early planting is also an important adaptation strategy, but the belief that only male household members should initiate planting at the beginning of the season demonstrates how cultural values can hinder female farmers' uptake of adaptation practices.

POLICY IMPLICATIONS

In order to achieve increased food security, the design of climate change policies and the adaptation of interventions

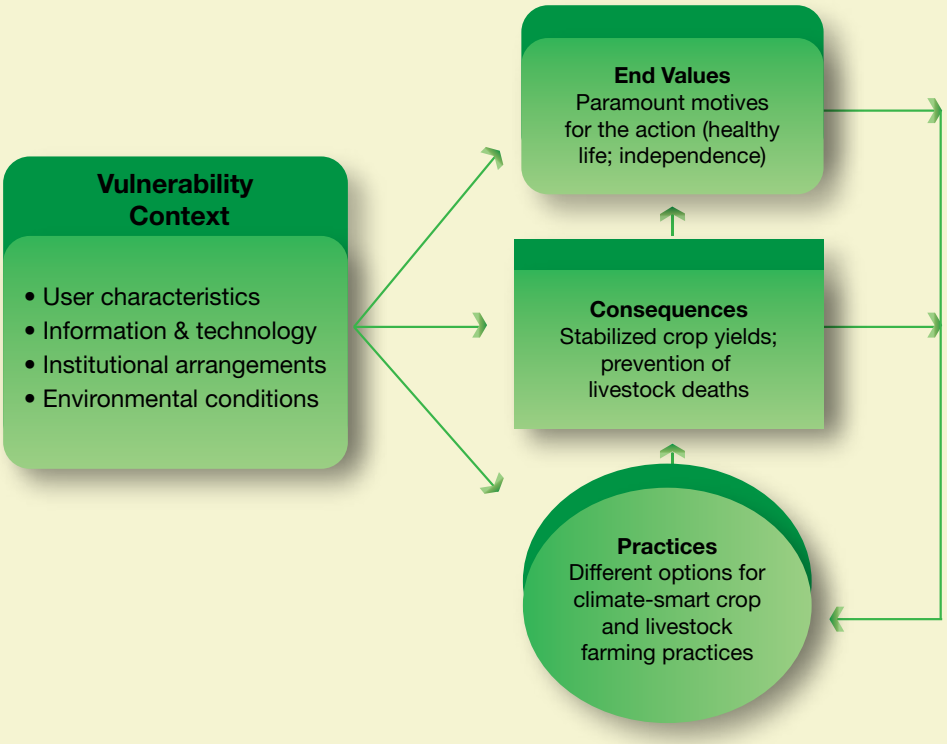
should take into account farmers' fundamental values and their gendered preferences. It is also critical to understand that, although culture may limit efforts to adapt to climate change, traditions are also malleable over time.

How can gender norms that often have asymmetric effects on different groups be transformed into equitable institutions? In Kenya, gender relations presenting obstacles to adaptation could be addressed through the support of traditional leaders for the empowerment of women at the household and community level. The establishment of public fora for discussion and dissemination of gender-specific adaptive strategies would encourage reflection on gender roles and climate-smart agricultural practices.

Since farmers' uptake of climate-smart practices is focused on the broader developmental goal of poverty reduction, complementary pro-poor policies that improve socioeconomic conditions are vital for sustainability. What is needed are policies that promote livelihood diversification through collective action, such as village savings groups or credit associations. Group-based approaches that promote sustainable natural resource management can play an important role in encouraging pro-environmental behavior in line with the sustainable development agenda.

Panos/P. Benatar

FIGURE 1 The means-end chain framework in climate change adaption



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Marther Ngigi *(martherngigi@gmail.com) is a doctoral student at the Institute of Agricultural Economics and Social Sciences in the Tropics and Subtropics at the University of Hohenheim, Stuttgart, Germany.*

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Gender, Risk, and Climate Information

Relevance for Climate Change Adaptation in Ethiopia

Helen Berga, Elizabeth Bryan, and Salvatore di Falco

AGRICULTURAL PRODUCTION IN ETHIOPIA IS CHARACTERIZED BY ITS LOW INTENSITY, LOW PRODUCTIVITY, and high susceptibility to climate shocks. Because agriculture is the key sector of the country's economy, dramatic improvements are needed to sustain economic growth and confront the challenge of climate change. Adaptation can help farmers achieve their food, income, and livelihood security in the face of changing climatic and socioeconomic conditions, including changes in climate variability, the frequency of extreme weather events such as droughts and floods, and volatile short-term changes in local and large-scale markets.

While many studies have examined the factors influencing adaptation to climate change at the household level, lack of gender-disaggregated data have precluded gender-sensitive analysis of climate change adaptation. However, emerging research suggests that men and women are differentially affected by climate change and have different priorities and needs for adaptation. This policy note summarizes the results of a study that examined how gendered risk preferences and access to information influence the adaptation decisions of rural agricultural households in Ethiopia.

CONTEXT OF THE STUDY

The literature on adaptation to climate change in Ethiopia points to several factors that influence the decision to adapt, including risk preferences, access to information, extension, and credit, agroecological setting, and other individual and household-level characteristics. One shortcoming of most household-level adaptation studies is that they only include individual characteristics of the household head (typically male but sometimes female), such as their level of education and access to information. However, the decision to adopt new technologies is most likely not taken in isolation by the household head. Rather, it is the result of complex decisionmaking processes within households that depend on the characteristics, resources, bargaining power, and preferences of both male and female decisionmakers. This study, therefore, included characteristics of both the main male and female decisionmakers within the household to assess how both husbands and wives influence the household's decision to adapt to climate change.

DATA AND DESCRIPTIVE STATISTICS

The data used for this study were drawn from 20 *woredas* in the regional states of Amhara, Benishangul-Gumuz, Oromia, the Southern Nations, Nationalities, and Peoples' Region, and Tigray in the Nile Basin of Ethiopia. The questionnaire included modules on access to information, climate change perceptions and adaptation, membership in groups, social networks, and risk preferences. The survey distinguished between different types of climate information including information about extreme weather events, seasonal weather forecasts, and information about climate change and the appropriate responses. Risk preferences were elicited using a lottery choice experiment designed by Salvatore di Falco and Ferdinand Vieider.

We find that husbands are more likely to perceive climatic changes, such as a delay in the onset of rains, a decline in rainfall, an increase in temperature, and more erratic rainfall patterns, than their spouses. Men also tend to have more education and access to climate information than their spouses. Extension services, radio broadcasts, and community meetings were the main sources of climate information for men, while informal sources of information—that is, family members, neighbors, and friends—were the main sources of climate information for women. There are thus large gender gaps on climate change perceptions and access to information.

Most farmers who experienced climatic changes also reported adopting various adaptation strategies, with more men

reporting that they adapted to climate change than their spouses. Most of the reported adaptation measures relate to crop production, including implementing soil and water conservation strategies, planting trees, and changing crop varieties and types. The data show that female-headed households are much less likely to adapt to climate change than male-headed households, although female household heads were more likely than married women to report that they considered themselves to be well informed about climate change. This suggests that female-headed households face constraints to adaptation that are not experienced by male-headed households, such as a shortage of agricultural labor.

THE DETERMINANTS OF ADAPTATION TO CLIMATE CHANGE

When the characteristics of men and women in the same household are not considered, the results are quite similar to previous studies on this topic. Individual characteristics of the household head, such as level of risk aversion, age, and access to climate information, are shown to influence whether the household decides to adapt to perceived climate change. Credit access increases the probability of adaptation, while larger distance to input markets reduces likelihood of adaptation. As distance to markets increases, the cost and difficulty of obtaining inputs needed for adaptation also increases, posing a significant constraint to adaptation.

The gender-disaggregated results show that the level of risk aversion of the husband has a negative impact on adaptation while that of the wife is insignificant. The finding that risk aversion of the husband hinders adaptation is consistent with other studies that have shown that risk and risk aversion of household heads have a negative impact on the adoption of soil and water conservation practices in Ethiopia.

The gender-disaggregated results also show that wives' access to climate information, namely information on extreme events and climate change, has a significant positive impact on the probability of adaptation. Thus, increasing women's access to climate information appears to be a key pathway to promoting adaptation to climate change. In addition, access to extension has a positive impact on adaption to climate change. This finding further confirms the results of several other studies showing that contact with extension agents is an important avenue by which farmers receive information and advice needed to adapt to climate change.

POLICY IMPLICATIONS

Understanding the factors that induce farmers to act in response to the threat of climate change can help policymakers to encourage farmers to take needed steps to adapt to climate change. The results showed that age, access to information, distance to input markets, contact with extension agents, and risk preferences influence household adaptation decisions. The results also showed that gender-disaggregated analyses can reveal key insights into the process of adaptation. This study found that the individual attributes of both husbands and wives influence the likelihood that households adapt to climate change, suggesting that adaptation decisions are not taken in isolation but are the result of complex decisionmaking processes within households.

Panos/P. Wiggers

The finding that women's access to climate information increases the likelihood of adaptation is noteworthy. Recent studies have shown that men and women have access to different forms of social capital and that women often have less access to information through formal and informal channels. The results of this study support these previous findings—showing that husbands are more likely to have access to both formal and informal sources of climate information (with the exception of family members). Yet when wives do have access to climate information, the household is more likely to adapt to climate change. These results suggest that ensuring that extension agents and other modes of information dissemination reach both genders would enable both men and women to support adaptation. Because women have different preferences and needs for adaptation given their unique role within the household, their information needs are likely to be different. This requires that information disseminated to women be tailored to fit their needs so that they may contribute to increasing household resilience in the face of climate change.

The finding that risk aversion is a key constraint to adaptation is consistent with other research on the impact of risk on adoption of new technologies. Providing climate information can reduce uncertainty and encourage farmers to adopt climate-smart strategies. Similarly, introducing technologies and adaption measures that are well-tested and have proven

effective in similar contexts, along with information about the technology and its application, may help to overcome risk-averse farmers' reluctance to adopt new adaptation strategies.

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Helen Berga *(helenberga@yahoo.com) is a research fellow at the Association of Ethiopian Microfinance Institutions/Ethiopian Inclusive Finance Training and Research Institute, Addis Ababa, Ethiopia.* ***Elizabeth Bryan*** *(e.bryan@cgiar.org) is a senior research analyst in the Environment and Production Technology Division of the International Food Policy Research Institute, Washington, DC.* ***Salvatore di Falco*** *(Salvatore.DiFalco@unige.ch) is a professor in the Department of Economics of the University of Geneva.*

The project is supported by the Federal Ministry for Economic Cooperation and Development, Germany, and is undertaken as part of the CGIAR Research Program on Policies, Institutions, and Markets (PIM). This particular note was also supported by the CGIAR Research Program on Water, Land and Ecosystems (WLE) and the CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS). We are also grateful for further support from CCAFS in funding the design and implementation of the lottery choice experiment underlying the risk variable used in this study under a project led by the International Maize and Wheat Improvement Center (CIMMYT) and titled "Understanding Adaptation to Climate Risk: Perceptions, Barriers and Adoption of New Technologies in Cereal Systems in East Africa."

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Climate-Smart Agricultural Practices in Rural Ethiopia

The Gender-Differentiated Impact of Land Rights Knowledge

Agnes R. Quisumbing and Neha Kumar

INCREASING PRODUCTIVITY AND INCENTIVES TO INVEST IN "CLIMATE-SMART" AGRICULTURAL PRACTICES ARE among the arguments frequently raised in favor of strengthening and formalizing land rights, particularly in areas where customary land rights prevail. The community-based land certification effort in Ethiopia has attracted much attention because it is an early successful attempt to implement a cost-effective and transparent land-registration process. Nevertheless, formal land rights are not sufficient to ensure increased investment. In order for men and women to act on newly acquired legal rights to land, they need accurate information about these rights. This policy note summarizes research examining the medium-term impact of land registration in Ethiopia on household investment behavior, specifically in terms of the adoption of soil conservation techniques and tree planting. The research investigated whether men's and women's knowledge of their land rights—defined as tenure security, land transfer rights, and rights related to gender equity and inheritance—had an impact on their investment behavior.

CONTEXT OF THE STUDY

A large body of literature shows that providing land tenure security among landowners and sharecroppers increases agricultural productivity. Such security also improves incentives to invest in land and increases users' ability to obtain credit. One of the pathways through which increased land tenure security is hypothesized to improve productivity is through investments in soil conservation. In addition, soil and water conservation measures are promoted as key strategies for alleviating growing water shortages, worsening soil conditions, drought and desertification, and the adverse impacts of climate change.

The Ethiopian land certification scheme is notable because land administration committees (LACs) at the smallest administrative unit were required to include at least one female member, and land certificates were issued after public registration for transparency. Land certification had a greater impact on women's participation in the land market because their tenure rights were previously less secure than those of men. Nevertheless, gaps remained in awareness and information about the process. It is often assumed that men and women share knowledge within a household, but accumulating evidence has challenged that assumption.

DATA AND SAMPLE DESCRIPTIVES

The study utilized data from the 1997, 2004, and 2009 rounds of the Ethiopian Rural Household Survey, resulting in a sample of about 1,300 households in 15 diverse villages that (while not statistically representative) included all major agroecological zones and ethnic and religious groups. About one-third of the sample households were headed by women, although variation across the villages was wide. Male- and female-headed households differed on a range of relevant characteristics (Table 1). Male-headed households were more likely to have heard of the land registration process, to be aware of public information meetings held prior to the process, to have attended such meetings, and to have received written material about the program. Nevertheless, there is very little difference between the proportion of area registered to male-headed households and the proportion registered to female-headed households, reflecting the near-universal registration of land in our study area. In addition to examining the impact of individual and household attributes, such as education and initial wealth, the study assessed having at least one female LAC member as a possible mechanism for increasing women's knowledge of their land rights.

TABLE 1 Average individual, household, and landholding characteristics, by sex of household head

Characteristic	Female-headed household	Male-headed household
Human, physical, and social capital		
Age of household head (years)	54.28	52.53
Education of household head (years)	0.33	2.22
Highest educational grade attained in household	4.76	6.28
Household size (persons)	4.39	6.38
Livestock owned (tropical livestock units)	8.82	9.40
Network size (persons)	8.61	11.41
Characteristics of total and cropped land		
Total plot area (hectares)	1.60	2.00
Share of land cropped (%)	71	85
Share of cropped area managed by women (%)	82	1
Share of plot area managed by women (%)	84	1
Share of cropped area registered (%)	95	97
Share of total land area registered (%)	96	97

Source: Calculated by authors from IFPRI (2011).
Notes: A tropical livestock unit is a standardized method of quantifying multiple types of livestock and is calculated as the equivalent of one head of cattle weighing 250 kilograms. Network size indicates the number of people that can be relied upon for support in times of need.

SUMMARY OF KEY FINDINGS

The study produced various findings about male- and female-headed households, as well as, in some cases, about individual men and women. A positive correlation between household knowledge and the head's years of schooling on the one hand and livestock ownership on the other hand suggests that knowledge of land rights was higher among households with higher physical and human capital. Men's land rights knowledge scores, in particular, were higher in households with larger areas of land owned. A female member on the village LAC increased female household heads' knowledge of the land reform process and encouraged their attendance at meetings but was negatively associated with both the total household's and men's knowledge scores. It is possible that a woman LAC member is able to disseminate her knowledge to other women but is not equally effective with men.

This gap between female and male household heads' knowledge scores that appears when a woman is on a village LAC is greatest in the area of gender and inheritance rights. It might also be related to the tendency of poorer villages—which on average have a higher prevalence of female heads, smaller plots of land, fewer livestock holdings, and poorer land quality—to have higher female representation in LACs. Why are female LAC members not as effective as desired? First, it is possible that women may have been appointed to the LAC just to meet requirements; second, women serving on a LAC have their own productive and domestic responsibilities and may not be that effective on committees; and third, in order to be effective as conduits of legal rights knowledge, female LAC members need to be trained.

With regard to soil conservation technology practices, a few key findings emerged. First, adoption of soil conservation techniques, being a labor-intensive process, is higher in

households with more labor resources but could be lower in households with higher labor opportunity costs. Second, the biophysical properties of the farm clearly mattered, with some types of technologies, such as bunds (structures built to control runoff), being more suitable to low rainfall areas. Third, while a household's level of knowledge about land tenure security did not appear, viewed in isolation, to affect the adoption of soil conservation techniques, the presence of a gender gap in tenure-security knowledge did diminish the probability of adoption for female-headed households. Finally, in no case was the share of land registered an important determinant of the adoption of soil conservation techniques. With an almost universal rate of land registration, this is no longer the binding constraint. Nevertheless, the differential impact of the knowledge scores on male- versus female-headed households indicates remaining scope to improve the knowledge of the rights embodied in land certification.

Tree-planting is a visible, long-term investment in land. Legume-planting, on the other hand, is an intercropping method that helps fix nitrogen in the soil with benefits that are reaped in the next agricultural season. Legumes are also not as visible as tree planting. Higher schooling attainment by the plot manager was positively associated with tree-planting on plots managed by men. While tree-planting did not appear to have high labor requirements, larger plots of land were less intensively planted with trees. Plots with good soil were associated with planting of both trees and legumes. Specific types of land rights had different impacts on the adoption of specific techniques. Whether a plot was registered increased the probability that legumes would be planted—in itself a soil fertility investment, given its nitrogen-fixing properties—whereas transferability of the plot was associated with higher probabilities of tree planting because investment in trees could be recouped if the plot were sold. Similar to results for plots managed by men, trees were also less likely (but legumes more likely) to be planted on large plots managed by women. Whether the plot could be transferred to others increased the probability of tree planting but not of legume growing, further supporting the hypothesis that transferability increases investments in land. Household knowledge scores and gender gaps in scores did not have consistent effects on tree planting at the plot level, and the magnitudes of these effects were small. At the plot level, land rights knowledge appeared to matter less than the biophysical characteristics of the plot and whether ownership was transferable.

POLICY IMPLICATIONS

Although male-headed households in rural Ethiopia had a higher proportion of land registered compared with female-headed households, the difference was small. The disparity in knowledge about land rights was more glaring, however. Gender gaps in knowledge about land rights as they related to (1) tenure security, (2) land transferability, and (3) gender rights diminish the adoption of both soil conservation practices and the planting of tree crops and legumes. Different types of land rights matter for different practices, suggesting that closing the knowledge gap in legal rights is an important step in improving adoption of soil conservation technologies and sustainable farming techniques.

Panos/P. Wiggers

Consequently, legal literacy campaigns are important for addressing low levels of land rights knowledge, in general, and gender gaps in knowledge, in particular. Campaigns should also be designed to educate grassroots-level members of LACs, in terms not only of the content of legal rights provisions but also of effective mechanisms for reaching women in landholding households. Where security of land rights is no longer a binding constraint based on gender-sensitive legislation or programs that increase women's tenure security, efforts should be directed to closing the gender gap in knowledge about land rights.

Increasing the adoption of soil conservation techniques and tree planting in particular, and integrated soil fertility management practices in general, will be increasingly important in East Africa's climate change adaptation strategy. While agricultural research centers have directed their efforts toward improving these technologies and building local capacity to implement them through more effective extension systems, the findings of this research suggest that increasing knowledge of land rights may be equally—or even more—important in ameliorating the adverse impacts of climate change in Ethiopia.

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Agnes R. Quisumbing *(a.quisumbing@cgiar.org) is a senior research fellow in the Poverty, Health, and Nutrition Division of the International Food Policy Research Institute (IFPRI), Washington, DC.* ***Neha Kumar*** *(n.kumar@cgiar.org) is a research fellow in the Poverty, Health, and Nutrition Division of IFPRI, Washington, DC.*

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The Diffusion of Agricultural Technologies within Social Networks

Evidence from Composting in Mali

Lori Beaman and Andrew Dillon

IN THE ABSENCE OF FORMAL INSTITUTIONS, SOCIAL NETWORKS ARE AN IMPORTANT MECHANISM FOR DIFFUSING information. Social networks are of particular importance for agricultural households in the developing regions of the world. A key difficulty in promoting new technologies is the labor-intensive and costly effort required to educate farmers about new technologies. A prominent approach is to use group-based, village-level trainings through agricultural associations or cooperatives. These programs implicitly assume that farmers' social networks reinforce extension messages and increase the uptake of technologies. They may be more cost-effective than direct extension visits to farmers in their fields; however, vulnerable or otherwise less-influential community members may be less likely to benefit due to the impact of social norms or the gender composition of the targeted groups. Little is actually understood about how networks function to disseminate information about agricultural technologies. The policy implications of this issue are critical to understanding whether group-based approaches can promote gender-inclusive adoption of climate-risk-mitigating technologies. This policy note summarizes research on the effect of social network characteristics and gender on the diffusion of information about an agricultural technology.

CONTEXT OF THE STUDY

The study was designed to test how social network structures affect the diffusion of information on composting among Malian farmers. The adoption of improved soil management practices, such as composting, are important not only for long-term soil fertility and productivity, but also because of their mitigating effects on climate risk and long-term climate change. The benefits of applying compost to soil, like many agricultural practices, are not certain; they require complementary inputs and farmers' knowledge of the practice in question. The benefits of composting are due to increasing the stability of organic material in the soil, which can change soil pH and moisture content, increase biomass, and reduce water run-off. These benefits depend on characteristics of the soil before the application of compost, the materials with which the compost is made, and the compost's quality prior to its application. For example, composts produced from crop residues release nutrients into the soil over a longer period of time than from animal residues, so the longer term benefits are potentially larger, but they accrue at a slower rate.

To develop a greater understanding of the effect of social network structure on agricultural information diffusion, a calendar providing farmers with information on composting was randomly distributed for the purpose of observing its diffusion across household networks. Calendars were chosen because Malians often display them in their homes for years as decorative conversation pieces. The calendar provided information about how to compost and generate organic fertilizer.

EXPERIMENTAL METHODOLOGY

The core of the experimental research design was to randomize the probability that a household would receive the information either directly or through a social network; the data facilitated the test of whether more influential nodes (that is, points of contact within the social network) would increase the probability of diffusion.

The first step of the study in 2008 was collecting baseline social network data. Within each village, all households and their members were fully enumerated in an initial visit. Husbands and wives were asked to list their social network links within the village: either people with whom they spoke frequently regarding agriculture, with whom they had financial transactions, or who were their relatives; or organizations with which they were affiliated. In addition, demographic and welfare characteristics of both nodes of each social network link were incorporated.

Villages were randomly assigned one of three treatments. Two treatments used social network characteristics to determine who would receive the calendars, whereas the third treatment randomly distributed the information within the village. The two social network characteristics utilized were *degree*, which measured the number of links to which the node was connected, and *betweenness*, which measured the share of shortest paths from all pairs of nodes in the network that were connected to that household. In short, *degree* measured potential household connectivity, whereas *betweenness* captured potential network influence. In the first treatment, the two women and two men with the highest *degree* measure within the village were chosen as calendar recipients; in the second treatment, the households with the highest *betweenness* measure were chosen, randomizing whether the individual recipient of the calendar within the household was male or female. In the random treatment, half of all calendar recipients were women.

There were 23 random villages, 15 *degree* villages, and 15 *betweenness* villages. The experiment was implemented in 30 villages in 2010 (15 random and 15 *degree*) and 23 villages in 2011 (8 random and 15 *betweenness*). Balancing tests within treatment villages were also conducted to determine whether observable characteristics of the calendar recipients differed by gender—indicating that it may be only one of the mechanisms influencing information diffusion. The gender balancing tests indicated that assets, household size, and experience with the primary crops grown in these villages were not statistically different by gender, a finding consistent across the random villages, *degree* treatment villages, and *betweeness* treatment villages.

The protocol was standardized across all villages. After the initial random allocation of calendars, initial nodes were provided with three additional calendars to pass onto other villagers after their initial training with the calendar on composting practices. All households within a village were revisited after a month and were tested on their composting knowledge to determine whether accurate information had spread and to track the distribution of the calendars.

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POLICY IMPLICATIONS

While the empirical strategy of using social network targeting may not be identical to the way group-based approaches are implemented in development programs (because they may use smaller groups), the analysis conducted for this study illustrates that links and their gender-related characteristics are significant determinants of knowledge diffusion. Without understanding social network characteristics either at the village level or in a smaller group, knowledge inequality may affect the efficacy of the adaptation strategy or general program intervention.

Results indicate that knowledge diffusion depended on the distance of a household from the initial node, but that women were less likely to receive a calendar than were men. Within the women's subsample, however, the probability of women's receiving a calendar was much more equal across social network distances relative to that of men's. With respect to knowledge of composting, women's social network distance to the initial node had a much larger effect relative to that of men's. Women who were four links away from an initial node had 79 percent less knowledge relative to the counterfactual, whereas men who were four links away from an initial node had only 35 percent less knowledge relative to their counterfactual. Moreover, women in villages who were targeted according to the social network *influence* of members of their village had significantly lower knowledge relative to women targeted in villages based on the *number* of contacts of villagers.

The results provide important insights into the potential effectiveness of targeting information on the allocative efficiency of public goods and on agricultural technologies. While networks or group-based approaches that rely on networks

within groups offer an opportunity to spread information cheaply and efficiently, network-based diffusion of information can exacerbate inequalities within the targeted area or population if the nodes targeted are influential but are connected to only a subset of villagers or if information flows between women and men are unequal. This would occur if information or resources do not equally disperse within a network or if any individuals in the community—in this case women—are socially excluded and hence lack the necessary social links to benefit from the intervention. Further research into the effect of social network structure on technology diffusion will be critical to developing further understanding of climate change adaptation strategies and the design of potential policies, given that potential gender and social inequalities will affect diffusion.

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Lori Beaman *(l-beaman@northwestern.edu) is an assistant professor in the Department of Economics of Northwestern University, Evanston, IL, US.*
Andrew Dillon *(dillona6@msu.edu) is an assistant professor in the Agricultural, Food, and Resource Economics Department of Michigan State University, East Lansing, US.*

The project is supported by the Federal Ministry for Economic Cooperation and Development, Germany, and is undertaken as part of the CGIAR Research Program on Policies, Institutions, and Markets (PIM).

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Strategies for Coping with and Adapting to Climate Change

Evidence from Agricultural Households in Bangladesh

Muntaha Rakib

UNDERSTANDING THE FACTORS THAT DETERMINE FARMERS' CHOICES IN COPING WITH AND ADAPTING TO the adverse effects of climate change are key to improving related policies and interventions. Also important are farmers' perceptions about whether climate change is actually occurring—which influences whether they take action—as well as their perceptions of factors constraining their ability to take action. Coping mechanisms adopted as a result of adverse climatic shocks influence decisions about future adaptation strategies. To adopt adaptation strategies, farm households need to perceive that the climate is changing and that resulting consequences will be harmful to their livelihoods. This policy note summarizes research that explored the perceptions of agricultural households in rural Bangladesh about climate change and their choices of coping mechanisms and adaptation strategies.

CONTEXT OF THE STUDY

The high population density, large share of the population dependent on agriculture, frequent climate extremes, and specter of sea-level rise affecting this low-lying country are just some of the many characteristics making Bangladesh one of the countries most vulnerable to the negative impacts of climate change. Bangladesh's National Adaptation Program of Action determined delayed rainfall, prolonged drought, and extreme temperatures to be the most severe climate change–related threats to the country's agricultural sector.

Adaptation is a dynamic social process whereby the impact of shocks can be minimized through a range of public and private, collective and individual, and anticipatory and reactive responses. Consequently, each adaptation measure has a potential benefit in reducing the effects of negative shocks and increasing resilience, even though unavoidable residual costs or damages may still be incurred.

SURVEY AND DATA

The study utilized panel data collected through primary surveys of 800 agricultural households in rural Bangladesh in 2010 and 2012 that were administered by the International Food Policy Research Institute and Data Analysis and Technical Assistance Limited (DATA), with additional inputs from the Center for Development Research (ZEF). Agricultural households were representative of the country's seven agroecological zones.

In order to assess adaptation and coping strategies, information was collected on demographic characteristics, land ownership, crop and livestock management practices, access to credit and extension services, prior experience with climatic shocks, and perceptions about climate change. In 2012, additional information was collected on coping mechanisms related to livestock, social and political capital, and participation in groups; hence, the analysis involving these variables is for 2012 only. Note that, of the responding households used in the analysis, 89 percent were headed by men, and 11 percent were headed by women.

RESULTS

Households were asked about their perceptions of temperature and rainfall changes and about overall climate change in the previous 20 years (Table 1). About 88 percent of households reported being aware that rainfall was decreasing, and approximately 86 percent noticed that temperatures were increasing. The three most-cited changes were more erratic rainfall, longer periods of drought, and later onset of rains.

TABLE 1 Households' perceptions of changes in rainfall and temperature in the previous 20 years

Households' perceptions	Rainfall	Temperature
Share of households (%) that . . .		
perceived an increase	8.5	86.0
perceived a decrease	88.4	8.9
perceived no change	2.8	4.6
did not know	0.3	0.5
Total	100.0	100.0

Source: Calculated by author based on survey data.

Households with more assets; access to credit, extension services, and information and communications technologies; greater female participation in groups; and greater exposure to climate change shocks were more likely to perceive changes in climate over the previous 20 years.

Results indicate that the major coping strategies adopted in rural Bangladesh are selling assets; borrowing from friends, relatives, or other informal sources; changing diets or eating less; keeping children out of school; and migrating or finding off-farm employment (Table 2). More than half of the households did nothing in times of adverse climatic shocks.

Male-headed households were likely to borrow money through informal sources, such as friends, relatives, and informal money lenders. Women in Bangladesh generally do not perform field labor or make decisions on crop planting and other farm management strategies. Typically, women are instead involved in husking, drying paddy, and managing postharvest processing. As a result, female-headed households have fewer crop-related adaptation options in response to adverse climatic shocks than do male-headed households. Their primary coping mechanisms include keeping children out of school and migrating. In most cases, they did nothing.

TABLE 2 Male-and female-headed households' coping mechanisms

Coping mechanisms	Male-headed households	Female-headed households
Share of households (%) that . . .		
did nothing	62	68
sold assets	8	5
borrowed from informal sources	23	5
migrated or took on off-farm activities	8	13
changed their diet or ate less	5	8
kept children out of school	5	15

Source: Calculated by author based on survey data.

Most frequently, household heads initiated the decision to adopt coping mechanisms; this was the case in 86, 89, and 84 percent of household responses to floods, drought, and cyclones, respectively. Spouses initiated coping mechanisms in only 3 percent of responses to floods, 2 percent of responses to drought, and 2 percent of responses to cyclones. Households also coped better with nonclimatic negative shocks than with climatic shocks (potentially because of their past experience with nonclimatic shocks as well as the idiosyncratic nature of these shocks), but experience of climatic shocks prompted them to adopt crop adaptation strategies.

For the purposes of the study, adaptation strategies were characterized into two broad categories, each comprising a range of subcategories (Table 3). Results indicate that farmers chose to adopt crop rather than livestock-focused production strategies and that households headed by men also adapted more than those headed by women. Participation by husbands and wives in social groups increased the probability that households would adopt different types of crop adaptation strategies but not livestock adaptation strategies. Households with assets, access to extension services and information and communications technologies, prior experience of climatic shocks, and wives' social and political capital were more likely to adopt crop and livestock strategies, whereas the number of dependents, the age of the household head, and husbands' social capital were negatively correlated with both crop and livestock adaptation strategies.

While households were more likely to choose a single coping mechanism, they tended to combine several adaptation strategies. For instance, they changed the dates of planting, while also adopting fertilizer use and irrigation techniques. Interestingly, men's social capital was likely to discourage them from selling assets, whereas women's social capital discouraged them from borrowing from informal sources, as well as from crop-based adaptation strategies.

Households were also asked about major obstacles to initiating adaptation strategies. The three most-important responses were lack of money, lack of information on climate change and adaptation options, and lack of water.

POLICY IMPLICATIONS

The findings indicate that greater access to information and communication technologies helps farmers perceive climate change and to adapt by improving their ability to manage the production of crops and livestock. Similarly, training for women could encourage them to practice livestock-related adaptation strategies, which were least practiced among women in the study. In addition, given that households

mainly cope with climatic shocks by modifying their food intake, training could also educate households on issues such as how to store food for use in times of negative shocks.

Increasing food aid and relief in times of negative shocks could avert the need for household members to skip meals or eat less—a practice that is even more prevalent in response to negative nonclimatic shocks—while at the same time protecting the household asset base and per capita consumption levels. Given that women's social capital is positively associated with the adoption of adaptation strategies, awareness campaigns targeting women could be offered by local organizations and broader media outlets on a range of subjects, such as the long-term detrimental impact of keeping children out of school or reducing food intake.

Participation in social groups by both men and women is an important factor associated with crop adaptation strategies, and participation by women is particularly important in enhancing their perceptions of climate change. Government policies should be initiated to improve household access to extension services, which would improve and diversify farmers' knowledge of innovative adaptation strategies, both relating to crop and livestock management. Improving opportunities for households to generate off-farm income could provide a further strategy in response to negative shocks.

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TABLE 3 Male- and female-headed households' crop and livestock adaptation strategies, 2010 and 2012

	Male-headed households		Female-headed households	
Adaptation strategy	**2010**	**2012**	**2010**	**2012**
Crop adaptation				
Share of households (%) that . . .				
changed planting dates	39	35	35	23
changed fertilizer use	59	77	49	51
changed crop choice	63	78	60	56
used irrigation	65	64	54	50
changed field management practices	29	40	26	30
migrated or took up off-farm employment	16	14	19	24
did nothing	8	6	26	17
Livestock adaptation				
Share of households (%) that . . .				
changed number of livestock		12		7
changed livestock feed		33		16
sought veterinary intervention		38		27
did nothing		50		62

Source: Calculated by author based on survey data.

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Muntaha Rakib *(mrakib@uni-bonn.de) is a junior researcher at the Center for Development Research (ZEF) at the University of Bonn, Germany.*

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Protecting Assets and Enhancing Welfare

The Potential of Gender-Differentiated Group-Based Approaches

Muntaha Rakib and Julia Anna Matz

SOCIAL CAPITAL GENERATED BY COOPERATION BETWEEN INDIVIDUALS IS CRITICAL FOR ECONOMIC PROSPERITY and sustainable development in developing countries. Involvement in social groups and political parties presents opportunities for people to participate in decisionmaking processes, reduce their risk exposure, mitigate and adapt to unexpected events, and exchange reciprocal assistance within the group. Group members benefit from sharing views and pooling ideas and knowledge in both "horizontal" associations among equals and "vertical" hierarchical associations of relative status and wealth, with advantages for both the rich and poor. The more informed people are, the better their ability to anticipate and prepare for adverse impacts of climatic shocks, such as droughts and flooding, on household welfare. For non-climatic shocks such as illness, group-based approaches can play a vital role by raising the awareness of health and social problems and by providing financial support and credit (see also companion note by Behrman, Bryan and Goh).

Most existing research on the impact of social capital on household welfare has considered the household as a single object, failing to take into account how the individual bargaining power of husbands and wives within the same household differs relative to their access to and ownership of assets. This policy note summarizes the main insights from a study on the factors associated with men's and women's participation in different types of groups and investigates the relationship between social capital and household and individual welfare among agricultural households in Bangladesh. The study contributes to existing research both by assessing how social capital impacts on the welfare of men and women differently and by considering the extent to which gender-differentiated group-based forces play a role in this.

DATA

The study used data collected in 2012 from 800 agricultural households in various administrative units in Bangladesh. That data-collection effort, known as round two of the "Bangladesh Climate Change Adaptation Survey," was conducted by the International Food Policy Research Institute (IFPRI) together with the Center for Development Research (ZEF) and Data Analysis and Technical Assistance Limited (DATA). The survey covers 31 out of 64 districts spanning all agroecological zones of the country and constitutes the second round of a previous IFPRI-DATA effort of 2010.

Husbands and wives were asked about their membership and level of participation in a list of formal and informal groups. For two of the groups that each individual identified as important, follow-up questions were asked of the respondent to sketch out details on activities, characteristics, and costs and benefits of the groups. The analysis categorized groups by type: farmer, credit, religious, women, political, and community. Farm, credit, and religious groups were identified as the most important due to a higher share of household participation. At least one household member participated in such a group in 89 percent of all households surveyed; 78 percent of husbands and 43 percent of wives in the sample were group participants. Husbands frequent, on average, two groups, and wives one. It is notable that members of credit groups were predominantly female while male membership prevailed in farmer and religious groups. In Bangladesh, wives' preference for credit groups may be explained by the large number of nongovernmental agencies offering credit programs for women's groups.

The study used principal component analysis to construct a broad index of aggregate social and political capital. Components of the social capital index included network characteristics, the cost of participation in groups, the labor contribution

to groups, active participation in group decisionmaking, participation in community activities, measures of trust in fellow villagers, and the heterogeneity of groups in terms of economic status and gender. Voting, participation in local and council meetings, protesting, relating local problems to the media and police, and whether respondent's decisions are valued by local elites form the political capital index. Data on social and political capital was aggregated and disaggregated by different characteristics: literacy, age, household expenditure per capita, and prevalence of climatic and other shocks, including both positive and negative ones.

In the sample, literacy was associated with higher social capital—even more so for husbands than for wives. Literate husbands participate in at least one more group than illiterate husbands, for example. Middle-aged people participate in more group activities than their elders, and those experiencing weather shocks were more likely to be group participants than those experiencing other negative shocks. The social capital of husbands in wealthy households is higher, although neither shock prevalence nor wealth had much effect on political capital.

FINDINGS

Several gender differences were evident. Literate husbands are active decisionmakers, and their participation in group decisionmaking increases with their rising wealth status, whereas literacy and wealth do not affect women's social and political standing. Husbands also spend more time participating in groups than do their wives. Participation in groups and access to social capital has different benefits for husbands than for wives. Husbands participate mainly in groups that are useful for livelihood and income enhancement, while wives prefer groups that mitigate the consequences of climatic shocks and, to a lesser extent, other negative shocks. It is possible that in such times women are seeking not only information and help for coping but also rely on direct group support. Wives are more likely to participate in groups if they are engaged in off-farm occupations. This may be because these women have a higher awareness of groups related to their occupations or are seeking training for craft work, tailoring, or household activities.

Group participation entails costs as well as benefits. In the sample, husbands and wives were asked whether they paid registration fees monthly or yearly or paid any amount toward funds for helping mitigate sudden shocks experienced by group members. Labor contribution was measured by the number of hours the participants worked for the group per month. Monthly payment for groups of husbands and wives

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was almost the same, although one-time registration fees were higher for husbands' groups.

Larger households, and in particular husbands in such households, are less likely to participate in groups. It may be that the extra demands of earning a livelihood and taking responsibility for more dependents leaves little time for group activities. Households experiencing positive shocks, such as receiving remittances and inheritances, are more likely to participate in credit groups, generally through the female decisionmaker. Households with wives involved in off-farm activities participate less in farmer groups, which are male-dominated. Older husbands and wives are more involved in religious groups and less in credit groups. It is also interesting to note that households with more educated heads are less likely to participate in farmer or credit groups.

The study found, furthermore, a positive relationship between social capital and household welfare, particularly for husbands' welfare. However, it is important to note that participation in groups alone does not help to increase social capital and household welfare if participants do not regularly take part in group activities or play an active role in decisionmaking. Another important finding is that climatic shocks increase consumption per capita whereas negative non-climatic shocks, such as death and illness, lead to a reduction in the expenditure on food and non-food consumption per capita. This shows that governmental and other efforts for disaster relief in Bangladesh are effective.

POLICY IMPLICATIONS

This study identified context-specific factors leading to group participation by husbands and wives that can inform policy formulation and lead to the design of programs that more effectively and efficiently meet the needs of targeted communities. The factors that influence husbands' and wives' group participation relate to their perceptions of the benefits and costs conferred by membership in different types of groups. Due to their differing roles and responsibilities, men and women are seeking groups that fulfill different needs.

Women participate in groups that are better targeted to fulfilling their needs to adapt to and cope with climatic and non-climatic shocks, strongly preferring credit groups over other types of groups. Because the study results also show that women benefit from groups when shocks occur, policies should be developed to raise women's awareness of groups that offer benefits in such times and encourage their participation. Considering that wives participate in fewer groups than husbands, spend fewer hours in group activities, and are less active in decisionmaking, policymakers should seek ways to increase the active participation of women rather than focus only on increasing membership density. These efforts may include raising women's awareness of the availability and benefits of local groups. To better meet women's needs, groups could also focus more on offering information and services that help women anticipate, prepare for, and mitigate the adverse effects of climatic and other negative shocks. For the welfare of men, who participate mainly in professional and other groups that focus on livelihoods and income generation (such as farmer and community groups), the positive effects of social and political capital are significant. When planning group-based approaches, policymakers should take into account the type of benefit offered by different groups and consider whether a group will better serve the needs of men or women.

Although social, human, and natural capital, measured by ownership of land and livestock, have a positive impact on overall household welfare, their impact on the welfare of husbands and wives differs. Since the accumulation of social and political capital has a stronger positive effect on husbands' well-being, an additional focus on policies that protect female-owned assets may be necessary to increase women's welfare. Policy interventions should also take into account the negative effects on household welfare of climatic and non-climatic shocks, aging, and large family size, and take a gendered approach to such interventions.

FOR FURTHER READING

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Muntaha Rakib *(mrakib@uni-bonn.de) is a junior researcher at the Center for Development Research (ZEF) at the University of Bonn, Germany.* ***Julia Anna Matz*** *(jmatz@uni-bonn.de) is a senior researcher at ZEF at the University of Bonn, Germany.*

The project is supported by the Federal Ministry for Economic Cooperation and Development, Germany, and is undertaken as part of the CGIAR Research Program on Policies, Institutions, and Markets (PIM).

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Microinsurance Decisions

Gendered Evidence from Rural Bangladesh

Neha Kumar and Daniel Clarke

IN RECENT YEARS, THERE HAS BEEN GROWING INTEREST IN THE ROLE INDEX-BASED INSURANCE CAN PLAY IN increasing the capacity of the rural poor to reduce agricultural risks as they cope with long-term changes in temperature and precipitation and growing climate variability. Index-based insurance relies on an independently observable index that is correlated with losses incurred as a result of a specific calamity. For example, rainfall index insurance pays out when the rainfall is below a threshold level at a rainfall measuring station in the vicinity of the farmer in question; such insurance is not based on the loss incurred by the farmer. Such insurance is based on the assumption that farm output is correlated with the amount of rainfall the farm receives, which in turn is correlated with the amount of rainfall at the weather station.

Most index-based insurance products have been developed without explicit attention to gender. Yet there is ample evidence that shocks affect men and women differently (see companion note by Quisumbing, Kumar, and Behrman). There is also substantial literature that shows that men and women allocate resources in different ways, with women spending more on schooling and food. Other considerations with regard to gendered differences, such as whether men and women cope differently with various shocks, might also be useful to take into account when developing index-based insurance products (see companion notes by Quisumbing, Kumar, and Behrman; and by Rakib and Matz).

This brief looks at the role index-based insurance can play in Bangladesh. Farmers in rural Bangladesh face a multitude of risks, ranging from extreme weather events to crop disease and pests, to health shocks, and like all rural poor they are particularly vulnerable to the adverse effects of climate change. Yet insurance markets have hitherto failed to develop in the country, despite an evident need for insurance products.

The increasing participation of women in the agricultural sector in Bangladesh reinforces the need to consider the role of gender in decisions to purchase agricultural insurance. Data from the Bangladesh Bureau of Statistics for the years 1999–2000 and 2005–2006 shows an absolute decrease of 6 percent in male labor participation in agriculture while the number of females employed in agricultural activities has increased from 3.76 to 7.71 million—that is, by more than 100 percent. As a result of such changes, the proportion of women in the agricultural labor force has increased from less than 20 percent to 34 percent of the total.

This brief summarizes an in-depth study on gendered aspects of willingness to pay for index-based agricultural insurance in Bangladesh.

EXPERIMENTAL DESIGN AND SAMPLE

The experiment included (1) a benchmark decision problem of a choice of six lotteries involving varying levels of risk and (2) insurance purchase decisions presented to be as similar as possible to real-world decisions. Participants were presented with a contract for catastrophic insurance (a low-probability event) and a contract for moderate insurance (a high probability event) and were asked to choose how much (if any) of each type of insurance they wanted to buy at a given price. The price of insurance was varied across 60 sessions, each of which had 15 participants. The study included a total of 900 participants across 20 villages.

A short questionnaire collected information on each participant's demographic characteristics, risk preferences, knowledge of insurance products, and asset ownership, as well

as the agricultural risks the participants face. The average respondent is 39 years old and had completed 4 years of schooling. An equal number of men and women make up the sample participating in the experiment sessions. Following the gender distribution in the sample, about half of the participants are self-employed in agriculture while the other half are involved primarily in housework and childcare. About half of the participants are household heads, and 89 percent of the participants come from male-headed households, reflecting the average proportion of male-headed households in Bangladesh at large. The average household has 5 members and a land holding of about 100 decimals (equivalent to 1 acre). Most participants grow paddy in the rain-fed Aman as well as the dry Boro season.

Pests were identified as a major source of risk by 37 percent of the participants. Deficient rain in the Aman season was identified as a major source of risk by 17 percent, excess rain by 14 percent, and flooding by 12 percent. Other risk factors noted by a small fraction of the participants were deficient irrigation water in the dry season, risk of crop diseases, untimely rain, and hail storms.

Although 12 and 16 percent of the respondents indicated that either they or someone in their household, respectively, had bought life insurance, no one in the sample had bought any other kind of insurance product. Three-quarters of the respondents were aware that they could not purchase insurance against a bad event after the event occurred, and more than half knew that a premium would not be returned to them if the event insured against did not occur. The majority said that they would be able to borrow money in case of an emergency. A small fraction of the respondents have bank accounts. Eighty-five percent of the respondents have cash savings, with an average value of 20,000 taka (equivalent to US$274).

For the benchmark decision problem of choosing lotteries the study found men to be more risk-averse than women, a result that is contrary to existing literature on gender differences in risk preference. However, when the participants were asked, as part of the questionnaire, to choose agricultural transactions with varying levels of risk, women were more risk-averse than men.

RESULTS AND COMMENTS

During the experiment, on average, 97 percent of the participants decided to buy insurance, with no significant difference between men and women. A small decrease in take-up of insurance for a catastrophic (low-probability) event is driven by the women in the sample. Among women, those who

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were older and those having a bank account were slightly more likely to purchase insurance. Men are more likely than women to buy more units of insurance. Wealth as captured by the total land owned had no apparent effect on the total number of units bought, but wealthier women bought more units at a decreasing rate.

Individuals who were more risk-averse bought fewer units of insurance, a relationship that became stronger at higher levels of risk aversion, potentially because the payout is tied to the index rather than the loss incurred. When insurance was offered at a marked-up (actuarially unfair) price, participants purchased fewer units, except for the case of the catastrophic event. It is possible that the participants associated the high price of the catastrophic event insurance with quality.

Turning to the question of how respondent and household characteristics differ across the various insurance products, one interesting gender distinction is that women bought more when the insurance was offered at the marked-up price, whereas men bought less. The ability to borrow 1000 taka for an emergency within a week is positively correlated with the amount of insurance bought for the high-probability event (more so among the men). Respondents may be regarding insurance as a substitute for borrowing from peers in the event of an emergency.

When offered insurance for the low-probability event, women bought more units at the higher (actuarially unfair) price. It was unclear whether they inferred quality from the high price or lacked understanding of how the product worked. Among the participants who were only offered the cheaper (actuarially fair) insurance, the more land men had the fewer units of insurance they purchased, but the reverse was true for women. When offered the more expensive (actuarially unfair) insurance product, men bought 0.48 units more, on average. Participants with more land and those who were able to borrow in emergencies bought more units. Women with a higher

financial literacy score bought a lower number of units (see Table 1 for how different characteristics affected men and women's uptake of different insurance products).

POLICY IMPLICATIONS

This study examined demand for agricultural index insurance products in rural Bangladesh, recognizing that insurance products have the potential to serve as an adaptation strategy to reduce adverse climate risks for farm households. The findings of this study suggest that there is significant demand and illuminated important gender differences to be taken into account in developing successful index-based insurance products for the rural Bangladesh market.

Women value insuring against agricultural risk faced by the household even though they are less involved in agricultural decisionmaking than men. Insurance companies or other microfinance institutions marketing an insurance product should take into account that women are just as likely as men to purchase agricultural insurance. However, for women, understanding of the insurance product and financial literacy are important factors in their uptake of insurance. On average, women have less education and lower financial literacy than men do, as well as less background in understanding agricultural risk. Because these factors place women at a disadvantage when facing an insurance purchase decision, insurance marketing efforts that include extensive training/information sessions will be more effective.

It is important, however, to keep in mind that the study areas, two districts in rural Bangladesh with smallholder and tenant farmers, do not represent all the agroecological zones of the country. Therefore, the findings are specific to this context and can be extrapolated only to scenarios that are similar. Also, it should be noted that the fact that these studies were about agricultural insurance gave the topic salience among the participants. Finally, even though the product offered in the experiment was designed to be as close as possible to a real-world insurance product, it was provided in a lab setting in which time was devoted to explaining the product and confirming understanding. Therefore, insurance companies or microfinance institutions offering insurance products should consider the relative demand for insurance products but avoid generalizing these findings to an absolute demand.

TABLE 1 Gender-differentiated descriptive statistics, 2009 and 2012 growing seasons

Effect on number of insurance units bought		
Characteristics of the insurance product	Men	Women
Offered for a catastrophic event (low probability)	• Positive effect of years of schooling • Negative effect of risk aversion • Negative effect if offered at expensive price	• Positive effect of ability to borrow emergency funds • Positive effect if offered at expensive price
Offered for a bad event (high probability)	• Negative effect of total land owned • Positive effect of holding a bank account • Negative effect of risk aversion • Negative effect if offered at expensive price	• Negative effect of holding a bank account • Negative effect if offered at expensive price
Offered at an expensive/actuarially unfair price	• Positive effect of ability to borrow emergency funds • Negative effect of risk aversion • Positive effect if offered for catastrophic event	• Positive effect of ability to borrow emergency funds • Negative effect of financial literacy score • Positive effect if offered for catastrophic event
Offered at a cheap/actuarially fair price	• Negative effect of total land owned • Negative effect of risk aversion	• Positive effect of total land owned • Negative effect of risk aversion • Negative effect if offered for catastrophic event

Source: Compiled by authors.

FOR FURTHER READING

Clarke, D., and N. Kumar. Forthcoming. Microinsurance Decisions: Gendered Evidence from Rural Bangladesh. IFPRI Discussion Paper. Washington, DC: International Food Policy Research Institute.

Clarke, D., N. Das, F. de Nicola, R.V. Hill, N. Kumar, and P. Mehta. 2012. *The Value of Customized Insurance for Farmers in Rural Bangladesh*. IFPRI Discussion Paper 1202. Washington, DC: International Food Policy Research Institute.

Neha Kumar *(n.kumar@cgiar.org) is a research fellow in the Poverty, Health, and Nutrition Division of the International Food Policy Research Institute (IFPRI), Washington, DC.* ***Daniel Clarke*** *(dclarke2@worldbank.org) is a senior disaster risk financing and insurance specialist at the World Bank, Washington, DC.*

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INTERNATIONAL FOOD POLICY RESEARCH INSTITUTE

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2033 K Street, NW, Washington, DC 20006-1002 USA | T. +1.202.862.5600 | F. +1.202.467.4439 | Skype: IFPRIhomeoffice | ifpri@cgiar.org | www.ifpri.org

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About the Editors

Claudia Ringler (c.ringler@cgiar.org) is deputy director of the Environment and Production Technology Division of the International Food Policy Research Institute (IFPRI), Washington, DC.

Agnes R. Quisumbing (a.quisumbing@cgiar.org) is a senior research fellow in the Poverty, Health, and Nutrition Division of IFPRI, Washington, DC.

Elizabeth Bryan (e.bryan@cgiar.org) is a senior research analyst in the Environment and Production Technology Division of IFPRI, Washington, DC.

Ruth Meinzen-Dick (r.meinzen-dick@cgiar.org) is a senior research fellow in the Environment and Production Technology Division of IFPRI, Washington, DC.

The project "Enhancing Women's Assets to Manage Risk under Climate Change: Potential for Group-Based Approaches" aims to help poor women farmers and pastoralists in Africa south of the Sahara and South Asia—especially those in Ethiopia, Kenya, Mali, and Bangladesh—manage risks under climate change. The notes in this collection explore how to protect or strengthen women's control over critical assets, including natural resources and social capital. These notes also examine the potential for innovative and group-based approaches to increase women's assets and strengthen their risk-management capabilities in the context of climate change.

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