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5

CASE STUDY

Livelihood adaptation to climate variability and change in drought-prone areas of Bangladesh

Developing institutions and options

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EXECUTIVE SUMMARY

The impacts of climate variability and change are global concerns, but in Bangladesh, where large parts of the population are chronically exposed and vulnerable to a range of natural hazards, they are particularly critical. In fact, between 1991 and 2000 93 major disasters were recorded, resulting in nearly 200 000 deaths and causing US$5.9 billion in damage with high losses in agriculture.

Agriculture is the largest sector of the Bangladesh economy, accounting for some 35 percent of the GDP and 63 percent of the labour force. Agricultural production is already under pressure from increasing demands for food and the parallel problem of depletion land and water resources caused by overuse and contamination. Impacts of climate variability and change cause an additional risk for agriculture.

Global circulation model (GCM) results predict an average temperature increase in Bangladesh due to climate change of 1.0ºC by 2030 and 1.4ºC by 2050. Though monsoon precipitation is likely to increase by 6.8 percent by 2050, the distribution patterns of precipitation during the growing season, high temperature and higher rates of evapotranspiration will create further water stress conditions and a decline in agricultural production in the drought-prone areas. A continued trend of more frequent and intense droughts, as a result of further climate variability and climate change, is expected to have significant impacts on the agricultural sector.

Within this context, FAO and the Asian Disaster Preparedness Centre (ADPC) are guiding an assessment of livelihood adaptation to climate variability and change in the drought- prone areas of Northwest Bangladesh. The project, implemented under the Comprehensive Disaster Risk Management Programme (CDMP) and in close collaboration with the Ministry of Agriculture Department of Agricultural Extension (DAE), specifically looks at: characterization of livelihood systems; profiling of vulnerable groups; assessment of past and current climate impacts; and understanding of local perceptions of climate impacts, local coping capacities and existing adaptation strategies. It also is developing a good practice adaptation option menu, evaluating and field testing locally selected options, and introducing long-lead climate forecasting, capacity building and training of DAE extension staff and community representatives.

Pilot areas are located in Chapai Nawabganj (Gomastapur and Nachole Upazillas) and Naogoan (Porsha and Sapahar Upazillas), districts mainly covering the Barind Tract and the Punarbhava and Ganges river floodplain. Average annual rainfall in the study area ranges between 1400–1500 mm, with 80 percent occurring during monsoon season (June–September). During the dry months, water deficits range from 400–500 mm. The surface water flow of the Mohananda and the Punarbhava rivers tends to decrease in the dry season. The rate of depletion of groundwater has been increasing since tubewell irrigation and crop intensification began in the early 1980s.

Within the pilot areas, the main rural livelihood groups identified were: crop and livestock farming (39.3 percent), fishing (0.4 percent), agriculture labour (34.3 percent), small business and hawking (9.8 percent), non-agricultural labour (3.7 percent), small enterprises such as

weaving, industry and construction (3.5 percent), transport and communication (1.2 percent) and other sources of income such as rentals, remittances and religious activities (6.5 percent).

Local informants indicated recent shifts in both coping strategies and livelihood portfolios of rural men and women due to institutional interference, economic motivation and employment opportunities. Traditional risk management practices such as sharecropping, goat rearing, craft making are less common. Farmers perceive that limited access to deep tubewell water in the non-irrigated areas is a cause of their current vulnerability, along with several other external factors such as electrical failures and high prices of agricultural inputs.

People in the study area perceive that today's climate is different from the past – the seasonal cycle and rainfall pattern have changed, droughts have become more frequent, pest and disease incidences have increased and the average temperature has increased in the summer while winter has shortened. Local people also feel that their production of *boro* and *aus* rice, winter vegetables and fruit including several varieties of mangoes have been affected by increased variations in rainfall, dry spells, temperature and drought occurrences. Focus group discussion with farmers showed they have developed rules-of-thumb to monitor dry spells and their likely impact on crop production, livestock and fisheries.

Household coping strategies in agriculture in the pilot areas for managing climate variability and drought occurrences can be categorized as: i) traditional, locally managed practices such as pond excavation, retention of rainwater in *khari* canals and moisture conservation, ii) government-supported practices such as deep tubewell facilitated irrigation, supplemental irrigation and miniponds, iii) alternative and innovative automatic adaptation practices such as adoption of mango farming, integrated crop-livestock farming systems, and iv) technology-driven efforts such as new short-duration and drought-tolerant crop varieties, cropping systems and homestead gardening.

Households also make non-agricultural adjustments such as i) disposing of productive assets and mortgaging lands, and ii) institutional-support activities including support from the government, NGOs and community-based organizations (CBOs). However, these strategies are insufficient for proper adjustment to future climate variability and change-related threats. Identification of additional good practices and broader replication and exchange of good practices needs promotion.

Several institutions including government agencies, NGOs, social, informal and private institutions and farmers' water-user groups are operating in the area. Their roles, capacities and expertise for dealing with climatic risks vary widely. The Barind Multipurpose Development Agency (BMDA), with its formal mandate to provide deep tubewell irrigation, plays a lead role but does not focus on areas where groundwater is not accessible. Local disaster management committees exist, but their capacities for advocating adaptation practices are limited. Coordination among NGOs and government agencies at local level appears weak. Efforts are already in place, through this project, to improve the technical capacities of the DAE and local disaster management committees as well as the coordination among them.

Climatic conditions and anthropogenic factors mutually reinforce the chronic vulnerability of livelihoods in drought-prone areas. Droughts strike regularly, but it is the limited local capacities and capabilities and the lack of access to various forms of assets that make peoples' livelihoods increasingly vulnerable.

Successful local adaptation to climate variability and change requires multiple pathways with well planned, interrelated short- and long-term measures, including:

- adopting physical adaptive measures – such as excavation, re-excavation of canals, miniponds, irrigation, storage facilities for retaining rain water;
- adjusting existing agricultural practices – such as adjustment of cropping patterns, selection of drought-tolerant crop varieties; better storage of seeds and fodder; dry seedbeds; or adopting alternative, cash crops such as mango and jujube (*Ziziphus jujuba*);
- adjusting socio-economic activities – such as livelihood diversification, market facilitation, small-scale cottage industries, integration of traditional knowledge;
- strengthening local institutions – such as self-help programmes, capacity building and awareness raising for local institutions;
- strengthening formal institutional structures – such as local disaster management committees and financial institutions;
- formulating policy to catalyze enhancement of adaptive livelihood opportunities;
- creating awareness and advocacy on climate change and adaptation issues;
- supporting better research – such as on-farm links to new or improved crops including drought-tolerant varieties, and other conducive and adaptive technologies.

Setting and selecting among these livelihood options for respective "geo-physical settings" and "livelihoods systems" requires stretching the limits and coordination of current local adaptive responses and research and technology development. In the first project phase, local adaptation practices were identified by involving the community in participatory dialogue. The practices identified included: dry seedbed, improved short-duration crop varieties, supplemental irrigation, closing of soil cracks, homestead gardening with fruit trees, re-excavation of *khari* canals and miniponds, and strengthening of field bunds. The next step was working with farmers to test various options, followed by a sound economic and marketing analysis of the successfully tested options. Dissemination and extension strategies being considered include: demonstrations, orientation meetings, field days, farmer field schools, and demonstration farmer or community rallies.

For medium- and long-term sustainability of any kind of intervention, the linkages between climate change adaptation and mainstream development need to be ensured, and an enabling institutional environment must be established. The fundamental prerequisite of long-term livelihood adaptation is coordination of agency planning, communication and field operations activities, as well as the activities of government line agencies and departments, NGOs, GO agencies and farmers.

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ACRONYMS

ADPC	Asian Disaster Preparedness Center
ADB	Asian Development Bank
AEZ	Agro-Ecological Zone
ASSP	Agriculture Support Service Project
BADC	Bangladesh Agricultural Development Corporation
BARC	Bangladesh Agricultural Research Council
BARI	Bangladesh Agricultural Research Institute
BEMAP	Barind Environment Management Action Plan
BIADP	Barind Integrated Area Development Project
BLB	Bacterial Leaf Blight
BMD	Bangladesh Meteorological Department
BMDA	Barind Multipurpose Development Authority
BRAC	Bangladesh Rural Advancement Committee
BRRI	Bangladesh Rice Research Institute
BSB	Bangladesh Sericulture Board
BSRTI	Bangladesh Sericulture Research and Training Institute
CARE	Cooperative for Assistance and Relief Everywhere
CBO	Community-Based Organization
CCS	Climate Change Scenario
CCC	Climate Change Cell
CDMP	Comprehensive Disaster Risk Management Programme
DAE	Department of Agricultural Extension
DANIDA	Danish International Development Agency
DAT	Days After Transplanting
DFID	Department for International Development
DMB	Disaster Management Bureau
DMC	Disaster Management Committee
DOE	Department of Environment
DOF	Department of Fisheries
DOL	Department of Livestock
DOR	Department of Relief
DRR	Directorate of Relief and Rehabilitation
DSR	Direct Seeded Rice
DTW	Deep Tube Well
FAO	Food and Agriculture Organization of UN
FAO-BD	Food and Agriculture Organization of UN-Bangladesh
FAO-SDAR	FAO- Rural Institutions and Participation Service
FFS	Farmer Field School
GCM	General Circulation Model
GDP	Gross Domestic Product
GFDL	Geophysical Fluid Dynamics Laboratory
GHG	Green House Gas
GO	Government Organization
GOB	Government of Bangladesh
HYV	High-Yielding Variety
IDA	International Development Association
IDB	Islamic Development Bank
IFAD	International Fund for Agricultural Development
IMDMCC	Inter-Ministerial Committee

IPM	Integrated Pest Management
LGED	Local Government Engineering Department
MAGICC	Model for Assessment of Greenhouse-gas Induced Climate Change
MoA	Ministry of Agriculture
MoEF	Ministry of Environment and Forests
MoFDM	Ministry of Food and Disaster Management
NARS	National Agricultural Research System
NDMAC	National Disaster Management Advisory Council
NDMC	National Disaster Management Council
NEMAP	National Environment Management Action Plan
NGO	Non-Government Organisation
NTIWG	National-level Technical Implementation Working Groups
PMU	Programme Management Unit
PRA	Participatory Rural Appraisal
PRECIS	Providing Regional Climates for Impact Studies
RCM	Regional Climate Model
SAAO	Sub-Assistant Agricultural Officer
SCENGEN	Scenario Gnerator
SCM	Sub-Component Mnager
SEMP	Sustainable Environment Management Programme
SIA	Sub-Implementing Agencies
SOD	Standing Order on Disasters
SPARSO	Space Research and Remote Sensing Organization
SRI	System of Rice Intensification
TMSS	Thengamara Mohila Sabuj Sangha (NGO)
TPR	Transplanted Rice
UAO	Upazilla Agricultural Officer
UNDP	United Nations Development Programme
UNFCC	United Nations Framework Convention on Climate Change
UTIWG	Upazilla Technical Implementation Working Groups

BANGLA TERMS/CROP NAMES

aus	rice crop coinciding with late dry and early monsoon season
baid	lowlands
beel	naturally depressed body of water remains throughout the year
bhiga	one third of an acre
boro	dry season rice that grows between December and April
chalas	uplands
khari	traditional irrigation canals
kharif I	early *kharif* season, typically from March to June
kharif II	a second part of *kharif* season, typically from July to October
kodal	hand-held hoe
monga	seasonal famine condition
pre-kharif	a season before kharif II typically from March to June
rabi	dry season, typically from November to February
shika	hanging shelves
taka	Bangladesh currency
thana	subdistrict
t. aman	transplanted aman rice typically from July to October
t. aus	transplated aus
upazilla	subdistrict