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# DYNAMICS OF RURAL GROWTH IN BANGLADESH

## SUSTAINING POVERTY REDUCTION

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## *Foreword*

Bangladesh's economy is vibrant. Healthy growth of nearly six percent per year over the past decade has propelled Bangladesh to a remarkable position in the fight against poverty. The number of poor people in Bangladesh dropped by one-third over that decade. The achievements of Bangladesh in improving food security and human development outcomes for its people are impressive and widely recognized. Less well appreciated is the story behind that story—the achievements of Bangladesh in agriculture.

This study, “Dynamics of Rural Growth in Bangladesh: Sustaining Poverty Reduction,” is the result of a partnership between the Government of Bangladesh Planning Commission and the World Bank. It rigorously looks at the changes taking place in the farm and non-farm segments of the rural economy, how well the markets for high-value agricultural products are performing, and assesses agriculture-nutrition linkages to delineate the implications for policy and strategic priorities to sustain future rural development, poverty reduction, food security, and nutrition.

The findings are compelling. Agricultural growth matters to—and directly benefits—a disproportionately large number of poor people. In fact, improved agricultural incomes have been the main source of poverty reduction since 2000. Agricultural growth also has a catalytic effect on broader non-farm economy; a 10 percent increase in farm incomes generates an increase of 6 percent in non-farm incomes through strong, economy-wide forward and backward linkages. An important message of this study is that a balanced growth strategy that focuses on agricultural as well as non-agricultural growth, and that focuses on a more diversified strategy within agriculture, will be more effective than single-sector strategies in delivering the higher growth that Bangladesh requires to overcome poverty, malnutrition, and environmental degradation.

Bangladesh's many advances in the ongoing fight against poverty need to be more widely known in development circles and among policymakers. The purpose of publishing this report is to inform policy, identify strategic directions, and generate consensus on actions that can be taken to unleash resilient, sustainable growth in the rural economy for overall improvement in the lives of ordinary Bangladeshi citizens.

We trust that the findings will find broad appeal with development practitioners and contribute to global thinking on the role of agriculture in achieving rural transformation, underscoring Bangladesh's success story both within the country and externally.

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## *Acronyms and Abbreviations*

BBS	Bangladesh Bureau of Statistics
BDT	Bangladeshi taka
BIDS	Bangladesh Institute of Development Studies
BIHS	Bangladesh Integrated Household Survey
BRRI	Bangladesh Rice Research Institute
CGE	Computable general equilibrium
CPI	Consumer Price Index
FAO	Food and Agriculture Organization
GDP	Gross domestic product
ha	Hectare
HH	Household
HIES	Household Income and Expenditure Surveys
IFPRI	International Food Policy Research Institute
InM	Institute of Microfinance
IRRI	International Rice Research Institute
Kcal	Kilocalorie
kg	Kilogram
km	Kilometer
LF	Labor force
LFS	Labour Force Survey
MH	Mahabub Hossain (panel surveys)
NRA	Nominal rate of assistance
R&D	Research and development
RRA	Relative rate of assistance
SAM	Social Accounting Matrix
t	ton (metric)
TFP	Total factor productivity
WBI	World Bank, BIDS, and InM
WDI	World Development Indicators
yr	Year

## *Executive Summary*

**The rural economy in Bangladesh has been a powerful source of economic growth and has substantially reduced poverty, especially since 2000, but the remarkable transformation and unprecedented dynamism in rural Bangladesh are an underexplored, underappreciated, and largely untold story.** Its origins are found in the mutually reinforcing forces of policy reform, technological progress, investments in infrastructure and human capital, and the persistent enterprise of rural Bangladeshi households. The progress achieved so far is commendable, yet poverty and malnutrition remain unacceptably high, posing a continuing challenge: how can Bangladesh accelerate and channel its rural dynamism to sustain the gains toward eliminating poverty, achieving shared prosperity, and advancing the aspirations of the people and economy toward middle-income status?

**The study described here—undertaken in partnership with the Planning Commission—provides an empirical basis for answering that question by analyzing the dynamics of rural growth.** The analysis identifies the key changes occurring in the rural economy, the principal drivers of rural incomes, the implications for policy, and related actions to foster future growth, further reduce poverty, and improve food security and nutrition. A substantial strength of this study is its empirical foundation, consisting of three sets of detailed data on rural households. Two of the datasets are unique in tracking the same set of households for more than two decades. These data make it possible to examine how change is occurring within and among rural households; they shed considerable light on trends that tend to be obscured at more aggregate levels of analysis. Nationally representative surveys and aggregate secondary data provide complementary and contextually rich insights into the household data.

## *Principal findings*

**Agriculture in Bangladesh has performed extremely well, despite being one of the sectors that is most vulnerable to climate shocks.** The trend growth rate (over rolling 10-year periods) has increased steadily for the past two decades, reaching a high 5 percent in recent years—high by agricultural growth standards. This growth has been driven primarily by productivity growth, underpinned by a combination of technical progress and efficiency gains triggered by policy reforms. The major macro-economic and trade reforms of the early 1990s, building on the momentum of previous agricultural reforms in agricultural input and output markets, had a significant positive impact on agricultural productivity. Total factor productivity (TFP) has grown at an average annual rate of about 2.7 percent—among the highest in the world, comparable to China and better than the star performers in East Asia.

**Agriculture’s performance is even more impressive considering that it has been achieved in the face of adverse incentives created by some macro policies (in essence, while “swimming against the tide”).** Even under the much-improved policy framework, domestic terms of trade for agriculture have steadily declined. An implicit anti-agriculture domestic policy bias has persisted

with continued protection for the manufacturing sector, likely aggravating rural-urban income and poverty gaps. This macro-policy context also means that while agricultural growth has been helped by higher food prices in recent years (a matter of concern to many), the steadily accelerating long-term growth in agriculture is not simply a price effect—it has been driven by productivity growth.

**The evidence clearly demonstrates the pro-poor and catalytic nature of agricultural growth, which has been the leading contributor to poverty reduction in Bangladesh since 2000.** The analysis provides important insights into the structural transformation underway in Bangladesh, much of which is occurring within the rural space, from the farm sector to the rural non-farm sector. The fortunes of much of the rural non-farm economy depend on the performance of agriculture, reflecting the changing role of agriculture from being a direct contributor to GDP to a more leveraged contributor. Analysis confirms the strong role of agriculture for growth and poverty reduction: a 10 percent increase in farm incomes generates an increase of 6 percent in non-farm incomes through strong forward and backward linkages.

**Pathways out of poverty are neither linear nor predictable, as confirmed by the analysis of the dynamics of poverty.** Panel data that allow the same households to be tracked over time show that even during a period of robust growth such as 2000–13, a large share of households regularly “churn” into and out of poverty, indicating a high level of vulnerability. Given the substantial risks associated with both farm activities (mostly natural risks, but also market-related risks) and non-farm activities (which carry economic and business as well as personal and health risks), upwardly mobile households pursue multiple strategies for generating income, diversifying their risks, and adopting reinforcing pathways out of poverty. Agriculture also provides an important safety net for households engaged in non-farm employment but facing significant business or market risks. It is thus not surprising to find that the vast majority (and an increasing share) of rural households rely on both farm and non-farm incomes, with about 87 percent of households reporting at least some income from agriculture. In other words, most rural households retain one “leg” in agriculture as central to their strategy to climb out of poverty. These findings are important for Bangladesh’s development strategy; they also contribute to the global thinking on rural transformation and the role of agriculture for poverty reduction and shared prosperity.

**Two statistics provide compelling evidence on rural households’ confidence in agriculture and on agriculture’s importance for sustaining progress in poverty reduction:** the deepening of agricultural capital per worker, even as non-agricultural capital per worker has declined, and the rise in leasing of land for cultivation by landless and functionally landless households. Remittances are an important pathway out of poverty, but given that so many households have limited access to this source of income growth, remittances have contributed relatively less to poverty reduction on average than either farm or non-farm sources of income.

**The most important drivers of agricultural growth—facilitated by policy reforms since the 1980s and strategic investments in research and infrastructure—have been irrigation expansion, modern technology (high-yielding varieties), better road connectivity, more**

**efficient markets, and increased mechanization.** In the last few years, high real prices have also significantly helped farmers, but only by preventing a further deterioration of the terms of trade, which remain well below the levels of the mid-1990s. The bulk of the growth has been through increased yields, and more precisely through TFP growth, reflecting high returns to agricultural research and policy reforms.

**It is increasingly apparent that agriculture must diversify more rapidly if Bangladesh is to meet changing demand, improve nutrition, and adapt to a changing climate.** The overall structure of agriculture has changed little. Rice continues to dominate the crop sector and has driven much of the growth in agricultural productivity. The share of high-value agriculture (horticulture, livestock, and fisheries products) has grown, but slowly. The progress on diversification partly reflects the past emphasis of policy and strategy on the production of food grains, principally rice, to achieve food security. Food security remains the central objective of the government's agricultural strategies, and it continues to be pursued through policies and public interventions to maintain the incentives for rice production, including output price support, price stabilization, and input subsidies. Levelling the playing field to promote more robust diversification is an important priority going forward, given changing consumption patterns and the need to improve nutritional outcomes through a more diverse diet. A step in this direction would be to remove the remaining regulatory constraints to private sector participation in the seed sector (as has been done for hybrid maize and maize) to inject new technological vigor.

**The time is opportune to explore the most effective and efficient ways to support agriculture.** Significant potential remains to increase productivity and incomes in agriculture, while making it more climate resilient and nutrition sensitive. Farmers remain heavily invested in rice even though non-rice crops and non-crop agriculture offer significantly higher incomes. To induce farmers to adopt these non-rice agricultural enterprises, their returns need to be further stabilized and solidified through investments in technology, markets, and infrastructure. Yet the much-needed investments in public goods to bring about this change—including investments in research (especially on the long-neglected non-rice crops, livestock, and fisheries), extension, and infrastructure—remain very low. The largest share of the public expenditure on agriculture goes to fertilizer subsidies, which have increased significantly since 2007. At the same time, an important finding from the farm-level analysis is that considerable wastage appears to be associated with the use of fertilizer. Almost half of all farmers overuse fertilizer, but that excess fertilizer is not delivering any additional output. Further, the overuse of chemical fertilizers imposes large potential environmental and health costs. Priorities to address this issue are to provide appropriate technical advice to farmers through extension services while removing the remaining incentives that might encourage farmers to overuse inputs.

**Although agriculture remains the dominant source of rural livelihoods, non-farm incomes will continue to grow in importance, and so will the need to adopt strategies to promote more robust development of the rural non-farm economy.** The role of agriculture and farm incomes remains highly relevant for the welfare of the vast majority of rural households, yet as farm sizes

decline, even more households will seek to earn income off of the farm. A little-remarked statistic from the 2010 Labour Force Survey is that rural non-farm employment in Bangladesh is almost 50 percent greater than all urban employment put together. Rural non-farm employment is also growing faster than urban employment, and three-quarters of rural households have at least some form of non-farm income. Clearly, a high priority to facilitate more rapid economic transformation is to implement strategies that will improve the enabling environment for creating better and more productive jobs in the rural non-farm sector.

**A strategy to promote robust development of the rural non-farm economy should pay attention to the country's secondary cities.** Aside from agriculture, key drivers of growth in the rural non-farm sector are connectivity and proximity to urban areas. The need for strategy and policy to focus on previously neglected secondary cities is highlighted by an interesting combination of facts. More jobs are located near the mega-cities of Dhaka and Chittagong, but the growth has been in informal and seemingly vulnerable jobs, while (surprisingly) the shares of all other (more productive) types of jobs have fallen. Well-connected cities have had positive growth in jobs of better quality (especially businesses). Poorly connected cities have shown no dynamism when it comes to creating employment, calling attention to the need for infrastructure development.

**An emerging concern is that rural non-farm activities do not seem to be growing in scope or sophistication over time.** Many rural non-farm activities are still linked to agriculture, consistent with the process of transformation—processing, trading, food preparation, and so on—but the conundrum is that they are not moving much from basic to more sophisticated activities. This stagnation in the types and quality of non-farm activities is puzzling, because such activities, especially rural non-farm enterprises, are associated with higher returns. At the same time, the rate of return to rural non-farm enterprises is not associated with urban proximity. It may be that because most rural non-farm enterprises still produce traditional and low-quality products, they cannot compete with cheaper and better quality mass-produced goods.

**A binding constraint on rural non-farm enterprises is the lack of credit, although the lack of infrastructure (for power and water) is also important.** Lack of credit is reported as the more pervasive constraint. The majority of enterprises use their own funds to finance investment and expansion.

**Given rapid growth in the share of rural non-farm enterprises focusing on trading, especially in agricultural produce, the good news from surveys of traders and farmers is that markets appear to be functioning very well.** Marketing margins are quite small and reasonable. Transport costs are the major source of traders' variable costs. The market survey found very little evidence of the much talked about cartelization of markets by a few powerful traders fleecing farmers, or other forms of uncompetitive behavior. Another finding that demystifies another widely held view is that physical post-harvest losses are very low (under 5 percent)—much lower than the 30–40 percent generally quoted.



**The liberalized markets of Bangladesh also appear to serve both producers and consumers very well.** Comparable data on the high-value commodities surveyed for this report are limited, but for rice, a recent study comparing Bangladesh, China, and India finds that the share of farm-gate price of rice in the final retail prices is higher in Bangladesh than in either of the other two countries.

**Improvements in market infrastructure and finance are vital to move Bangladesh to the next level of more modernized and even more efficient supply chains.** Further investment is needed in roads, electricity infrastructure, and upgraded market facilities. Traders, especially those operating in markets for high-value products, require substantial working capital and better access to finance.

**Projections indicate that the future supply of rice relative to demand is unlikely to be a major concern, but the supply of other food groups needs to grow significantly faster than in the past—raising important questions for policy makers on the strategic priorities for public investments and policy focus.** The prospects for agricultural growth, food security, and nutrition are closely linked. Fortunately the trade-off appears to be less of an issue now than in the past, when self-sufficiency in rice was the overarching imperative. The scope for improving rice yields is substantial, especially if farmers succeed in closing the yield gaps for aman and aus rice. With a continued focus on agricultural research to push the production frontier forward and to build agriculture's resilience to climate and biophysical stress, there is significant potential to release land for much-needed crop diversification.

**A more immediate policy priority is to achieve better outcomes in nutrition.** Malnutrition rates remain high, with serious human development and economic impacts. Intuitively it can be argued that what happens *to* agriculture is important to sustaining food security, and what happens *in* agriculture matters for improving nutritional outcomes. Clearly, nutritional security is a complex, multi-sectoral challenge, with many contributory factors, among which agriculture is prominent. The empirical findings show a significant impact of agricultural diversification (out of rice) on dietary diversity, which remains very low in Bangladesh. They also show that dietary diversity has a strong, direct impact on the nutritional status of fathers but not mothers. Women appear to suffer from basic undernutrition, as seen in the body mass index (BMI) of mothers, which is significantly affected by calorie insufficiency (at the household level). Regarding nutritional outcomes in children under five years of age, the BMI of both parents has a strong negative influence, as do relative prices of foods, reflecting the significant impact of agricultural policies on nutrition.

**Single-sector strategies are inferior to a growth strategy that is balanced between agricultural and non-agricultural growth.** The scenario analysis using a computable general equilibrium model confirms that superior benefits are associated with a growth strategy stressing both farm and non-farm growth, and that within agriculture, a diversified production structure performs better in delivering on key development objectives—pro-poor growth and food security

(in terms of inducing a higher level of consumption) as well as better nutrition (through a more diversified diet).

### ***Priority areas for action***

Based on the findings summarized here, the five priority areas for action are:

- 1) ***A balanced development strategy.*** A development strategy that stresses both farm and non-farm growth, and at the same time pursues a diversified strategy within agriculture itself (favoring no agricultural subsector over others), is superior to alternative sector-specific strategies in all dimensions of development—to pursue growth, further the gains in poverty reduction, reduce economic vulnerability, maintain food security, and promote better outcomes in nutrition.
- 2) ***More rapid diversification in agriculture—with carefully balanced attention to rice.*** Within agriculture, diversification into high-value agriculture (non-crop agriculture and crops other than rice) is a priority, but it is important to neither neglect nor overemphasize the rice sector. Consolidating the prospects for rice is important and is eminently feasible, through an approach that emphasizes exploiting the remaining yield gaps, investing in traditional and non-traditional technologies (planting hybrids and responsibly realizing the potential of biotechnology), and leveraging the private sector to move the current technology frontiers. This approach will safeguard past achievements while injecting new momentum into productivity growth and will be critical in building resilience to potential climate change impacts. Strategic priorities include improving aman rice yields and freeing up the more suitable boro rice areas for a diverse range of high-value and more sustainable crops, and giving greater attention to various aspects of developing the high-value crop, livestock, poultry, and fisheries subsectors.
- 3) ***Further improving the policy framework and rebalancing public expenditure priorities.*** At the macro level, policy distortions protecting the non-farm economy remain and create an implicit anti-agriculture domestic bias. The main issues are analyzed in the Diagnostic Trade Integration Study by the World Bank, which also identifies key actions to address them. Among sectoral policies, a careful review is warranted to assist farmers in pursuing economically and ecologically optimal use of inputs. Evidence indicates that significant wastages (with large environmental and health costs) are associated with the overuse of chemical fertilizers, which may be due to insufficient technical knowledge or inappropriate incentives. Rationalizing public expenditures to emphasize investments in research (with increased attention to non-rice crops, livestock, and fisheries), extension services, markets, and infrastructure will help to enhance incomes, value-chain efficiencies, and competitiveness. Finally, removing the remaining regulatory and institutional constraints to private sector participation in the seed sector will have a large potential payoff.
- 4) ***An enabling environment for robust rural non-farm growth and more efficient value chains.*** For rural non-farm growth to flourish, especially the growth of business enterprises,

the empirical analysis reaffirms the essential role of the enabling environment. Access to finance, power, and roads are critical elements of this environment, along with better access to technology and information, and the removal of business environment barriers, such as those influencing terms of trade, discriminatory taxes, and stifling regulations. Value-chain analyses highlight the importance of focusing on food safety standards and modern market infrastructure, given the large share of rural non-farm enterprises that pursue activities related to agriculture (such as trading and processing). The value-chain analyses also clearly show that agricultural markets are functioning quite efficiently, with low marketing margins (driven mostly by transport costs), dispelling the general myths on the distortions and inefficiencies associated with the liberalized market environment. The clear priority is to avoid distracting debates and focus on improving market infrastructure and facilitating more efficient value chains.

- 5) ***Continued investment in connectivity.*** The widespread impact of connectivity is well demonstrated. Looking to the future, continued investments in infrastructure are a high priority. Rural roads have been a key part of the past success in raising productivity, promoting the limited diversification that has taken place, and creating better employment opportunities. Closely related to connectivity is the need to focus on secondary cities that remain poorly connected, because they are potential drivers of economic activity and better quality jobs. The evidence shows that while the mega-cities have attracted more employment, they have overwhelmingly attracted informal jobs with higher vulnerability. Well-connected cities have had positive growth in business jobs, while poorly connected cities have languished, with no structural change in the types of jobs created.

# 1 Introduction

Unprecedented changes in the rural economy of Bangladesh have brought significant reductions in poverty and increases in economic growth, especially since 2000, yet the remarkable transformation of the country's rural areas and the dynamics of its rural economy remain an underexplored, underappreciated, and largely untold story. Together, policy reforms, changes in technology, investments in infrastructure and human capital, and the persistent enterprise of rural Bangladeshi households offer a compelling case study of how mutually reinforcing actions can trigger the highly sought-after virtuous cycle of rural development.

On the surface, the broad socio-economic characteristics of the agricultural sector in Bangladesh seem to have changed very little. Nearly 70 percent of the population—and most of the poor—live in areas classified as rural. Rural poverty remains significantly higher and more extreme than urban poverty. Primary agriculture—generally less productive than non-agricultural sectors—still dominates the rural economy in terms of employment, providing income for the overwhelming majority of rural residents. The declining share of agriculture in the economy (as shown in Annex 1, Figure A1.1) reinforces the stereotypical perception of agriculture as a backward sector in decline, beset by relatively weaker performance and higher volatility than other sectors (not least because of the effects of periodic natural disasters). Agriculture appears to offer few prospects for any significant contribution to economic well-being, either through its potential to markedly reduce poverty or its prospects for broadening opportunities for more widely shared prosperity.<sup>1</sup>

These perceptions belie the fact that strong currents of change are moving under the surface, propelled by the structural transformation of the rural economy. Deeper analysis, moving beyond superficial rural–urban, farm–non-farm, and sectoral profiles, reveals substantial economic vibrancy, mobility, and interdependency.

The findings of the Poverty Assessment Report (PAR) (World Bank 2013) challenged the perception of agriculture as a backward sector and came as a surprise to many. Using data from the nationally representative Household Income and Expenditure Surveys (HIES), the assessment revealed that growth in farm income drove nearly half of the reduction in poverty in Bangladesh between 2000 and 2010, and that farm income became substantially more powerful as a driver of poverty reduction as the decade progressed. Between 2000 and 2005, growth in non-farm income accounted for almost 40 percent of poverty reduction, while growth in farm income contributed about 21 percent. These relative contributions changed dramatically between 2005 and 2010, when

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<sup>1</sup> Agriculture's share in total GDP was 32 percent in 1980. It has declined steadily since, to 29 percent in 1990, 25 percent in 2000, and an estimated 18 percent in 2013. Over the long term, between 1980 and 2013, agricultural GDP grew at 3.0 percent compared to overall economic growth of 4.8 percent.

farm income growth accounted for more than 90 percent of poverty reduction and non-farm income growth was responsible for only 6 percent.

These findings emphasized the pressing need to understand the dynamics of rural growth in Bangladesh, especially agriculture's role and its relationship to the rural non-farm economy, given that poverty—despite the remarkable progress since 2000—remains unacceptably high and largely rural. If Bangladesh is to achieve its goal of steadily transitioning to middle-income status, it is vital to pinpoint the factors that are likely to speed the rate at which poverty declines and shared prosperity grows, promote and accelerate sustainable rural growth, and build resilience to maintain food security.

For those reasons, the World Bank, in partnership with the Planning Commission, undertook the present study of the dynamics of rural growth in Bangladesh. Recognizing that an extensive body of knowledge exists on agriculture in Bangladesh, the first step in initializing this study was to take stock of the current state of knowledge (Faruquee 2012). This step was followed by consultations with a broad spectrum of stakeholders, including policy makers, academics, researchers, sector technical experts, and other development partners, to identify the knowledge gaps and define the priority areas of focus for this study.

This identification process pointed to the need for a deeper analysis on: sources and drivers of rural incomes, including both farm and non-farm incomes; the performance of agricultural value chains, particularly for high-value agricultural commodities; and implications of the patterns of agricultural growth for food security and nutrition. To address these issues, this study approaches the challenge of promoting growth through the lens of rural poverty. A rural poverty perspective makes it possible to zero in on the specific diagnostics needed to:

- Analyze recent changes in the rural economy and identify key drivers of emerging trends.
- Assess the implications of these changes for future growth, poverty reduction, food security, and nutrition.
- Identify the highest-priority policies and actions required to strengthen and sustain an environment that enables more rapid growth.

As such, it is important for readers to bear in mind that this study does not seek to address in depth all issues concerning the various aspects of rural growth. Instead it builds on available studies and complements ongoing analyses by other agencies and research institutions. It makes use of recent in-depth studies on Bangladesh by the World Bank whose findings remain highly relevant. An important study in this respect is the detailed and sophisticated analysis of the impacts of climate change on food security, which highlights the importance of promoting activities and policies that help households build resilience to climate risks (Yu et al. 2010). This study speaks directly to key elements of Yu et al.'s "no-regrets" adaptation strategy to climate change, which would include efforts to diversify household livelihoods and income sources, improve agricultural productivity, promote crop diversification, enhance efficiency in the use of water and land, better manage the natural resource base, and support increased agricultural research and development to tackle future



uncertainties. Other studies include an assessment of the agri-business opportunities and constraints, focusing on high-value agricultural subsectors (World Bank 2008); the Diagnostic Trade Integration Study (Kathuria and Malouche 2016); and a large body of analysis on the investment and business environment in Bangladesh summarized in the Systematic Country Diagnostic (World Bank 2015). Finally, it complements the ongoing work supported by the World Bank Group as part of its engagement with the government of Bangladesh, in partnership with the government of the Netherlands and the 2030 Water Resource Group, to prepare the Bangladesh Delta Plan 2100, which seeks to create a long-term vision and investment strategy to build Bangladesh's resilience to climate change.

Many concepts and topics integral to this analysis—examples include “rural economy,” “farm” and “non-farm,” and “rural” and “urban”—are variously defined in the literature, owing to their overlapping and interdependent qualities. To provide some clarity, Box 1.1 explains how some of these key concepts are defined in this report. The careful reader will bear in mind that many empirical findings cited in the chapters that follow come from studies that differ in their definitions and interpretations of terms, and that while additional clarifying statistics and data are provided where possible, it is neither feasible nor advisable to repeat much of the very rich and insightful analysis that exists in Bangladesh.

#### **Box 1.1: Definitions of key terms**

**Rural economy** describes the economy of a rural area, which encompasses population concentrations in farms, villages, and towns below a threshold level defined by the national statistical bureau in its broad rural-urban classification. In Bangladesh, that threshold is 40,000 individuals.

**Agriculture** is the sector consisting of crops, livestock, agro-forestry, and fisheries (excluding natural forest, which is managed under a different approach than is applicable for agriculture). The terms **agriculture** and **farm** are used interchangeably throughout this report and refer to the same measures, concepts, and issues pertaining to the agricultural sector. Broad sectoral aggregates of income, poverty, and employment include the contributions or shares of labor when referring to the broad **farm** and **non-farm** categorization. **High-value agriculture** refers to fish, livestock products, fruits, vegetables, and spices that have a higher market value than traditional food grains. **Non-farm activities** include all rural economic activities outside farm agriculture, such as self-employment, wage employment (full-time, formal, informal, and seasonal) and non-farm production.

A **driver of growth** is an economic activity that creates growing demand for other economic activities through two routes. It can (1) raise incomes, which are then the source of growing consumer demand for the products of the other activities, or (2) create derived demand on the input side for other outputs and create demand for processing downstream.

*Source:* Authors.

The approach adopted in this study was deliberately empirical, to keep the analysis as objective and factual as feasible. The analysis described in the chapters that follow therefore relied on a large number of sources for data and other information, including a new survey of market participants along the value chains for selected high-value products. It made use of national and district-level aggregate data from the Bangladesh Bureau of Statistics (BBS) for national accounts statistics and agricultural production, along with agricultural data from the Food and Agriculture Organization

(FAO). Sources of household-level data include the nationally representative HIES for 2000, 2005, and 2010, and the Labour Force Survey (2005 and 2010), as well as three unique household surveys. One is a household panel survey conducted by the Bangladesh Institute of Development Studies (BIDS), International Rice Research Institute (IRRI), and Bangladesh Rural Advancement Committee (BRAC) under the guidance of Dr. Mahabub Hossain since the late 1980s. The panel surveys—henceforth referred to as the “MH panel surveys”—were undertaken in 64 study villages covering all districts of Bangladesh in four rounds (1988, 2000, 2004, and 2008) and supplemented by relatively more limited census data for 2013 from all 64 villages. Another longitudinal household panel survey, conducted by the World Bank, BIDS, and the Institute of Microfinance (InM), provides two rounds of data (for 1998/99 and 2010/11) and is referred to as the “WBI data.” The third survey is the nationally representative Bangladesh Integrated Household Survey (BIHS), conducted by the International Food Policy Research Institute (IFPRI), which collected data for 2011/12. These micro-level datasets provided most of the data used to obtain the original empirical findings presented here; for details on the two panel datasets, see Annex 1, “Data used for micro-analysis,” and for details on the BIHS, see IFPRI (2013). The market surveys undertaken for the analysis of the value chains for high-value agricultural products are described in Annex 5.

Following this brief introduction, Chapter 2 provides a detailed descriptive review and deeper analysis of the drivers and dynamics of change in the rural economy—in household poverty, income sources, and employment status—including the roles of the farm and non-farm sectors in rural employment and incomes. Chapter 3 focuses on the evolving structure of agriculture, including sources of agricultural growth, the varied contributions to growth by agro-ecology and subsector, and the effects of policy reforms. This exploration of the farm sector is followed in Chapter 4 by an analysis of growth in the non-farm sector, with particular attention to how the sector has been developing over time, across geographical areas, and through various types of rural non-farm enterprises. Over the past two decades, the marketing of agricultural products has benefited from infrastructure investments and agricultural policy reforms that fostered private investment in trade, transport, and other services; Chapter 5 reports new findings from value-chain surveys to investigate how well markets and value chains are functioning. Chapter 6 examines the dimensions of food insecurity and malnutrition in Bangladesh, especially in relation to strategic priorities for public investments and policy. Each chapter is followed by a summary of the analytical results and the implications for policy and strategy to sustain progress in improving growth, reducing poverty, and fostering shared prosperity. The final chapter briefly lists all of the priority areas for action.

## *References*

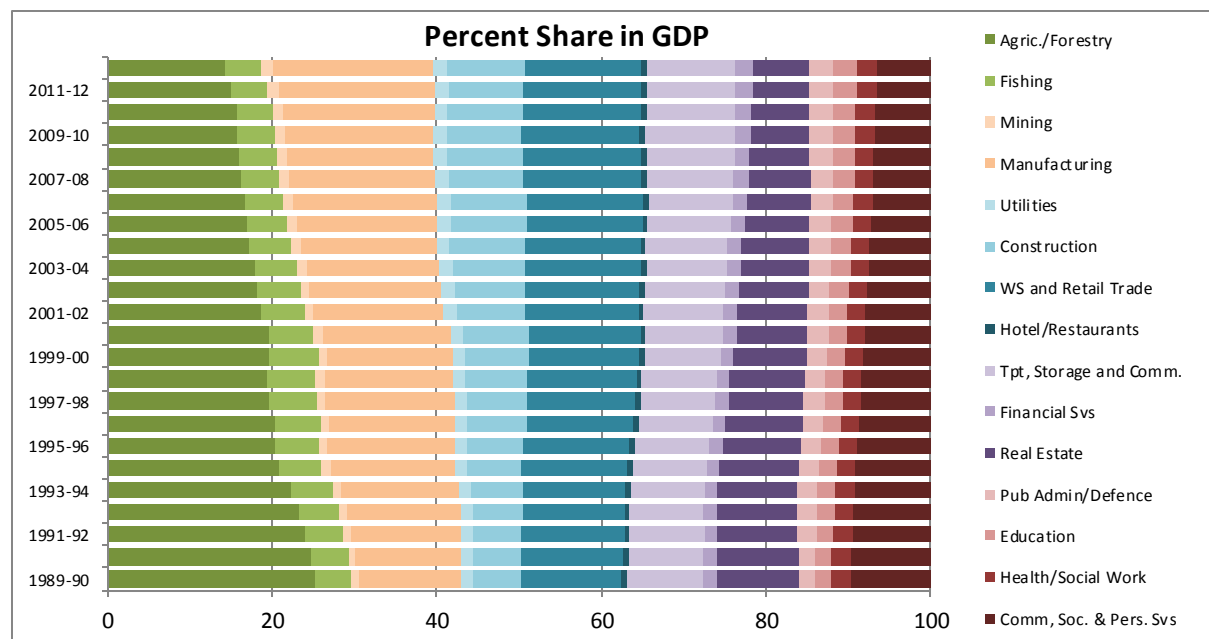
Faruquee, R. 2012. Stock-taking of Major Studies and Reports on Agriculture and Rural Development in Bangladesh. World Bank, Washington DC. Processed.

- Hossain, M., D. Lewis, M.L. Bose, and A. Chowdhury. 2006. "Rice Research, Technological Progress, and Poverty." In *Agricultural Research, Livelihoods and Poverty: Studies of Economic and Social Impacts in Six Countries*, edited by A. Michelle and R. Meinzen-Dick. Baltimore: Johns Hopkins.
- Hossain, M., M.A. Quasem, M.A. Jabbar, and M.M. Akash. 1994. "Production Environments, Modern Variety Adoption, and Income Distribution in Bangladesh." In *Modern Rice Technology and Income Distribution in Asia*, edited by C.C. David and K. Otsuka. Boulder: Lynne Reiner.
- IFPRI (International Food Policy Research Institute). 2013. Bangladesh Integrated Household Survey (BIHS), 2011–2012. Dataset. Washington, DC.
- Kathuria, S., and M. Malouche. 2016. *Toward New Sources of Competitiveness in Bangladesh: Key Insights of the Diagnostic Trade Integration Study*. The World Bank Group, Washington, DC.
- Khandker, S., and H. Samad. 2014. "Non-Farm Drivers of Rural Growth: A Case Study of Bangladesh." Background paper for "Dynamics of Rural Growth in Bangladesh," GFADR, World Bank, Washington, DC.
- World Bank. 2008. "High Value Agriculture in Bangladesh: An Assessment of Agro-Business Opportunities and Constraints." Bangladesh Development Series Paper No. 21. Dhaka.
- 2013. Bangladesh Poverty Assessment. Washington, DC.
- 2015. "Bangladesh: More and Better Jobs to Accelerate Shared Growth and End Extreme Poverty: A Systematic Country Diagnostic." Washington, DC.
- Yu, W., M. Alam, A. Hassan, A.S. Khan, A. Ruanne, C. Rosenzweig, D. Major and J. Thurlow. 2010. *Climate Change Risks and Food Security in Bangladesh*. London: Earthscan.

# Annex 1: Macro-economic Structure and the Micro-data Used in the Study

## Composition of GDP

Figure A1.1: Sectoral composition of GDP, 1990–2012



## Data used for micro-analysis

The micro-level findings discussed in this report are based on in-depth analyses of three rich household-level surveys: (1) the national representative repeated cross-sectional Household Income and Expenditure Surveys (HIES) conducted by the Bangladesh Bureau of Statistics (BBS) for 2000, 2005, and 2010; (2) nationwide panel surveys by BIDS-IRRI-BRAC undertaken in 62 villages (1 in each of the districts) spanning 25 years and conducted in 1988, 2000, 2004, and 2008, with a supplemental census of the study villages with more limited information in 2013; and (3) World Bank-sponsored micro-credit long panel data spanning over 20 years, from surveys conducted in 1991/92, 1998/99, and 2010/11.

### HIES repeated cross-sectional surveys

Detailed descriptions of these surveys are available from BBS. In brief, the data for this study came from three rounds of HIES, carried out by BBS in 2000, 2005, and 2010, to determine the poverty profile of Bangladesh. The data are geographically representative of the entire country and provide information about the standard of living and nutritional status of the population in urban and rural areas. A two-stage stratified sampling technique was used, in which the primary sampling units (the PSUs, roughly comparable to blocks of villages in rural areas or street blocks in urban

areas) were selected in the first stage, and households were selected in the second stage. The number of PSUs selected was 442 in 2000, 504 in 2005, and 612 in 2010. Roughly about 20 households were randomly selected from each of the PSUs, resulting in 7,440, 10,080, and 12,240 households in 2000, 2005, and 2010, respectively.<sup>2</sup> While the PSUs across the surveys were not comparable, there was a significant overlapping of *upzilas* (subdistricts) across the surveys.<sup>3</sup> The survey covered 295 *upzilas* in 2000, 366 in 2005, and 386 in 2010. Since the individual households cannot be tracked across the surveys, panel analysis of the survey data across years is possible only at the *upzila* level. The final and cleaned dataset contains 5,030, 6,031, and 7,840 rural households from 2000, 2005, and 2010, respectively.

### **BIDS-IRRI-BRAC longitudinal data: MH panel surveys**

The MH panel surveys refers to a series of longitudinal surveys of a nationwide sample of rural households in Bangladesh initiated and undertaken over the years under the leadership of Mahabub Hossain. The survey spans about two decades (1988–2008) with 4 rounds of surveys (1988, 2000, 2004, and 2008). The surveys were undertaken to assess changes in rural poverty and livelihoods and identify the roles of different factors driving those changes, such as technological progress, prices, and so on. The baseline survey was administered by the Bangladesh Institute of Development Studies (BIDS) in 1988 to 1,240 rural households from 62 villages in 57 of 64 districts in Bangladesh to study the impact of technological progress on income distribution and poverty in Bangladesh (Hossain et al. 1994). IRRI revisited the households in 2000, 2004, and 2008 to study the impact of rice research on poverty reduction (Hossain et al. 2006). The 2004 and 2008 surveys were also used for poverty mapping in Bangladesh and for assessing the impact of the rise in food prices on rural livelihoods.

The benchmark survey used a multi-stage random sampling method. The sample size has been adjusted in each round of the survey to make the sample representative of the rural population for the survey year. In the first stage, 64 unions were selected randomly from the list of all unions. In the second stage, one village was selected from each of the unions that best represented the unions in terms of population density, land distribution, and literacy rate. Two villages were excluded later because their remoteness posed challenges for administering the survey. A census of households was conducted in the selected villages to stratify households according land ownerships, land tenure, and literacy. A random sample of 20 households was selected from each village such that each stratum was represented by its probability distribution.

For the repeat surveys in 2000, 2004, and 2008, enumerators revisited the original households and their offshoots. The repeat surveys also included additional households from the same villages to address the sample attrition problem. The sample sizes in the repeat surveys were 1,880, 1,930, and 2,010, respectively. Because the sample size is larger, much of the analysis in this report used

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<sup>2</sup>Except for 140 urban PSUs in the 2000 survey (where 10 households were selected per PSU), the number of households selected per PSU was 20 for all PSUs across all surveys.

<sup>3</sup> An *upzila*, which is the lowest administrative unit (after division and district), is at a higher level than a PSU in the geographical hierarchy, and can contain about 10-50 PSUs (villages).

data from the three later survey rounds from 2000 to 2008. Data from 1988 survey were used selectively to highlight some long-term trends. Aside from the larger sample size, the main reason for using the 2000, 2004, and 2008 survey data for the deeper analysis was to focus on the dynamics and drivers of farm income growth in the last decade, which was the purpose of this study.

### **World Bank, BIDS, and InM (WBI) micro-credit long panel survey**

The HIES survey data is not panel at the household or enterprise level; hence any analysis of productivity growth and drivers of RNF growth based on HIES data will be biased owing to a number of unobserved factors (for example, entrepreneurial ability, which contributes to RNF growth as well). Because the data are not collected at the enterprise level over time, analysis using the HIES data might not capture the dynamics that the RNF sector experienced over the last decade. The dynamics of sectoral issues may be better examined by analyzing the panel dataset collected by the World Bank with the help of BIDS and InM. This dataset has detailed coverage of micro-enterprise activities undertaken by households, including sources of finance, as well as data on key public goods (such as the density of rural roads or the distance to various infrastructures), allowing for high-resolution analysis of households' RNF activities and of the extent to which growth in households' RNF activities can be explained by the enabling environment (for details on the dataset, see Khandker and Samad 2014).

The World Bank and BIDS carried out the first survey in 1991/92 to study the role of micro-finance in poverty reduction. The sample of 1,769 households was drawn randomly from 87 villages of 29 *upzilas* in rural Bangladesh. In 1998/99, again with the help of BIDS, those households were revisited, but only 1,638 households were available for the repeat survey owing to attrition. The resurvey included some new households from old villages and a few newly included villages. Altogether 2,599 households were surveyed in 1998/99, of which 2,226 were from old villages (allowing for the new households that had split off from the initial households) and 373 from new villages.

The households were surveyed again in 2010/11, this time with InM. The resurvey tried to visit all the households (2,599) surveyed in 1998/99. Due to attrition, 2,342 households were located, which grew to 3,082 households to include those that had split off. The analysis for this study is based on the 1,509 households from 1991/92 that were included in all three surveys. Of course, because of household split-off, the number of households is higher in 1998/99 (1,758) and 2010/11 (2,322). For the sake of completeness, this report uses the unbalanced dataset.

### **Advantages and drawbacks of the datasets**

Both datasets have advantages and drawbacks. The HIES is a large dataset, representative of the population and regions, but the panel survey is drawn primarily from low-income areas targeted by micro-finance institutions in the early 1990s, and the data thus have a sample bias for poorer areas. The HIES data covering 2000, 2005, and 2010 are not panel data (that is, they do not have

observations on the same unit at different points in time) at the household, PSU, or village level. As noted, panel analysis of these data can be done at the *upzila* level, which has limitations (unobserved factors at the household level may affect estimates drawn at the *upzila* level). On the other hand, the long panel data are drawn for the same households and communities over the 20-year period. This dataset is truly a long household panel in which it is possible to control for unobserved household and community characteristics.

Although this report analyzes the two datasets separately, it is worthwhile to examine at the outset how comparable they are. Two points are important to emphasize. First, HIES households from the lower 60 percent of the sample (based on income) are compared with the full sample of the long panel data, after excluding the non-poor population from the latter (based on sample in the first round of 1991/92). Second, HIES data of 2000 are compared with the 1998/99 data of the long panel, and HIES data of 2010 are compared with the 2010/11 data of the long panel, because only these survey years are close enough to be comparable between the two datasets. Table A1.1 (discussed and shown in the section that follows) compares the important outcome variables from the two datasets. It shows that among the six income and expenditure variables reported for two years, the differences between the outcomes are not statistically significant in most cases. Only the total income and non-farm income between the HIES 2010 and long panel 2010/11 datasets are found to be different (t-statistics of the differences are significant). While these differences (or lack thereof) between the two datasets are important to keep in mind, the report will investigate how trends in the outcomes and other findings vary between the two datasets.

### **A note on consistency between MH panel surveys and HIES of BBS**

The analysis takes advantage of the unique panel data structure of the MH panel surveys. The surveys cover all parts of the country, but since the sample is not nationally representative, it is important to analyze the comparability of the MH panel survey data with the nationally representative data to assess whether meaningful inferences can be drawn. A high degree of comparability would add to the main advantage of the MH panel surveys over the HIES, which is its longitudinal nature, which allows a deeper analysis of dynamics in rural Bangladesh.

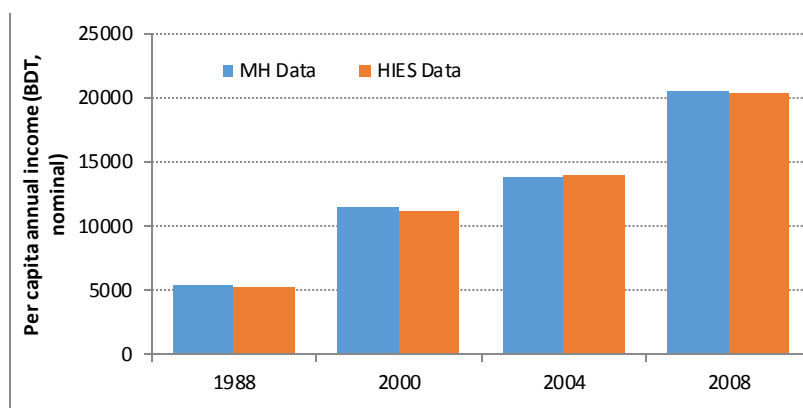
To check the validity and consistency of the MH panel surveys, key statistics (those that can be meaningfully compared, give the differences in the variables and definitions in each survey) from the MH data and the rural sample of HIES were compared for 2000, the only year of overlap, allowing a valid comparison. In 2000, the HIES sample covered 5,040 rural households, while the MH panel surveys included 1,911 households.

One important difference between the two surveys is that the MH panel surveys contains data on production and other income-generating activities of rural households but not on consumption. HIES includes consumption and income-generating activities but no data on production. An important implication of these differences is that the MH panel surveys allows estimates of poverty using only incomes and not consumption. Poverty statistics are normally measured using consumption expenditure.



For that reason, it is necessary to examine the differences in poverty estimates using the related but distinct measures of income vs consumption. One consistency check compares income estimates from the two surveys. Per capita annual income from two different surveys for four rounds is presented in Figure A1.2. Income for the HIES survey has been adjusted to the nearest years in which the MH surveys were conducted, adjusted by the rural consumer price index (CPI). The figure shows that the comparable per capita annual income from both datasets are almost identical, and statistical tests fail to reject the null hypothesis of equality of the income estimates from the two sets of surveys. The conclusion thus is that rural income estimates from both surveys are statistically comparable.

**Figure A1.2: Per capita annual income comparisons using HIES and MH panel surveys**



Source: HIES (various years), MH panel surveys (various years)

Note: HIES incomes for 1988, 2004, and 2008 have been generated using rural CPI from the closest survey.

Another important consistency check of the data from these two surveys is the estimate of rural poverty. Poverty rates from both surveys are compared in Table A1.1. As noted, a key difference in the poverty estimates is that poverty from the MH panel surveys is based on per capita incomes while poverty from HIES is estimated using per capita consumption expenditures, both using the same reference poverty lines from HIES. How much of a difference this might make involves understanding the relationship between the per capita expenditure and the per capita income. There is an obvious and natural relationship, but consumption is normally considered a more reliable indicator (due to measurement errors, but also as an indicator of a household's permanent income and consumption levels may differ from income levels at any point in time due to various consumption-smoothing mechanisms a household may have at its disposal).

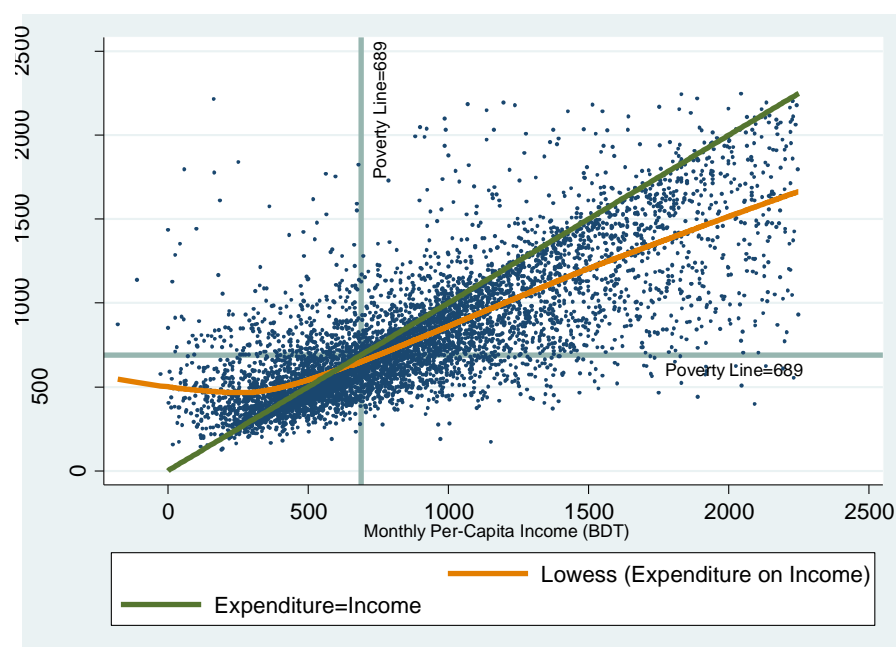
In general, income is expected to be higher than consumption for a typical household (reflecting some amount of saving) at any given level of expenditure. As such, poverty rates estimated based on the same level of income as poverty-level consumption expenditures may thus be expected to be higher than the poverty rates estimated based on consumption expenditures. This income-consumption gap is expected to grow with higher levels of income (consumption), reflecting the falling marginal propensity to consume. On the other hand, it is not unusual to observe some



households with consumption levels higher than their income levels, reflecting dissaving (or transfers), typically at very low (and typically below poverty) income levels.

To check the relationship between income and expenditure, a non-parametric relationship (using a Lowess curve) between consumption expenditure and income using the 2000 HIES data is plotted in Figure A1.3. The figure shows that the poverty line cuts the 45-degree line, which reflects equality between income and consumption expenditure, at a point marginally above the Lowess curve, which implies that poverty estimates based on income are expected to be marginally underestimated compared to poverty estimates based on expenditure. However, the scenario flips when considering the lower poverty line, with the Lowess curve above the 45-degree line (not shown), in which case estimates of extreme poverty based on income are overestimated compared to poverty estimates based on consumption expenditure.

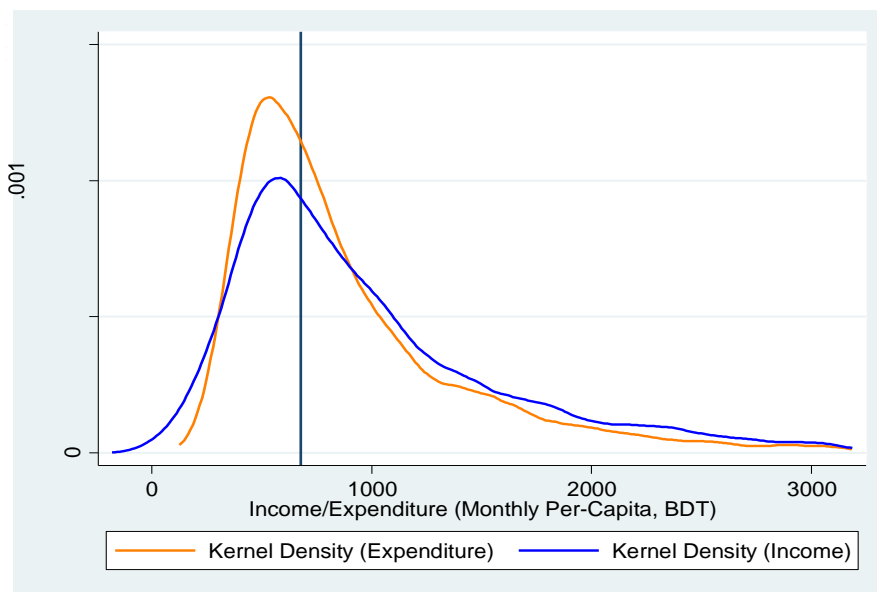
**Figure A1.3: Lowess of per-capita income on per-capita expenditure (HIES 2000) (truncated at 90th percentile)**



*Source: HIES (2000)*

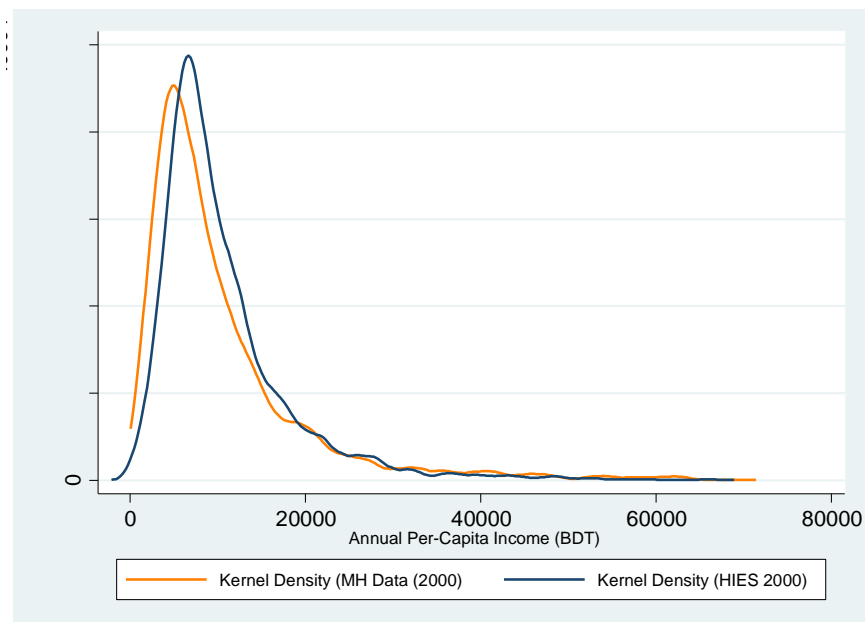
The similarity of the poverty estimates derived from income and consumption measures is shown in the distributions of the two derived measures (using kernel density distribution) in Figure A1.4. The figure shows more households below the upper poverty line based on expenditure than below the line based on income. It is thus clear that poverty estimates based on income will give lower estimates of poverty than the poverty estimates based on expenditure. Finally, Figure A1.5 shows the kernel density distribution of per capita annual incomes from both surveys. The distributions are similar, with income from HIES showing slightly higher incomes per capita. The main conclusion is thus that poverty estimates based on income using upper poverty lines from MH panel survey data provide a reasonably accurate picture of the level of poverty derived from the HIES consumption based measures.

**Figure A1.4: Kernel density per capita income and expenditure (monthly, BDT) from HIES 2000**



*Source: HIES (2000)*

**Figure A1.5: Kernel density function of incomes from HIES and MH survey, 2000.**



*Source: HIES (2000), MH panel survey (2000)*

Next, the actual estimates of poverty derived from both data sources are given in Table A1.1, using both the upper and lower poverty lines. The estimates based on the upper poverty line from both the MH panel surveys and HIES are consistent. For 2000, the MH data give the headcount poverty estimate of 51 percent

compared to the estimate from HIES of 52 percent. Similarly, for 2004, the estimates are 43 percent and 44 percent from the MH and HIES data, respectively. As expected, the estimates using the lower poverty line are higher from the MH data.

Other readily comparable sample characteristics across the two sets of surveys are household characteristics and land ownership. Mean household size for different rounds of the surveys, given in Table A1.2, are found to be quite consistent in both the levels and trend over time.

Another important consistency check is to compare land distribution in the two surveys. One important distinction that emerges from this comparison is that the MH surveys give relatively more weight to farm households (given their focus on agricultural activities) compared to HIES, as seen in Table A1.3. While 60 percent of the rural households covered in HIES are functionally landless, 43 percent of the households in the MH survey are functionally landless.

To conclude, despite some differences in orientation between the HIES and MH, the two samples are found to be reasonably comparable, allowing reasonably accurate inferences to be drawn from the dynamic analysis using the MH panel surveys.

**Table A1.1: Poverty rates derived from HIES and MH panel surveys**

Survey year	Head count poverty rate			
	Upper poverty line		Lower poverty line	
	MH surveys	HIES	MH surveys	HIES
1988	58.60		49.12	
1989		59.20		44.3
2000	51.28	52.30	43.17	37.90
2004	43.12		36.70	
2005		43.8		28.6
2008	37.46		28.16	
2010		35.2		21.1

**Table A1.2: Mean size of sample households, HIES and MH surveys**

Year	Household size	
	MH surveys	HIES
1988	5.87	
2000	5.25	5.18
2004	5.08	
2005		4.85
2008	4.94	
2010		4.50

**Table A1.3: Land ownership patterns, HIES and MH surveys in 2000**

	MH Surveys	HIES
Absolutely landless	7.2	5.6
Functionally landless	43.1	60.0
Marginal farmer	15.2	9.5
Small farmer	19.2	15.4
Medium and large farmer	15.4	9.4



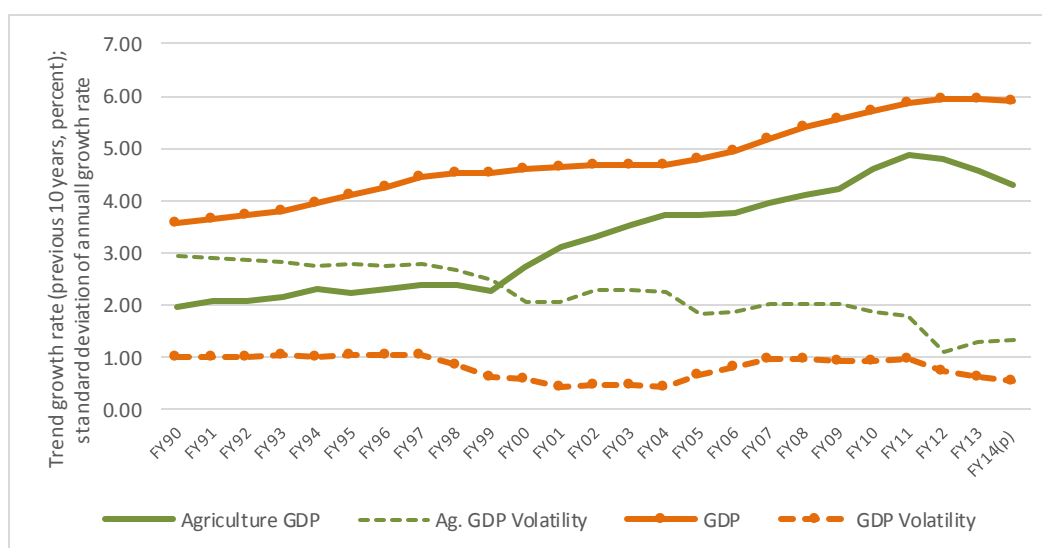
## 2 The Dynamic Rural Economy

### *Changing Economic Context*

For the Government of Bangladesh to achieve its stated goal of becoming a middle-income economy by 2021, national gross domestic product (GDP) must grow at a sustained rate of over 7 percent per year until then (World Bank 2012). Bangladesh's recent performance is encouraging. Overall GDP (trend) growth accelerated steadily from under 4 percent in the 1980s to approach 6 percent in the most recent 10-year period.

Agricultural growth also improved progressively (Figure 2.1). Starting from a low of around 2 percent in 1990 (reflecting growth in the 1980s), it improved only marginally (to about 2.2 percent) through the 1990s but then accelerated sharply and steadily to peak at almost 5 percent in the late 2000s—an impressive rate of growth for agriculture globally. Growth has moderated somewhat in recent years, but remains near its historical highs.

**Figure 2.1: Total and agricultural GDP in Bangladesh: Trend growth rate and growth volatility**



Source: National accounts data, BBS.

Note: Trend growth rate is estimated over each of the previous 10-year periods; volatility is measured as standard deviation of the annual growth rate over the same (previous) 10-year period.

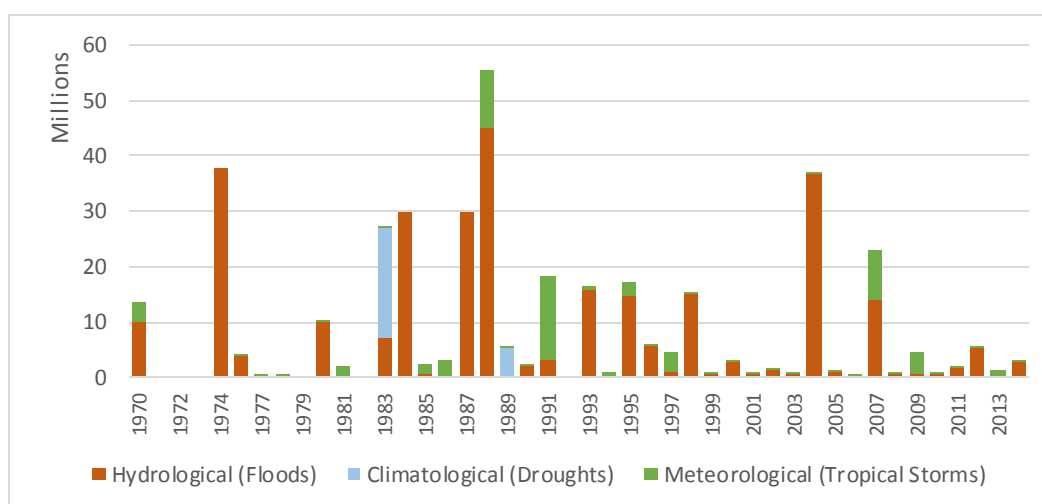
The sharp increase in the trend growth rate for agriculture around 1998 suggests that a structural break occurred in the sector's growth trajectory. In fact, the standard Zivot-Andrews unit root test<sup>4</sup>

<sup>4</sup> The Zivot-Andrews unit root test for structural break allows for the break point to be determined endogenously from the time-series data on agricultural GDP. The data used are from 1976 to 2014, leaving out the turbulent years of the early 1970s.

detects a break in 1996, the year that policy reforms were completed. The break in the trend is not visually perceptible until a couple of years later, likely due to the impact of the massive floods in 1998. The wide-ranging reforms implemented from 1991 to 1996 aimed to achieve macro-economic stability, increase the orientation toward private sector-led growth, initiate trade and a broader economic liberalization with an explicit outward emphasis, and renew the focus on agricultural and rural development (Ahmed et al. 2009; Mujeri 2008). The reforms' significant positive impact on agriculture is visible in the subsequent rapid acceleration of agricultural growth.

Agricultural growth has also become markedly less volatile, partly because relatively fewer major natural disasters have occurred since 2000 compared to previous decades (Figure 2.2). Floods have historically been the most devastating natural disasters in Bangladesh, but storms also regularly pound coastal areas. A second factor that has reduced volatility is the increasing resilience of agriculture, which absorbed two major, damaging shocks in 2004 and 2007 reasonably well. Resilience has increased through the rapid spread of irrigation, the contributions of different subsectors within agriculture (crops, livestock, forestry, and fisheries), and the spread of agricultural technology.

**Figure 2.2: Incidence of natural disasters and numbers of persons affected, 1970–2014**

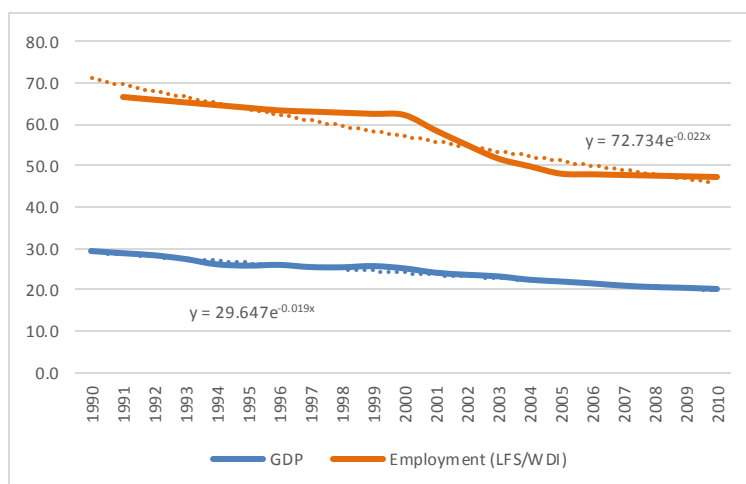


Source: EMDAT database.

The structural transformation of the economy in Bangladesh has followed the familiar pattern observed in transforming economies worldwide (Figure 2.3). Relative to most other developing countries, Bangladesh is “ahead of the curve,” as the share of agriculture in total employment is falling faster than the share of agriculture in GDP. Agriculture’s employment share fell at an annual rate of 2.2 percent between 1990 and 2010 (the latest year for which employment data are available), while its share in GDP fell at a rate of 1.9 percent over the same period (from about 30 percent in 1990 to about 20 percent in 2010) and is now at 19 percent (as per the national accounts

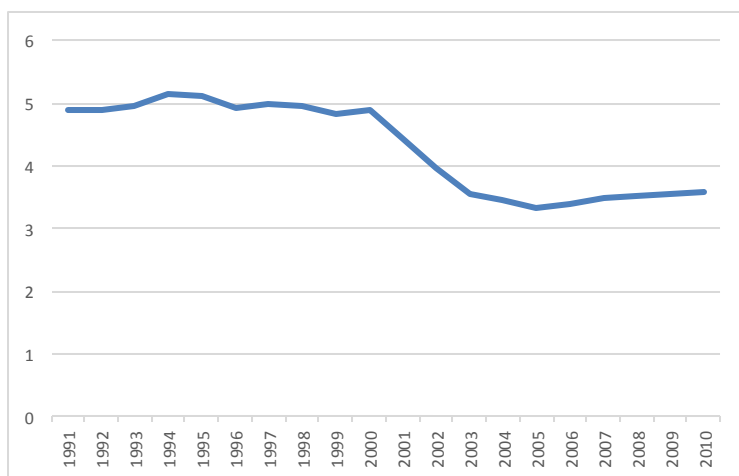
data for 2013).<sup>5</sup> As is also typical of transforming economies, labor productivity is significantly higher in non-agricultural sectors than in agricultural sectors (Figure 2.4). But good agricultural growth and the exodus of labor from agriculture have significantly narrowed this gap since 2000.<sup>6</sup>

**Figure 2.3: Structural transformation: Share of agriculture in GDP and employment**



Source: National accounts data, LFS (various years), and WDI.

**Figure 2.4: Ratio of non-agricultural to agricultural labor productivity**



Source: Calculated using national accounts data on GDP and LF data (interpolated for inter-survey years).

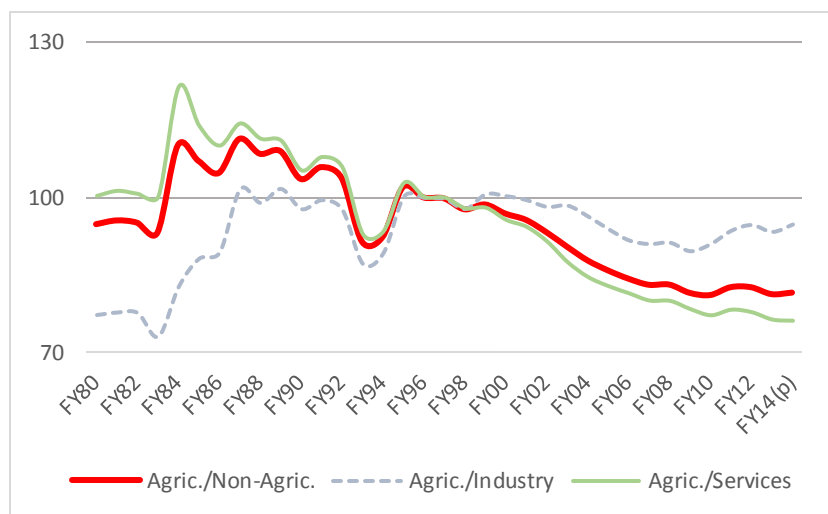
<sup>5</sup> Agricultural GDP is defined to include crops and horticulture, livestock, forestry, and fisheries; the sector's share is taken as the share of real GDP at producer prices using the national accounts data from BBS.

<sup>6</sup> The share of employment in agriculture is interpolated for the years between the various Labour Force Surveys, which were carried out in 1991, 1996, 2000, 2003, 2005, and 2010.

Agriculture's overall performance since the mid-1990s is all the more remarkable because it has occurred in a challenging macro policy environment. Two major indicators of the broad policy-induced incentive structure facing agriculture are the aggregate sectoral terms of trade and the external and macro policy environment, as summarized in the nominal and relative rates of protection. The agricultural/non-agricultural terms of trade, calculated as the ratio of the GDP deflator for agriculture to the GDP deflator for the rest of the economy (indexed at 1995=100) favored agriculture in the 1980s but deteriorated steadily after 1995 (Figure 2.5). Figure 2.5 also displays trends in the terms of trade for agriculture in relation to industry and to the services sector. The deterioration in terms of trade was significantly worse for agriculture in relation to the services sector, declining steadily through 2014. The agriculture/industry terms of trade experienced a minor bounce in the late 2000s—although remaining well below the 1995 benchmark—reflecting the global food price spikes in 2007 and higher relative real prices for agriculture afterward. The overall terms of trade for agriculture, in which the services sector weighs more heavily than the industrial sector, has remained flat and significantly depressed, however.

The conclusion emerging from these trends is that while price increases arrested the deterioration in the terms of trade and possibly reversed it to a limited extent against industry, agriculture's recent improved performance cannot be attributed largely to higher real food/agricultural prices, a concern expressed by many observers. Instead, the overall improvement in agricultural growth has been driven more by improved productivity, with investments in infrastructure, physical and human capital, and technology, as discussed in the following chapters of this report.

**Figure 2.5: Trends in terms of trade for agriculture and other economic sectors**



Source: National Accounts data, BBS.

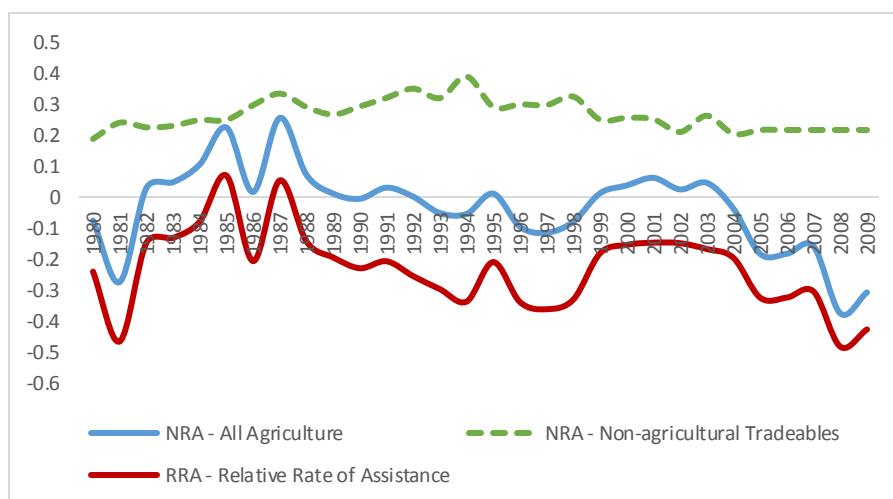
The influence of macro policy on overall incentives for agriculture is also reflected in the level of assistance afforded to agriculture. (Figure 2.6). The nominal rate of assistance (NRA) measures



the extent to which public policy alters the incentives for farmers by raising (or lowering) domestic prices relative to the external market prices, and the relative rate of assistance (RRA) provides a measure of the domestic distortions as differential policies across sectors alter the relative prices across sectors (Anderson 2009).

External trade policies appear to have had a fairly neutral effect on agriculture from the 1990s to the mid-2000s, with the NRA showing minor annual fluctuations, implying that Bangladesh has maintained a stable external policy framework that generally did not distort incentives for farmers. In other words, agriculture experienced no implicit taxation or implicit subsidies until about 2004. Between about 2004 and 2009 (2009 is the latest year for which estimates are available), agriculture was increasingly heavily taxed. During that period, as global food prices soared, Bangladesh maintained domestic prices below world market prices. In contrast, the domestic policy environment for agriculture was characterized by a large and consistently negative RRA. That is, the neutral external trade policy for agriculture coexisted with protection for the non-agricultural tradeables, creating an implicit domestic policy bias against agriculture: protection raised the domestic prices of goods produced by the other sectors relative to their competitive levels while agricultural goods were competitively priced, effectively taxing agriculture.

**Figure 2.6: Nominal and relative rates of assistance**



Source: Anderson and Nelgen 2012.

The negative RRAs for agriculture resonate with findings of the Diagnostic Trade Integration Study (Kathuria and Malouche 2016), which discusses Bangladesh's current trade policy in detail and highlights the remaining inconsistencies and distortions in the trade regime. Kathuria and Malouche report that while the Bangladeshi economy has become increasingly open since independence (1971), with significant reforms in the early 1990s, trade liberalization has experienced periodic reversals. Tariff rates generally have been scaled down, but myriad para-tariffs and duties still protect selected industries. Consumers and export sectors (other than the

garment industry) bear the brunt of the consequences of protectionist policies that reduce incentives to export and diversify and also raise domestic prices.

Because levels of taxation vary across and within sectors, incentives across sectors and products are distorted. Estimated levels of taxation show that textiles, foodstuffs, and vegetable products are taxed the least, whereas other sectors are subject to much higher levels of border taxation. These underlying distortions and uneven taxation lead to the implicit taxation of agriculture as shown by the negative RRAs for agriculture in Figure 2.6.

## *Transforming Rural Economy*

Much of Bangladesh's structural transformation is taking place within the rural space. The process of growth and change in the rural economy has not been uniform in all areas, but the effects are evident both within and outside agriculture. The steady though not dramatic transition in the structure of economic activities has been reviewed by Rahman (2014) and is summarized in Table 2.1. The scarcity of arable land (estimated at 0.05 hectares per capita) probably poses the most serious obstacle to future agricultural growth in Bangladesh, given that its population density is among the highest in the world. The challenge to agricultural livelihoods is clearly indicated by the very small amount of arable land per agricultural worker (averaging 0.26 hectare per worker over 2006–11, according to FAO).

**Table 2.1: Changes in income and employment in agriculture and rural non-farm activities (RNF), 2000–10**

Sector	Item	Year		Increase in 10 years (%)
		2000	2010	
Agriculture	Employment (millions)	18.70	22.74	21.6
RNF	Employment (millions)	11.60	18.92	63.1
Agriculture	Annual income of rural HH (million BDT, 2010 prices)	61,3307	91,3566	48.96
RNF	Annual income of rural HH (million BDT, 2010 prices)	61,5426	99,5461	61.75
Agriculture	Share of income (%)	49.9	47.8	--
RNF	Share of income (%)	50.1	52.2	--

Source: Rahman 2014.

Certainly rural households need to diversify their income sources and livelihood strategies, not only to manage risk but to ensure more rapid growth. The evidence suggests that such diversification is well underway in Bangladesh. Two particularly important dimensions of the evolving rural structure deserve attention. First, the process of transformation has not followed the generally assumed rural-urban pattern. Second, what emerges is a pattern of income diversification rather than discrete changes in livelihoods or occupational shifts of entire households.

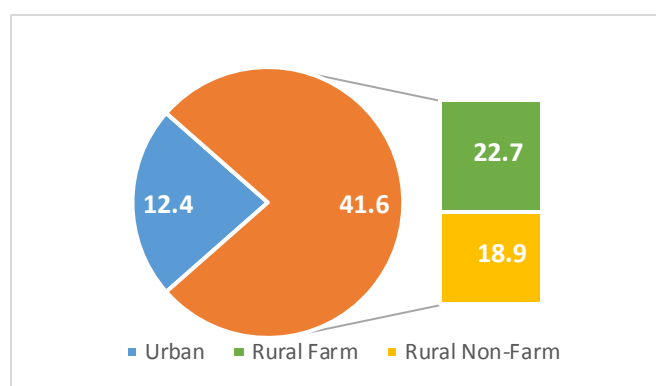
### *Structure of rural employment*

An important facet of Bangladesh's structural transformation is that much of it is taking place within the rural space and is not driven by the typical shift from rural to urban employment. An

understanding of how this process is unfolding is essential for understanding the dynamics of poverty and income growth, which will be discussed later in this chapter (see “A Changing Poverty Profile” and “Patterns and Drivers of Income Growth of Rural Households”).

The nationally representative Labour Force Survey (LFS) (BBS 2011), summarized in Figure 2.7, shows that in 2010 almost 42 million, or 77 percent, of the 54-million-strong national workforce was employed in rural areas. This share was marginally higher than the 76 percent estimated in 2002/03 and 2005/06 LFSs. Among all forms of employment (rural and urban), agricultural employment occupied just over 47 percent of the workforce, a modest decline over previous LFSs (52 percent in 2002/03, 48 percent in 2005/06).<sup>7</sup>

**Figure 2.7: Urban and rural workforce (millions), 2010**



Source: LFS, 2010.

Between 2003 and 2010, most non-agricultural jobs created in Bangladesh were in rural and not urban areas, as generally presumed. Urban employment increased at about 2.1 percent annually over that period (from 10.3 million in 2002/03 to 11.3 million in 2005/06 and 12.4 million in 2010). In contrast, rural employment grew at 3.1 percent, providing an additional 2.5 million jobs between 2002/03 and 2005/06 and a substantial 5.5 million between 2005/06 and 2010. By 2010, employment in the rural non-farm sector was 18.9 million

compared to total urban employment of 12.4 million, or over 50 percent higher.

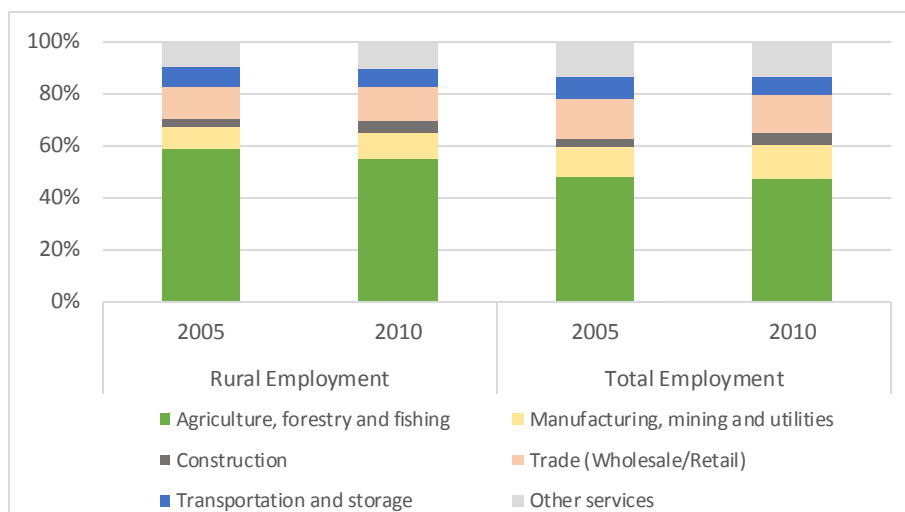
Cities still attract workers, probably because more services are available, yet the urban unemployment rate (about 6.8 percent, having grown at a staggering 15.8 percent between 2005/06 and 2010) was almost double the rural unemployment rate (3.9 percent, having grown by 1.5 percent per year). These magnitudes and trends have significant implications for policy, development strategy, and public expenditure priorities if the objective is to reduce poverty more rapidly and share prosperity more widely.

Agriculture, defined as including agricultural wage labor and self-employed farming, provided most of the jobs in rural areas in 2010 (22.7 million, as shown in Figure 2.7) and occupied more than 54.5 percent of the rural workforce (a slight decline from 58.6 percent in 2005/06) (Figure 2.8). Agriculture remained the dominant employer of both the rural and total labor force. The sector employed a significantly higher share of women in 2005 (78.8 percent) than in 2010 (69.5 percent), and in both years, agricultural employment was higher among women than men, who formed 52.3 percent of the rural male workforce in 2005/06 and 48.1 percent in 2010.

<sup>7</sup> According to previous LFSs, agricultural employment rose from 48.9 percent in 1995/96 to 51.3 percent in 1999/2000 and 51.7 percent in 2002/03 before starting the decline documented in later surveys.

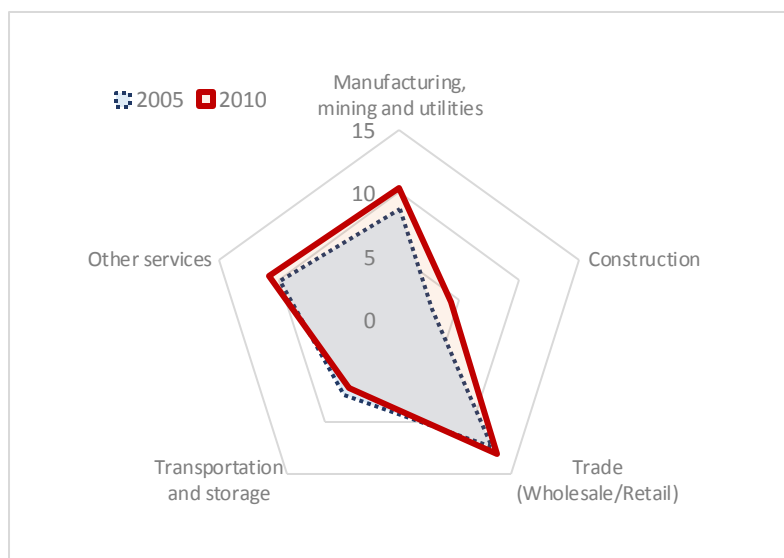
The structure of rural non-farm employment, using the broad categories of employment in the LFS, changed little between 2005/06 and 2010. Trade continued to provide the largest share of non-farm jobs, with some increase in manufacturing and construction employment (Figure 2.9).

**Figure 2.8: Agriculture continues to dominate rural and overall employment**



Source: LFS 2005 and 2010, BBS

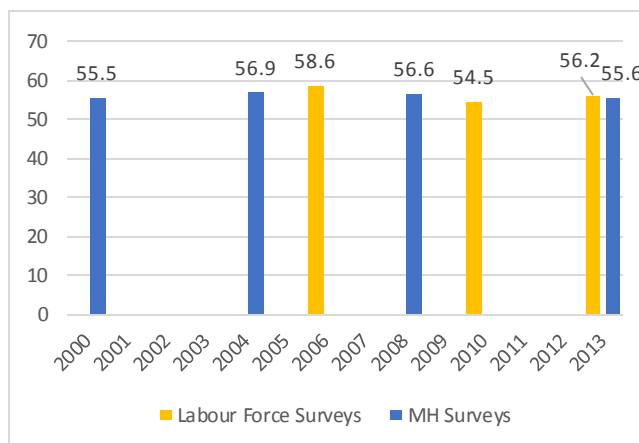
**Figure 2.9: Rural non-farm employment, 2005–10**



Source: LFS 2005/6 and 2010; BBS 2010.

The MH panel surveys describe the broad composition of the rural workforce reasonably well. The shares of agricultural employment (including farmers and agricultural labor) from the MH panel survey and LFS appear fairly consistent (Figure 2.10). A more detailed comparisons of non-farm jobs is not possible due to definitional differences between the two surveys.

**Figure 2.10: Share of rural workers in agriculture, Labour Force Survey and MH panel survey**



Source: LFS, BBS and MH Surveys, various years.

The panel data show that the shares of farmers (self-employed) and of agricultural labor have declined as employment has expanded in business activities (Table 2.2). Employment in services and transportation changed very little. It is noteworthy that the shares of employment in services requiring lower skills (a primary education or less) or higher skills (more than a primary education) remained static.

**Table 2.2: Evolution of rural employment (percent), 2000–13**

	2000	2004	2008	2013
Farming	42.1	46.3	43.0	39.6
Agricultural labor	11.7	10.1	11.8	9.2
Non-agricultural labor	3.9	2.8	3.3	6.3
Business	15.8	14.5	14.4	18.4
Transportation	7.0	6.2	6.9	6.5
Low-skilled service	8.1	7.6	8.5	8.0
High-skilled service	11.4	12.6	12.1	12.0

Source: MH panel survey.

## *Sources of rural incomes*

In 2010 nearly 87 percent of rural households earned some income from agriculture, whereas 77 percent earned some form of non-farm income (HIES data, Table 2.3). Slightly more rural households are drawing income from non-farm as well as farm sources (65 percent in 2010, up

from 63 percent in 2000), confirming the increasing tendency to pursue multiple income-generating strategies.

The picture that emerges from Table 2.1, which uses household-level aggregates, shows the growing size (in macro terms) of rural non-farm activities. Averages at the household level provide a more accurate picture at the micro level, however, by taking account of the inequality in incomes and important demographic changes in households, specifically the decline in household size and changes in the number of workers.

**Table 2.3: Sources of income for rural households, 2000–10**

<b>Welfare indicators</b>	<b>2000</b>	<b>2005</b>	<b>2010</b>
Per capita total income (BDT/month)	899	991	1,188
Per capita farm income (BDT/month)	424	385	579
Per capita non-farm income (BDT/month)	400	519	487
Per capita remittance income (BDT/month)	75	86	122
Share of farm income (%)	47.2	38.8	48.7
Share of non-farm income (%)	44.5	52.4	41.0
Share of remittances (%)	8.3	8.7	10.3
<i>Households with farm income (%)</i>	<i>79.9</i>	<i>80.8</i>	<i>87.2</i>
<i>Households with non-farm income (%)</i>	<i>83.1</i>	<i>89.1</i>	<i>77.4</i>
<i>Households with both farm and non-farm income (%)</i>	<i>62.9</i>	<i>69.9</i>	<i>64.5</i>
<i>Composition of household income</i>			
Share of agricultural production <sup>†</sup> (%)	23	21	18
Share of livestock and fishery (%)	10	4	14
Share of agricultural wage income (%)	14	14	16
Share of enterprise income (%)	15	15	13
Share of wage and salaried income (%)	13	27	24
Share of income from miscellaneous sources <sup>‡</sup> (%)	17	11	4
Share of remittances (%)	8	9	10

Source: HIES 2000, 2005, and 2010.

Note: Monetary figures are CPI-adjusted; 2000 = 100.

<sup>†</sup> Receipt from crop, vegetable, and fruit production and other horticultural activities.

<sup>‡</sup> Receipt of self-employed professional (lawyer, doctor, tutor, and so on), rental income from properties and assets, interest and profits from savings and investments, and receipts from safety net programs, charities, and similar sources.

Key welfare measures for rural households derived from the HIES between 2000 and 2010 (summarized in Table 2.3) show that the share of households with farm-sourced income (income from all crops and horticulture, livestock, fisheries, and agricultural wages) increased marginally through the decade, while—surprisingly—non-farm incomes (from all sources other than farm-related activities and remittances) fell. The relative slowdown of the non-farm sector during 2005–10 occurred as the profitability of agriculture surged and consumer goods from urban centers

increasingly replaced goods once supplied by village industries.<sup>8</sup> Even so, non-farm activities remain critically important for rural households, as they account for a significant share of rural household income (41 percent).

Remittances are another major factor that has driven growth.<sup>9</sup> Estimates from the 2010 HIES indicate that a significant 26 percent of rural households receive remittance income, and on the whole remittances account for about 10 percent of the income of an average rural household.<sup>10</sup> These estimates coincide closely with those from the BIHS survey, which shows that on average remittances constitute 13.8 percent of rural household income. The BIHS also shows that the incidence of remittances and the relative size of their contribution to household income vary significantly.

The benefits of remittances appear to be concentrated in particular geographical areas. The distribution of remittance amounts by administrative division, estimated in HIES 2010, shows that the vast majority of remittances were concentrated in two divisions—Chittagong Division (42.4 percent of all remittance income) and Dhaka Division (35.0 percent). All other divisions have much lower shares, with the next largest being Rajshahi Division, at 7.6 percent.

## *Changing Poverty Profile*

As the array of farm and non-farm activities in rural areas grows, becoming more intricately intertwined and interdependent, the rural economic structure and its dynamics become increasingly more complex and challenging to understand. This section aims to develop a more accurate picture of the underlying dynamics and drivers of rural poverty at the household level. The starting point for the analysis is the central insight of the PAR—that growth in farm income was a powerful and unappreciated driver of poverty reduction between 2000 and 2010. Much of the ensuing discussion focuses on the considerable mobility of rural households' economic status and consequently on the need for policies and strategies that not only enable households to move out of poverty but help them avoid repeated transitions in and out of poverty.

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<sup>8</sup> Farm incomes experienced faster growth per capita (at 1.2 percent per year between 2005 and 2010) than non-farm incomes, including remittances (at 1.0 percent per year between 2005 and 2010). Between 2000 and 2005, farm incomes per capita grew at 0.99 percent per year while non-farm incomes (again, broadly defined to include remittances) grew relatively faster at 1.02 percent per year.

<sup>9</sup> Here and for most of the analysis in this report, remittances are considered as distinct from other non-farm sources of income. Remittances are a rapidly growing non-farm source of income. They are not derived from the local economy; as such, they require actions that differ from actions needed to stimulate local drivers of economic activity and so have different implications for policy.

<sup>10</sup> Estimates from HIES need to be interpreted carefully, as they show that in 2010 only 13.72 percent of rural households (12.28 percent of all households) had migrant members (4.84 percent reporting domestic migrants and 9.25 percent reporting foreign migrants). When only households with migrant members are considered, only about 7 percent of household income, on average, comes from remittances, a figure that has remained constant since early 2000. It is likely, however, that some households do not currently have dependents or nuclear family members who are migrants but nevertheless receive remittances, perhaps from extended family or adult offspring who are no longer considered to be part of the current family as defined in the survey framework.

## *The evolving endowments of rural households*

Rural households in Bangladesh are changing in a number of ways that are significant for agriculture. Panel data from the same set of households over 13 years show that family size has continuously fallen since 2000, while the number of income-earning members in each household has remained relatively stable, causing the dependency ratio to decline (Table 2.4). Survey households also experienced a decline in the number of agricultural workers and a corresponding increase in the number of non-agricultural workers, as well as a significant increase in the share of female workers per household. An especially dramatic change is that the share of households headed by women doubled between 2004 and 2008.

**Table 2.4: Changes in household assets, 2000–13**

	2000	2004	2008	2013
<b>Labor force</b>				
Family size	5.40	5.23	4.94	4.43
Number of earners	1.56	1.63	1.58	1.51
Number of agricultural workers	0.89	0.93	0.84	0.63
Number of non-agricultural workers	0.67	0.69	0.73	0.88
Number of female workers	0.09	0.12	0.18	0.185
Sex of household head (female, share)	0.06	0.07	0.14†	0.15
<b>Natural assets</b>				
Per capita owned land (ha)	0.11	0.11	0.10	0.11
Per capita cultivated land (ha)	0.07	0.07	0.06	0.08
Per capita rice area (ha, gross)	0.09	0.09	0.08	
Per capita rice area planted to modern varieties (ha)	0.07	0.07	0.07	
<b>Human capital assets</b>				
Average years of schooling of earning members	4.10	4.21	4.34	4.60
Average years of schooling of agricultural workers	3.33	3.46	3.7	3.87
Average years of schooling of non-agricultural workers	5.1	5.57	5.35	5.50
<b>Financial assets (in 2008 BDT)</b>				
Amount of formal institutional (bank) loans (per capita)	533.44	366.18	360.89	518.5
Amount of NGO loans (per capita)	429.27	563.32	956.40	1,588.2
Amount of non-institutional (informal) loans (per capita)	375.56	499.63	1,070.94	1,064.3
Total amount of loan taken (per capita)	1,338.27	1,429.13	2,388.23	3171
Agricultural capital (per agricultural worker)	8,158.30	8,434.42	11,757.45	
Non-agricultural capital (per non-agricultural worker)	15,523.16	11,514.14	12,938.70	

Source: Authors' calculations, based on data from MH panel surveys, various years.

† HIES 2010 reports that 15.3% of rural households are headed by women.

With about 8 million hectares of arable land for about 160 million people, Bangladesh has the world's highest population density; landholdings per capita are extremely small. The decline in the size of landholdings among the panel survey households appears to have stabilized, remaining at about 0.11 hectares per capita from 2000 to 2013. For these households, the area of cultivated land is even lower at 0.08 hectares per capita, but it has also remained stable. Irrigation has helped



the gross area per capita under rice to become slightly larger. Farm households have not increased the area planted to high-yielding modern varieties, but given that roughly 80 percent of the area is already under modern varieties, the scope for expansion is limited.

An important change in these rural households is their growing endowment of human capital. Average years of schooling for workers in a rural household increased from 4.1 years in 2000 to 4.6 in 2013. The average level of schooling has risen for agricultural and non-agricultural workers alike. Additional schooling is thought to facilitate the transition to non-farm work (in addition to the advantages it confers on those who remain in agriculture).

Access to finance from formal financial institutions (banks) has stagnated, and over time such financing has declined in size relative to non-formal sources of credit. The size of loans per capita from non-governmental organizations (NGOs) and non-institutional (family, friends, informal moneylenders) sources is now significantly larger. The rate of increase in volume per capita has been rapid for both NGO loans (almost quadrupling between 2000 and 2013) as well as non-institutional loans (tripling over the same period).

One of the most telling statistics for rural households is where they choose to invest their savings or borrowed capital, and in this regard the panel data imply that an important change is underway in rural Bangladesh. Agricultural capital per agricultural worker increased by 44 percent between 2000 and 2008,<sup>11</sup> even as the amount of non-agricultural capital per non-agricultural worker declined, reflecting households' continued engagement, and confidence, in agriculture. This information also reflects the increasing capital intensity of agriculture, which is consistent with the growth in agricultural mechanization. The apparent decline in capital intensity in the non-farm sector probably reflects an increase in informal or wage labor rather than an increase in non-farm business activities.

### ***The changing poverty profile of rural households***

Strong growth, both in the overall economy and in agriculture, has been accompanied by a significant reduction in poverty, measured by income as well as by significant improvements in some key human development indicators (World Bank 2012). Trends and severity of income poverty in Bangladesh since 1988/89 are presented in Table 2.5 and Table 2.6, estimated from HIES data for 2000 to 2010. As Box 2.1 explains, these trends are closely reflected in the MH panel data.

A brief recap of the main trends helps to frame the overall progress in poverty reduction over recent years as well as the development challenge that lies ahead. First, the headcount ratio of the population living in poverty declined from 58.4 percent in 1991/92 to 31.5 percent in 2010, a reduction of 1.5 percent per year (Table 2.5). Second, the pace of poverty reduction was faster in the 2000s—poverty declined by 1.75 percent per year with faster income growth (Table 2.5).

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<sup>11</sup> This information was not collected in the census of 2013.

Third, the pace of poverty reduction was uneven between rural and urban areas. In the 1990s, urban poverty levels fell faster than rural poverty, but in the 2000s, poverty declined more rapidly in rural areas. These trends correspond closely to agricultural growth performance (shown earlier in Figure 2.1). Fourth, the level of inequality, as measured by consumption expenditure distribution, shows very little change in both rural and urban areas between 1991/92 and 2001 (Table 2.5). Fifth, per capita income as a ratio of poverty-line income, an indicator of economic vulnerability, is much higher in urban areas, implying that urban non-poor households are less vulnerable than rural non-poor households (Table 2.6).

**Table 2.5: Trends in consumption-poverty in Bangladesh (CBN method)**

	1988/89	1991/92	1995/96	2000	2005	2010
<b>National</b>						
H	57.1	58.4	53.1	48.9	40	31.5
P(1)	15.4	17.2	14.4	12.8	9	6.5
P(2)	5.8	6.8	5.4	4.6	2.9	2
<b>Urban</b>						
H	43.9	44.9	35.1	35.2	28.4	21.3
P(1)	11.1	12	9.2	9	6.5	4.3
P(2)	3.8	4.4	3.4	3.3	2.1	1.3
<b>Rural</b>						
H	59.2	61.2	56.6	52.3	43.8	35.2
P(1)	16	18.1	15.4	13.7	9.8	7.4
P(2)	6.1	7.2	5.7	4.9	3.1	2.2

Source: Estimates taken from the HIES 2010 report and the World Bank Country Study on Bangladesh (1999).

Note: H is a headcount measure, P(1) is the poverty gap, and P(2) is the squared poverty gap. CBN is cost of basic needs.

**Table 2.6: Trends in income growth and inequality, Bangladesh**

	Poverty line	Survey mean (BDT/person/month)	M-P ratio	Gini index
<b>Rural</b>				
1988/89	379	435	115	0.26
1991/92	469	510	109	0.25
1995/96	591	653	110	0.27
2000	635	820	129	0.27
2005	832	1,088	131	0.28
2010	1,511	2122	140	0.27
<b>Urban</b>				
1988/89	454	695	153	0.32
1991/92	535	817	153	0.31
1995/96	707	1,234	175	0.37
2000	725	1,430	197	0.37
2005	949	1,808	191	0.35
2010	1,730	3,202	185	0.32

Source: HIES, 2000–2010.

Note: M-P ratio is the mean as a percentage of the poverty line.

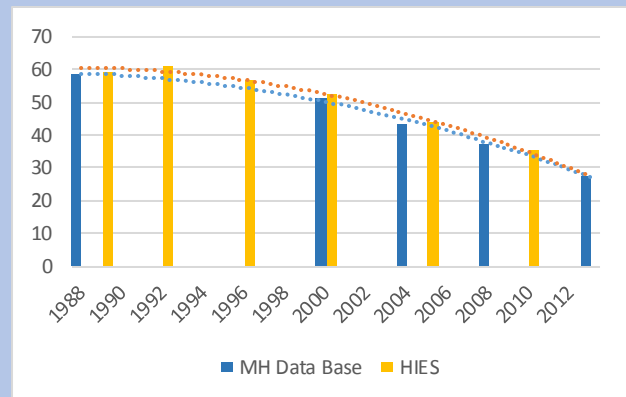
### Box 2.1: Comparability of poverty estimates based on MH and HIES data

The poverty ratio for the MH panel survey data is estimated using rural stratum poverty line incomes from various rounds of the Household Income and Expenditure Survey (HIES). The HIES poverty lines are based on the cost of basic needs. Poverty lines from a nearest year's HIES are updated with the rural consumer price index to match the years of the MH panel surveys. HIES uses consumption expenditure data to estimate income poverty, as consumption is considered to be a better indicator of households' permanent income status, especially in agrarian economies subject to year-to-year fluctuations in output. However, the 62-village panel survey does not collect households' consumption information; rather it focuses on their income-generating activities. An estimate of income, instead of consumption expenditure, is thus used to generate the poverty trends from the panel survey.

Because they use the same reference poverty line incomes used in HIES, the income-based poverty measures from the MH surveys provide estimates of poverty comparable to the HIES poverty measures. For example, in 2000, the poverty rate was 51 percent for the 62-village panel survey, and the matched rural poverty rate was 52 percent in HIES. The interpolation of income poverty lines for years other than HIES survey years also shows that the MH panel surveys reflects the emerging poverty picture for 2004 and 2008 with reasonable accuracy. These similarities are evident in the figure, which plots trends in rural poverty and its evolution from 1988 to 2013. This comparability is important, as the MH panel data offer a unique opportunity to study the dynamics of poverty by tracing the fortunes of individual households over time. Because of this usefulness, the MH panel surveys is used extensively later in this report. For a comparison of poverty and selected indicators from the various years of HIES and the MH panel surveys, see Annex 1.

Source: Authors.

Evolution of rural poverty in Bangladesh: 1988–2013



Source: HIES data 2000, 2005 and 2010, and MH panel surveys 1988, 2000, 2004, 2008, and 2013.

Aside from the progress in poverty reduction indicated by these income/expenditure measures, Bangladesh has also made progress based on non-income measures, as noted in the PAR, including food security. In 2010, 38.4 percent of the population was moderately calorie deficient, down from 40.4 percent in 2005.<sup>12</sup> The percentage of people suffering from severe calorie deficiency declined relatively faster, from 19.5 percent in 2005 to 16.1 percent in 2010.

Yet rural poverty, even with these impressive declines, remained high in 2010 at 35.2 percent, and it is deeper and more concentrated than urban poverty. An important facet of poverty that is well recognized in the literature<sup>13</sup> but often insufficiently analyzed is the movement of households in and out of poverty. This churning has major implications for policy and strategy, yet it cannot be

<sup>12</sup> A moderately calorie-deficient individual is defined as consuming fewer than 2,122 kilocalories per day. A severely calorie-deficient individual is defined as consuming fewer than 1,805 kilocalories per day.

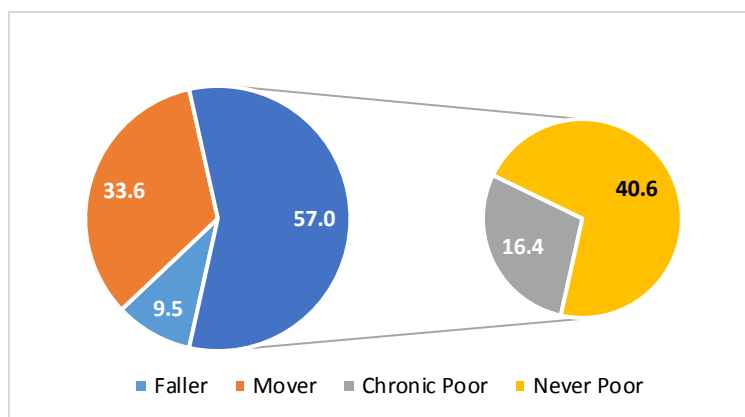
<sup>13</sup> See, for example, Ravallion (2001, 2005) and Narayan, Pritchett, and Kapoor (2009).

detected by looking at poverty estimates at discrete points of time, as in the figure in Box 2.1. The figure depicts a relatively smooth decline in poverty, but in reality, the poor and the vulnerable engage in a real-life game of Snakes and Ladders; for them, pathways out of poverty are rarely linear or predictable.

Despite significant efforts and sacrifices to climb up the income ladder, many poor people are pushed back down the ladder because of multiple shocks—sudden illness or chronic poor health, deaths or disabilities of earners, natural disasters, and a multitude of other personal or impersonal misfortunes (Rahman and Hossain 1995; Kabeer 2009; Narayan, Pritchett, and Kapoor 2009). Aside from personal issues and health crises, economic and business risks are important and often underestimated risks for poor rural entrepreneurs.

The twists and turns experienced by rural households cannot be observed with cross-sectional surveys such as HIES, but as discussed in Box 2.1, an important advantage of the MH panel surveys is that they track changes in households over time, especially changes in their poverty status, which allows a more robust analysis of the characteristics of the poor and the drivers of poverty. Each household can be classified into one of four groups (“dynamic poverty groups”) based on its poverty status between any two years. For example, Figure 2.11 shows the classification of households into dynamic poverty groups for the 2000 and 2013 rounds of the MH panel survey. If the sample households were not poor in each round, they were categorized as *never poor*; households that were poor in each round are categorized as *chronically poor*. Households that were not poor in the base year but had become poor by the end year were categorized as *faller households* (or *descending households*), and households with the opposite pattern were considered *mover households* (or *ascending households*).<sup>14</sup>

**Figure 2.11: Poverty status of rural households, 2000 and 2013**



Source: MH panel survey.

<sup>14</sup> These terms are first used in Sen (2003) and, more precisely, in Deininger, Narayan, and Sen (2009).

In a comparison of any two years, this classification generates a simple 2x2 table, but with multiple survey rounds, it is possible to capture a household's multiple movements across the poverty line. The most recent four rounds of MH panel survey data (2000, 2004, 2008, and 2013) were used in the analysis for this report<sup>15</sup> to examine the churning that takes place as rural households move in and out of poverty. The data track the poverty status of about 1,300 households at four points in time between 2000 and 2013.

The static (single-period analysis) shows poverty declining from about 50 percent in 2000 to 43, 38, and 26 percent in the successive survey years. A simple end-point comparison of households between 2000 and 2013 (shown in Figure 2.11) shows that the majority of households (almost 57 percent of the sample) maintained the same poverty status over the entire period. Altogether, 41 percent remained non-poor and 16 percent remained poor; of the other 43 percent, about 36 percent had climbed out of poverty by 2013, while 10 percent had fallen into poverty. This simple analysis presents a generally positive picture.

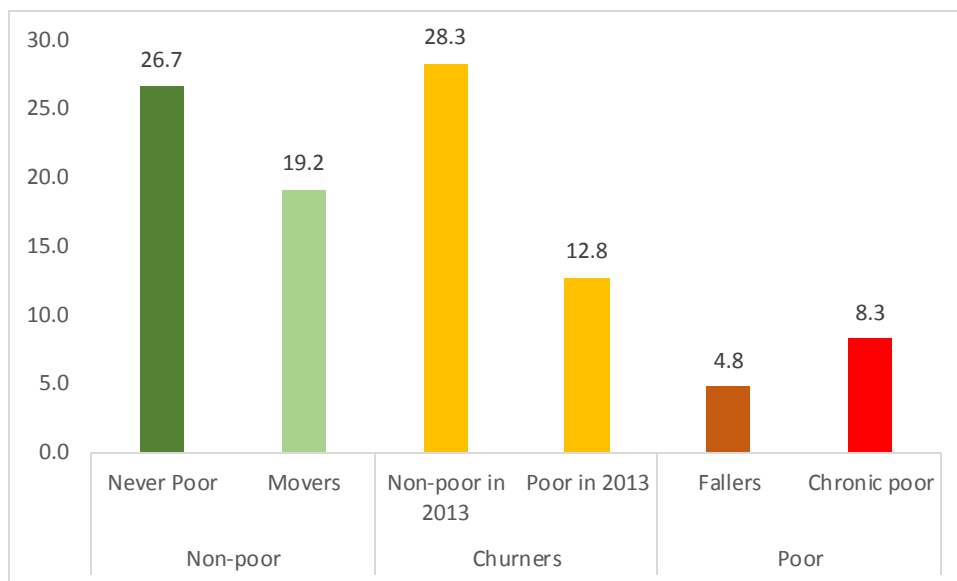
Yet when changes in households' poverty status over the intervening two years are taken into account, a much more complex and dynamic picture of rural vulnerability emerges (Figure 2.12). Households' fortunes follow myriad trajectories through time, and the majority of the sample risks falling into poverty in any given year. Figure 2.12 shows the distribution of households in 2013 based on their poverty status in each of the previous rounds of survey (2000, 2004 and 2008). Thus among the non-poor households in 2013, only 27 percent of households managed to stay out of poverty throughout the entire 13 years. Of the 26 percent that were poor in 2013, the share of the chronically poor households (that is households that were poor in each of the survey years) was 8 percent, 5 percent had fallen into poverty at some point between 2000 and 2013 and stayed poor, while 13 percent were "churners" who had experienced at least one period above the poverty line but had fallen back under the line by 2013.<sup>16</sup> About 19 percent of households had climbed out of poverty since 2000, but a substantial 28 percent that were not poor in 2013 had endured at least one period of poverty in the previous three rounds. Such households are clearly vulnerable to falling back into poverty.

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<sup>15</sup> Sen, Ahmed, and Gautam (2015) performed an analysis of poverty dynamics over a longer period (between 1988 and 2008). They identified similar trends and drew similar conclusions.

<sup>16</sup> Risers are households that saw a one-way movement out of poverty; they transitioned from being poor in 2000 to being non-poor in 2013. This transition could have occurred between any of the three intervening periods (2000–04, 2004–08, or 2008–13). Similarly, fallers are households that initially were not poor but saw a one-way movement to poverty in 2013. Churners are households that moved into and out of poverty multiple times—for example, households that were not poor in 2013 but experienced at least one episode of poverty prior to 2013, and those that were poor in 2013 but experienced at least one episode of not being poor prior to 2013. Included in the non-poor churners are households that were poor in all three previous surveys but were not poor in 2013 (11.2 percent), because these households are deemed to be highly susceptible to falling back into poverty. Similarly, poor churners in 2013 include households who were non-poor in each of the three previous rounds but were poor in 2013 (3.4 percent); this group is also considered to be vulnerable rather than to be definitive fallers.

**Figure 2.12: Evolution of rural poverty: Churning from 2000 to 2013**



Source: Authors, based on MH panel survey data for 2000, 2004, 2008, and 2013.

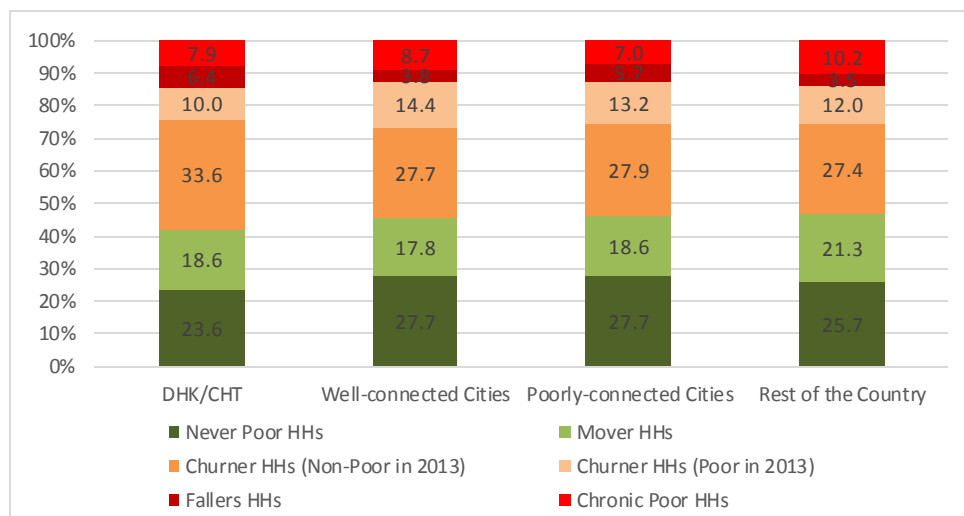
For the households in the panel survey, it is possible to look at how poverty status changes not only over time but in different geographical settings. Understanding the spatial dimensions of poverty and vulnerability is essential to devise appropriate strategies to tackle the remaining poverty and vulnerability challenges in rural Bangladesh and guide decisions on public investments and other public policies.

Proximity to urban centers and the potential for households to connect to those centers (via road, for example) are two key geographical features that are likely to influence poverty dynamics. To explore this poverty-urbanization nexus, the sample is divided into four groups by district as follows: households in districts adjacent to Dhaka and Chittagong; districts adjacent to secondary cities and with good road connectivity (Bogra, Comilla, Mymensingh, and Sylhet); districts adjacent to secondary cities but with poor connectivity (Barisal, Jessore, Khulna, Rajshahi, and Rangpur); and the remaining districts, which are mostly rural or adjacent to smaller cities.

Figure 2.13 shows the share of households by dynamic poverty group (never poor, movers, churners who were non-poor in 2013, churners who were poor in 2013, fallers, and the chronically poor) in each of the four groups of districts. The size of the poverty groups is broadly consistent across the four spatial settings, although the static share of all non-poor in 2013 (the sum of never poor, movers, and churners who were among the non-poor in 2013) is marginally higher near the megacities of Dhaka and Chittagong than in the rural areas. Yet while the bright lights of the megacities attract a substantial share of households, such households face greater vulnerability. The share of churners is higher near the megacities than in rural areas, and the share of the non-poor who are churners (in other words, who remain vulnerable) is much higher near the megacities.

For households near secondary cities, connectivity makes a substantial difference. Smaller cities that are well-connected to the rest of the country have the highest share of households that have never been poor and the lowest share of churners (especially among those who were non-poor in 2013).

**Figure 2.13: Spatial dimension of poverty dynamics**



Source: Authors, based on MH panel survey data for 2000, 2004, 2008, and 2013.

These findings confirm that progress has been made in reducing poverty, but by revealing the large share of the rural population that remains highly vulnerable to falling into poverty, they serve as a warning against complacency.<sup>17</sup> They also have several implications for policies and strategies to reduce vulnerability and foster sustained poverty reduction. Both policy and strategic attention need to be broadened to include the significant share of the population that lies just above the poverty line, and improved connectivity and the economic development of secondary and tertiary cities should be high priorities. Finally, the significant mobility across poverty lines (in both directions) suggests caution in using static indicators of poverty for profiling the poor and drawing conclusions on proximate drivers—a challenge taken up in the next two sections of this chapter.

### ***Socio-economic characteristics of the dynamic poverty groups***

Table 2.7 uses the dynamic classification of poverty to compare changes in socio-economic characteristics and asset endowments across poverty groups. All income and asset values are measured in constant 2008 prices (for comparability) and on a per capita basis (to take account of changing household sizes over time). The analysis is restricted to the years 2000 and 2008 for

<sup>17</sup> Any specific poverty line is essentially arbitrary, and a household's position above or below a specific cut-off depends significantly on the household's "luck of the draw" at any point in time, but the larger issue here is not that vulnerability and poverty are relative but that a large number of households are nevertheless exposed to the risk of impoverishment.

several practical reasons: it makes the analysis is more current,<sup>18</sup> the 2013 survey provides less comprehensive information for the sample, and using the 2000 and 2008 data makes it possible to maximize the number of households included in the panel (about 1,600).

**Table 2.7: Changes in assets by dynamic poverty group, 2000–08**

	Never-poor households		Faller households		Mover households		Chronically poor households	
	2000	2008	2000	2008	2000	2008	2000	2008
<b>Labor force</b>								
Family size	5.04	5.12	4.86	5.28	5.29	4.63	5.23	5.35
Number of earners	1.54	1.73	1.51	1.49	1.40	1.69	1.32	1.47
Number of agricultural workers	0.76	0.77	0.77	1.01	0.81	0.89	0.80	0.94
Number of non-agricultural workers	0.78	0.96	0.74	0.47	0.58	0.80	0.52	0.53
Number of female workers	0.12	0.20	0.09	0.13	0.06	0.20	0.09	0.14
Sex of household head (female, percent)	6.63	13.6	7.14	11.20	5.87	14.00	5.66	10.80
<b>Natural assets</b>								
Per capita owned land (ha)	0.21	0.20	0.09	0.06	0.06	0.09	0.03	0.03
Per capita cultivated land (ha)	0.12	0.10	0.07	0.05	0.05	0.06	0.04	0.04
Per capita rice area (ha, gross)	0.15	0.12	0.09	0.06	0.06	0.07	0.05	0.05
Per capita rice area planted to modern varieties (ha)	0.11	0.11	0.07	0.05	0.04	0.06	0.03	0.04
<b>Human capital assets</b>								
Average years of schooling of earning members	6.10	6.18	3.91	4.09	3.32	3.81	2.47	2.62
Average years of schooling of agricultural workers	4.97	5.31	3.15	3.87	2.97	3.18	2.12	2.28
Average years of schooling of non-agricultural workers	7.41	6.96	5.07	4.90	3.73	4.82	3.26	3.35
<b>Financial assets (2008 BDT)</b>								
Institutional loan (per capita)	1,767	2,083	801.8	875.4	646.5	1218	470.6	811.1
NGO loan (per capita)	480.3	1,078	502.3	732.5	479.5	1125	340.8	738.2
Non-institutional (per capita)	505.9	1,623	733.3	1,840	225.8	633.3	182.9	330.8
Total loan taken (per capita)	2,273	3,707	1,535	2,716	872.3	1852	653.5	1,142
Agricultural capital (per agricultural worker)	11,392	15,183	8,526	11,089	5,583	10,139	5239	10,766
Non-agricultural capital (per non-agricultural worker)	33,685	28,375	17,735	6,042	3,039	11,552	1,662	1,760
Total capital (per worker)	53,298	45,385	28,818	17,571	10,204	22,083	8,126	13,894

Source: Authors, based on MH panel survey data for 2000 and 2008

Several aspects of the comparison are revealing. First, poverty status is closely related to the number of workers in a household. Households that have never been poor have the most workers; chronically poor households have the fewest. Ascending households gained workers even as their family size fell, whereas descending households lost workers despite an increase in family size—in other words, their economic dependency ratio rose rapidly. As more women started to participate in the workforce, the number of overall earners increased. Numbers of working women

<sup>18</sup> The longer-term analysis from 1988 is in Sen, Ahmed, and Gautam (2015).



expanded in all four dynamic poverty groups, with the largest increase occurring among mover households, followed by the never-poor. The number of workers increased modestly in chronically poor households, but the benefits were limited by the high average family size of these households (relative to all other groups), which increased over time. Progress in reducing fertility clearly helped a substantial proportion of households to reduce their number of dependents in relation to their number of workers and realize a “demographic dividend” in the form of higher per capita income and lower poverty.

A second important observation is that rural households must rely upon multiple income strategies, on and off of the farm, to improve their welfare, especially because most have only a limited and declining amount of land at their disposal. Non-farm sources of income have been important for the never-poor and the mover households, as indicated by the growing number of non-agricultural workers in those households (although they also gained more agricultural workers, albeit more slowly). The faller households maintained their average number of earners, but in those households the number of non-agricultural workers shrank, while the number of agricultural workers expanded. At the same time, the share of land owned and planted by faller households declined. As discussed later in relation to changes in households’ sources of income, agriculture can be an important safety net for households that lose other sources of income, but in a context where the productive asset base (the availability of land) is declining rapidly, households struggle to compensate for a large loss in non-agricultural income.

Third, as expected, never-poor households had the most natural assets, followed by (in order) the ascending, descending, and chronically poor households. The chronically poor had the lowest endowments of every type of asset—the fewest earners per household, fewest average years of schooling among earners, poorest access to a credit market, and lowest ownership of fixed capital other than land. Land ownership increased substantially among mover households but decreased sharply among falling households (the other two categories changed little or not at all). Notably, the asset base of the faller households was higher than that of the mover households at the start of the period.

The loss of natural assets by descending households and the gain by ascending households is important information about poverty dynamics in rural Bangladesh. Table 2.8 shows the extent to which land ownership influences the likelihood of escaping from poverty (for convenience, the analysis used the 2000 endowment of land and four categories of land size). The proportion of households that escaped from poverty—the exit ratio—was highest (76 percent) for the medium and large landowners, followed by small and marginal landowners (about 60 percent) and the absolutely or functionally landless (41 percent). Households with more land were able to exit from poverty more often, and those with no land faced the highest odds.

The vulnerability ratio—the proportion of non-poor households that subsequently became poor—is also sensitive to the initial asset position. The vulnerability ratio is highest for the landless (35 percent) and lowest for larger landowners (10 percent). Analysis over the extended period from

1988 to 2008, however, shows an improvement; vulnerability declined across all household groups in the 2000s compared to the 1990s—it was near 67 percent in the 1990s for the marginal landowners but fell to less than half of that in the 2000s (Sen, Ahmed and Gautam 2015).

**Table 2.8: Change in poverty status by land ownership, 2000–08**

Land ownership in 2000	Never-poor households	Faller households	Mover households	Chronically poor households	Exit ratio	Vul. ratio
Absolute/functionally landless ( $\leq 0.2$ ha)	21.01	11.19	27.92	39.87	41.2	34.8
Marginal landowner (0.21–0.4 ha)	36.84	13.36	29.15	20.65	58.5	26.6
Small landowner (0.41–1.0 ha)	45.34	17.04	22.51	15.11	59.8	27.3
Medium/large landowner ( $> 1.0$ ha)	76.52	8.5	11.34	3.64	75.7	10.0
<i>All</i>	36.75	12.25	24.5	26.5	48.0	25.0

Source: Authors, based on MH panel survey data for 2000 and 2008.

Note: Exit ratio = Col 4/(Col 4+Col 5)\*100. Vulnerability ratio = Col 3/(Col 3+Col 2)\*100.

The fourth important observation from the comparison of changes in socio-economic characteristics and asset endowments for the dynamic poverty groups is the high degree of inequality in the distribution of human capital. Human capital is widely acknowledged to be a critical source of income growth with significant potential to trigger improvements in economic and social well-being. The panel survey data reveal that initial human capital endowments—measured as the average years of schooling for earners—were twice as high for never-poor households compared to chronically poor households. While the human capital of rural labor increased across all four dynamic poverty groups, it improved most rapidly among the ascending households.

In sum, investments in natural assets (land ownership) and human capital (educational attainment of household members) are demonstrably important for rural households' poverty dynamics in Bangladesh. These assets are expected to translate into physical capital (equipment, machinery, and other forms of physical business investments); in the data examined here, however, changes in the average value of capital per worker show varying trends. Total capital per worker fell for the never-poor and faller households but increased for the riser as well as the chronically poor households. The compositional shifts show that the decline in the total capital per worker for the non-poor was driven by a decline in non-agricultural capital, even as agricultural capital increased. Faller households saw a sharp fall in non-agricultural capital, which is consistent with the falling number of non-agricultural workers and suggests that such households have withdrawn from non-agricultural activities. Mover households, on the other hand, substantially increased both forms of capital, as did the chronically poor. The mover households increased their investment relatively more in non-agricultural capital, whereas the chronically poor invested more in agricultural capital.

### ***Drivers of rural poverty***

The descriptive analysis provides much insight into the dynamics of rural poverty in Bangladesh between 2000 and 2008, but being correlational at best, it cannot indicate causal relationships or

clearly identify drivers of poverty. Statistical analysis of the panel survey data helps to identify characteristics that potentially distinguish the movers from the chronically poor, as well as features that distinguish households that fell into poverty from households that did not.

The probability that poor households will move out of poverty and that non-poor households will subsequently fall into poverty is modelled over the two subperiods for which data are available—2000–04 and 2004–08—in addition to the longer-term outcomes between 2000 and 2008. A number of potential correlates are included in the analysis, based on the data and the literature, including household demographic characteristics, physical and human capital endowments, migration of household members, occupational structure, and access to financial services and infrastructure. To avoid potential endogeneity problems, only base-year values of explanatory variables are used for each period to explain the change in poverty status between the two periods. Annex 2, Table A2.1 provides the regression results for the mover versus the chronically poor households; Table A2.2 shows the results for the faller versus the never-poor households.

Results for the movers and fallers very consistently highlight the roles of particular factors in transitions into and out of poverty. The results are also consistent with the varying roles of farm and non-farm income drivers between the early years of the 2000s (2000–04) and the later years (2004–08). Household size and number of workers helped the movers, although the role of these factors in preventing the downward mobility of fallers was limited and is significant only for the full period. Age of household head, reflecting life-cycle effects, helped households with older heads to avoid falling into poverty but shows only weak effects for upward mobility.

Land ownership is especially significant for preventing households from declining into poverty (consistent with land's importance as a determinant of poverty, as discussed in the descriptive analysis). Similarly, human capital (the average years of schooling of earners) plays a strong, positive role in helping households to move out of poverty and in preventing them from falling back. Migration, especially foreign migration, is strongly correlated with moving out of poverty, and in the later 2000s it helped households avoid falling into poverty.

For the most part, however, no significant correlation emerges between sector of work and the dynamics of poverty. (The indicator includes all household members and is based on the type of activity in which the largest share of the household's collective time is spent—farm, non-farm, or both). For households engaged only in farming, the probability of the poor rising out of poverty fell and of the non-poor falling into poverty increased during 2000–04. This is consistent with the poor performance of agriculture in the early 2000s, as discussed elsewhere in this report. The same conclusions emerge for the roles of agricultural and non-agricultural capital (per worker).

Being located farther from Dhaka reduced the probability that a household would rise out of poverty and also increased its chances of falling into poverty, highlighting the importance of access to services, markets, and connectivity for poverty outcomes. Interestingly, over the long run households in western Bangladesh (as indicated by the East-West indicator) had a higher probability of rising out of poverty, although the effect of location was not significant in either of

the two subperiods. Being located in western Bangladesh is consistently significant in preventing people from falling into poverty, however, indicating that the particular economic characteristics of western Bangladesh require further study. Other factors, such as population density and urbanization, did not appear to be significant determinants of poverty.

The main message emerging from the analysis of poverty dynamics is that while all routes mattered in determining poverty outcomes, some mattered more in a particular subperiod than others. The longer-term analysis suggests that different factors were structurally transformative in different subperiods.

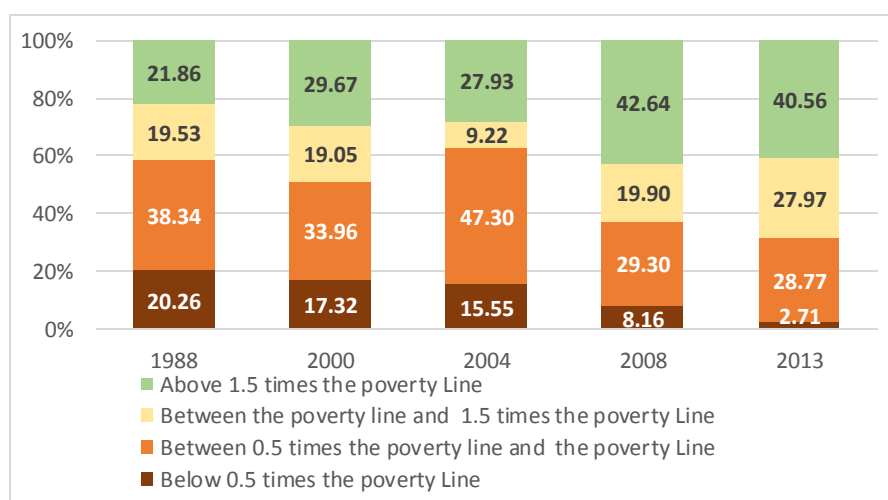
## Pattern and Drivers of Income Growth of Rural Households

The panel survey data provide a unique opportunity to identify the role of different sources of income growth in different types of households. The previous analysis of poverty dynamics classified households into simple poor/non-poor categories. For this analysis, a slightly finer grid was used to categorize sample households into four groups, based on their poverty status in the particular survey year, and using the poverty-line incomes from HIES:

- **Non-poor:** Monthly per capita incomes more than 1.5 times the poverty-line income.
- **Vulnerable:** Monthly per capita income between the poverty line and 1.5 times the poverty-line income (reflecting the higher risk of falling into poverty).
- **Poor:** Monthly per capita income less than the poverty line but above half of the poverty line.
- **Extremely poor:** Monthly per capita income less than half of the poverty line.

Figure 2.14 shows the distribution of the sample households by their poverty status for all years in which the panel survey was done. The long-term decline in poverty among the sample households resembles the decline seen in successive HIES. Consistent with trends observed in the HIES data, the panel survey data show that headcount poverty rose in 2004 (mostly in the poor group, but not in the extremely poor group) and then fell sharply in 2008. A major flood in 2004 affecting a very large

Figure 2.14: Distribution of households by poverty status, 1988–2008



Source: Authors, using MH panel surveys.

part of the country and its population may explain the rise in poverty in 2004. The poverty reduction trend appears to have continued in 2013, although the data also suggest that the number of vulnerable households rose slightly.

The recent rate of poverty decline is impressive, yet it is imperative not to lose sight of the fact that a significant proportion of households remains below the poverty line. One-third of non-poor households remain vulnerable, with income levels within a 50-percent margin of the poverty line. Such households have a high risk of descending into poverty following a natural disaster, serious illness, economic loss, or other type of shock.

Further insight into patterns of poverty and income dynamics is gained when the analysis is confined to the 2000, 2004, and 2008 rounds of the MH panel surveys. Data from those three rounds are more recent and so more pertinent to current policy concerns (1988 may be too far back in time); they also provide the largest sample of panel households (1,600) for the analysis. The 2013 survey collected only limited information on income by source. Note that the panel of households used for the analysis has a similar distribution by poverty profile as the full sample from all survey rounds (Annex 2, Table A2.3).

The classification of households by economic stratum and average real per capita annual income confirms that some groups of households experienced remarkable upward income mobility (Table 2.9). Households that were extremely poor in 2000 more than tripled their average income over the 8-year period (income for these households rose rapidly to 2004 and continued to rise after that). Similarly, households that were poor in 2000 had more than doubled their average real income per capita by 2008. Even the vulnerable group, on average, saw an increase in income. On the other hand, households that were extremely poor in 2008 had reported much higher incomes in 2000,

**Table 2.9: Average real per capita income for survey households in 2000, 2004, and 2008**

	Household income group	2000	2004	2008
<b>2000</b>	Extremely poor	4,052	9,983	12,290
	Poor	8,708	14,192	16,235
	Vulnerable	14,443	17,204	18,788
	Non-poor	36,775	30,980	32,645
<b>2008</b>	Extremely poor	11,373	11,082	4,277
	Poor	11,820	11,644	8,908
	Vulnerable	13,389	15,040	14,052
	Non-poor	24,754	28,213	36,857

Source: Authors, using MH panel surveys.

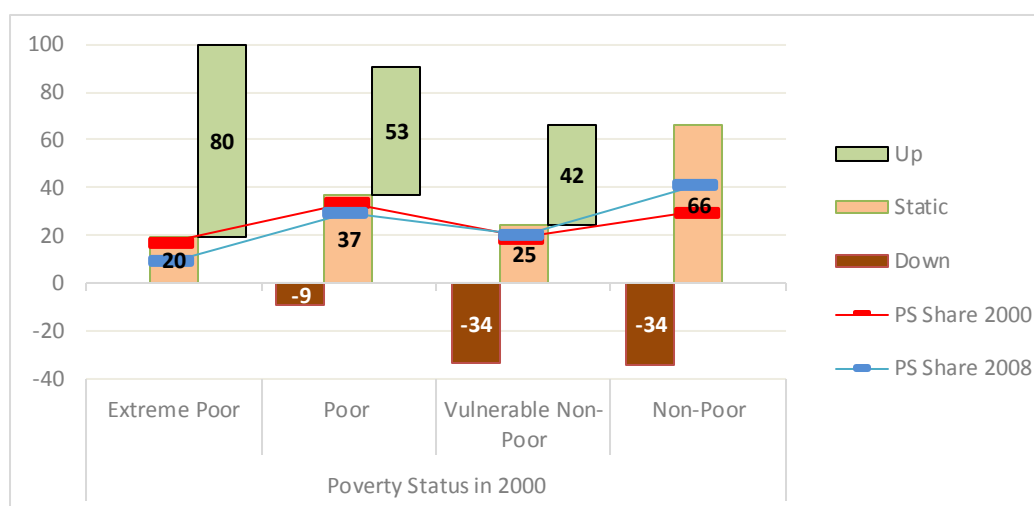
indicating that significant shocks and the associated decline in income had precipitated a sharp descent into poverty. A similar but less pronounced pattern is observed among poor households, while the non-poor on average maintained high incomes and marginally improved them.

When the average real per capita incomes of households in each economic stratum in 2000 and 2008 (the highlighted cells in Table 2.9) are compared, relatively little appears to have changed in the intervening years. Extremely poor and poor households attained minor increases in income, but incomes for vulnerable and non-poor households stagnated, suggesting some improvement in

the incomes of the poor but not the non-poor. Clearly the static snapshot by poverty status is a dramatically different picture than the dynamic picture that emerges from observing the same households at different points in time.

Household income can move both up and down. A sense of the degree of mobility can be gained from the panel of 1,600 households in the longitudinal survey. Figure 2.15 shows the mobility of those households between 2000 and 2008. The trends in the figure confirm that although the average proportion of impoverished households in the two years (shown by the two lines) appears to have changed relatively little, households below the poverty line experienced significant upward mobility between 2000 and 2008. Incomes rose for the majority of households that were extremely poor and poor in 2000, allowing many to escape poverty by 2008 (the next paragraph presents the detailed numbers). Even a substantial share of vulnerable households improved their economic status. By definition, upward mobility of the highest income group is ruled out, but a majority of non-poor households (two-thirds) maintained their status. Even so, these positive developments must not obscure that fact that economic status fell for a non-trivial share—one-third—of households in the vulnerable and non-poor groups.

**Figure 2.15: Household income mobility, 2000–08**



Source: Authors, using MH panel surveys.

How did those changes in household income translate into changes in poverty status? The detailed dynamics are captured in Annex 2, Figure A2.1. A substantial two-thirds of the households that were extremely poor in 2000 had attained a higher income status by 2004, and another 15 percent had moved out of extreme poverty by 2008. As a result, only 1 in 5 extremely poor households remained in extreme poverty by 2008, while 1 in 3 had exited poverty altogether. Among the moderately poor households of 2000, a substantial 55 percent had exited poverty by 2008—but about 9 percent had descended into extreme poverty. One-third of the households that were

vulnerable in 2000 had descended into poverty by 2008, while 42 percent had moved up into the non-poor category. Even some households that were not poor in 2000 became poor later; by 2008 almost 20 percent had slipped into poverty, and about 4 percent had fallen into extreme poverty.

### *Income dynamics and poverty*

Given the significant heterogeneity across households, and the extent of economic mobility experienced by households, looking beyond the sample averages will provide a better understanding of the performance of households in different strata and their main sources of income. The income-poverty dynamics for rural households between 2000 and 2008 can be analyzed based on the two categorizations of households—by their static poverty status and their dynamic poverty status.

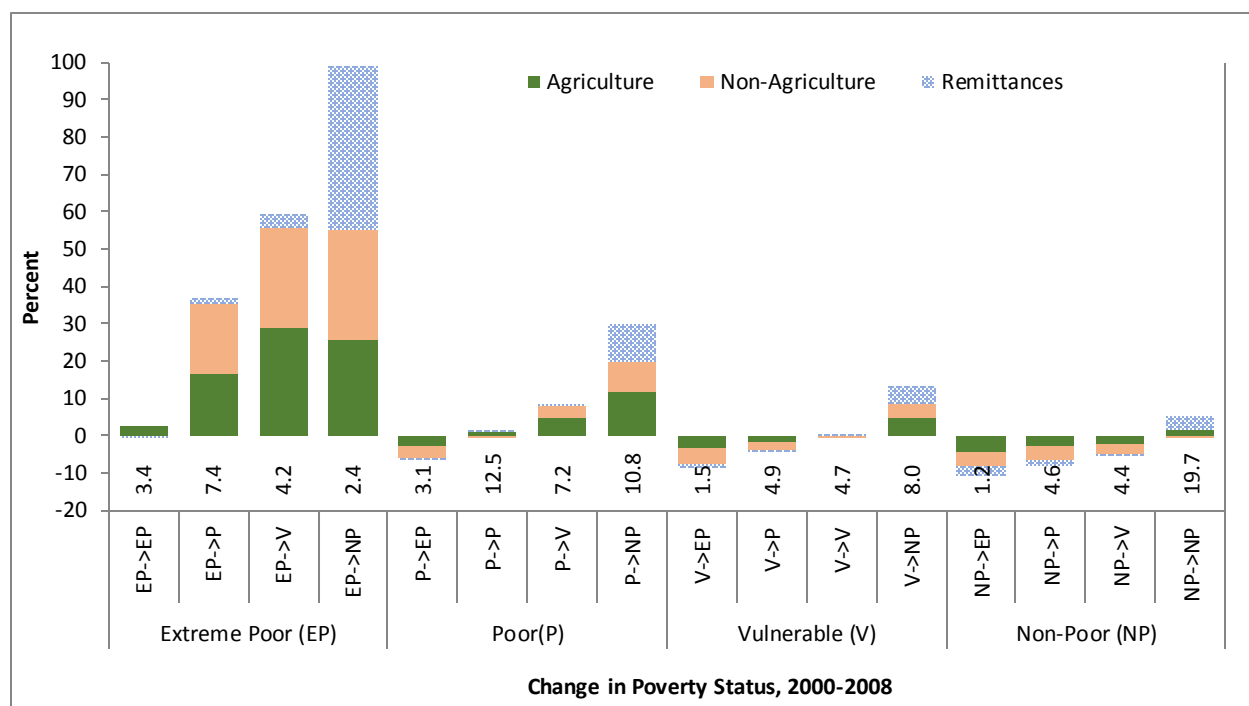
Using the ex-ante poverty status (the poverty status of the panel households in 2000), Figure A2.2 in Annex 2 shows that for households with the highest income growth between 2000 and 2008—the extremely poor and moderately poor households—both agricultural and non-agricultural income contributed significantly to rising incomes. The implication is that those households benefited from following multiple pathways out of poverty. (Remittances also contributed to rising incomes among those households, but they played a minor role.) Agricultural and remittance income made the greatest contribution to income growth for poor and vulnerable households, with agricultural income contributing the largest share of income gains for the poor. Remittances were the major driver of income only for non-poor households. For the non-poor households, gains from agricultural income were small, and non-agricultural incomes actually declined.

Figure 2.16 shows the sources of income that contributed to the mobility of households classified by dynamic poverty group. The x-axis shows each group's mobility from original (2000) to final (2008) poverty status. For example, EP→EP represents households that were extremely poor in 2000 and remained extremely poor in 2008, EP→NP represents households that moved from extreme poverty in 2000 to non-poor status in 2008, and so on. Next to the x-axis is the percentage of the sample in each transition category; hence 3.4 percent of households never left the EP category between 2000 and 2008, whereas 2.4 percent made the leap from EP to NP status. The height of the stacked bars shows the percentage improvement in per capita household incomes. As noted, most extremely poor households exhibited upward mobility. The 2.4 percent who had leapt into non-poor status by 2008 made significant gains in income from all three sources, with the biggest contribution coming from remittances. For all other groups, agriculture was the main contributor to income growth.

Among poor households that exhibited upward mobility, agriculture provided the largest share of income, with a relatively smaller contribution from non-agricultural income. Remittances played a minor role in the income of poor households, except for those that managed to escape poverty, for whom remittances made a significant contribution.

About two-thirds of the non-poor households in 2000 maintained their economic status through 2008, while about one-fifth had descended into poverty. Remittances were the major source of income for households that maintained their non-poor status.

**Figure 2.16: Contributions of agricultural, non-agricultural, and remittance income to households' movement in and out of poverty, 2000–08**



Source: Authors, using MH panel surveys.

Analysis of the panel survey data confirms that agriculture has been a major driver of poverty reduction since 2000 (the main conclusion of the PAR), but it also shows that no single source or sector—no proverbial “silver bullet”—stands out as the dominant means of reducing poverty. Households rely on multiple sources of income, implicitly recognizing that a multi-faceted strategy is the prudent strategy for climbing out of poverty. Among all sources of income, remittances helped only a few households to advance their economic status dramatically. The households that appear to have gained the most from remittances were not poor.

In their more detailed analysis of income sources, Ahmed and Gautam (2015) consistently find that on average and at the aggregate level, upwardly mobile households rely on multiple sources of income. The average and aggregate figures mask variations among regions and households, however, so that while the share of remittances is large on average across households, only a relatively small percentage of households saw extraordinary gains from remittance income. Clearly, remittances are an important potential driver of incomes and poverty reduction, but not



many households have been able to pursue this strategy. A surprising finding is that incomes from trade, business, and services did not make a positive contribution to income growth for most households. Importantly, for the households that descended into poverty over 2000–08, non-agricultural incomes fell sharply, while agricultural incomes did not grow fast enough to compensate for the loss.

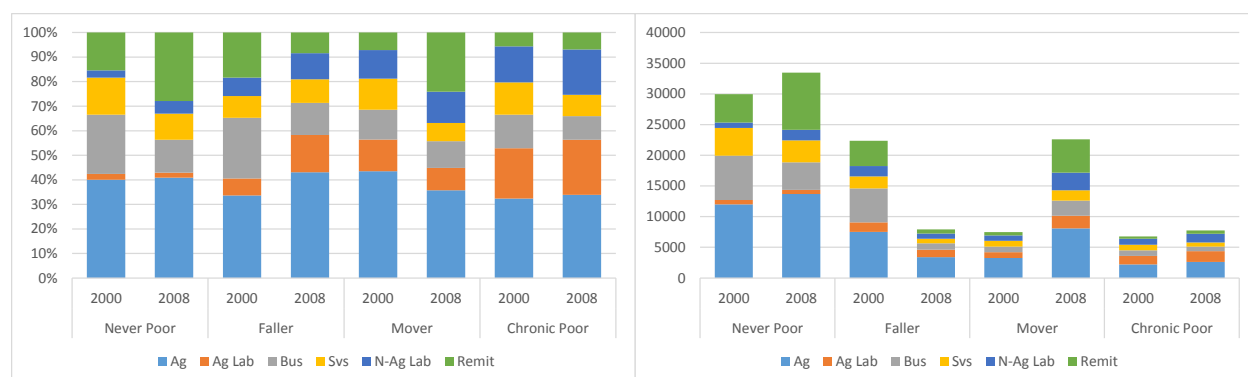
The drivers of income growth also vary considerably across the six divisions of Bangladesh. Remittances were the main driver of income growth in Chittagong and were significant in Sylhet and Dhaka. In the other three divisions, agriculture was the main driver of income growth. Non-agricultural income (from business, services, and wage labor) was the major driver only in Sylhet. Growth in non-crop income (from livestock, fisheries, and forestry) made the greatest contribution to growth in agricultural income across all divisions, while income from labor dominated growth in non-agricultural sources of income. Remittances provide a substantial increase in income on average, but they also reflect the highly unequal access across geographical locations to this opportunity for income growth.

How do these various findings, and those of the PAR, square with the general conclusions drawn from static poverty profiles, which show how various sectors (agriculture, business, services, remittances, and so on) contributed to the total income of poor households *at the time of a specific survey*? A static analysis shows what the poor currently do, but not how they got there. Given the considerable income and occupational mobility of these households, a static analysis may be misleading, as the findings of the longitudinal panel survey indicate.

Figure 2.17 helps to illustrate this point. The left panel shows the static income profiles for households by dynamic poverty group at the start and end of the analysis (in 2000 and 2008). The poor consistently obtain a higher share of their overall income from agriculture at the start, and the share of income from agriculture is even higher among those who are poor at the end of period. The strong correlation between agriculture and poverty apparent in the left panel leads to the general conclusion that poverty is synonymous with a livelihood in agriculture.

This conclusion may be erroneous, however, at least for the sample at hand, as seen in the right panel of Figure 2.17. The right panel shows the composition of per capita household incomes in *monetary levels* rather than in percentage terms. Households that were never poor clearly continued to have a high share of income from agriculture—in fact, a higher share than the other household groups. Movers benefited from an increase in all sources of income, although the growth in remittance income was much faster for these households than other non-farm sources of income. Agricultural incomes again grew faster than non-remittance, non-farm incomes. An even more important observation is that households that fell into poverty lost income across the board, especially non-farm income, which saw the largest percentage decline. As a result, *ex post*, agriculture's share of faller households, and by definition of the *ex post* poor, appears higher. These dynamics illustrate agriculture's function as a safety net: when households lose other sources of income, for whatever reason, they tend to fall back on agriculture.

**Figure 2.17: Income sources for dynamic poverty group as a percentage of total income (left panel) and in amounts earned (right panel, in BDT), 2000 and 2008**



Source: Authors, using MH panel surveys.

## *Drivers of rural incomes*

A dynamic earnings function helps to determine which factors may explain the changes in household incomes (note that the analysis helps to identify factors correlated with income growth, which should not be interpreted as causes of income growth). Both the initial conditions (household characteristics) as well as changes in key household characteristics are used to explain the changes in per capita household income growth.<sup>19</sup> Given the seemingly different trajectories of households in different poverty strata, the analysis is done for the full sample as well as for each of the four groups of household classified by their 2000 poverty status. For detailed results, see the discussion in Ahmed and Gautam (2015); for the main results, see Annex 2, Table A2.4. The key findings are summarized here.

Older households (which had fewer young, non-working dependents) experienced faster growth. This finding is consistent with the negative impact of household size on per capita income growth.

Ownership of agricultural land (both initial holdings as well as the change over time) is strongly positively correlated with income growth. As may be expected, the returns to land vary inversely with poverty status, reflecting the initial land ownership patterns.

Investment in human capital, using the average years of education of household workers (other than the household head) as a proxy, is strongly correlated with per capita income, and the estimated impact of an additional year of schooling is consistent across poverty groups and initial education levels. The education level of the household head in the base year is also included and shows a positive correlation with income, but it seems to matter more for the non-poor. Clearly

<sup>19</sup> The change in per capita real income is regressed on a range of factors (base-year values and the change between the previous and current survey at the household level), such as demographic characteristics, human capital, physical and financial assets, and market access, while controlling for division and year fixed effects.

investments in education are important irrespective of the initial endowment of household capital (as embodied in the household head's education level).

Both agricultural and non-agricultural capital appear to have a significant role in households' earnings. Non-agricultural capital has a larger marginal impact, as may be expected. Nevertheless, the positive sign on agricultural capital across the income strata indicates that investment in agriculture, as for example evidenced by mechanization, is positively and strongly correlated with incomes.

An important set of findings relates to households' labor force participation. Increased participation in non-farm work is strongly correlated with higher incomes, highlighting the importance of non-farm work and income diversification. Income from non-farm work is especially crucial for the extremely poor, who are more likely to be landless or to have very small farms. In general, the findings from the regression analysis support the conclusions from the earlier descriptive analysis that households with multiple income-earning strategies tend to do better than those relying primarily on agriculture.

The descriptive analysis shows that both domestic and foreign migration appeared to be important drivers of income growth in the last two decades. In the regression results, domestic and foreign migration both appear with positive coefficients, but the domestic migration coefficient is not statistically significant. Sending a household member abroad could raise per capita earnings by 76 percent on average, yet only a small minority of households participate in foreign migration owing either to the initial costs or risks involved. The results (which capture the marginal impact) clearly show that those who do participate benefit greatly—a result that is consistent across all poverty status groups.

Female participation in the workforce significantly raises household earnings. Households with females who participate in the workforce earn, on average, 14 percent more than households with females who do not participate. This finding is important for rural Bangladesh, where female labor force participation is still around 25 percent. Empowering and creating incentives for more females to join the workforce would raise per capita earnings significantly.

### ***Farm–non-farm linkages and the role of agriculture***

The main message emerging from the analysis of both macro-level and micro-level data is that households have diversified their income-earning strategies and have successfully used those diverse strategies to pull themselves out of poverty. Some sources of income have mattered more in particular periods than in others, as clearly seen in the analysis of HIES data (2000–05 and 2005–10) and the MH panel survey data (2000–04 and 2004–08). Progress in reducing poverty appears to have continued to 2013, as indicated by the 2013 panel survey data—a trend that needs to be confirmed with nationally representative data. The farm and non-farm sectors each have a strong role in household employment and incomes, however, and are expected to remain key determinants of further progress in poverty reduction and shared prosperity.

As important as the farm and non-farm sectors of the rural economy may be in their own right, it is vital to recognize their considerable interdependence and critical roles in accelerated and robust structural transformation. Agriculture has traditionally dominated the rural economy, and the importance of agricultural linkages in driving development, especially in the rural non-farm economy, has long been recognized at the global level and in Bangladesh (see Annex 4). The agricultural sector's superior performance in recent years has helped to reduce poverty rapidly, amply demonstrating its continuing pivotal role in development. In fact agriculture's role has been significantly larger than is apparent only from its direct contribution to household incomes and poverty reduction.

These conclusions are highly relevant to the debate on whether agriculture has a continuing role to play in Bangladesh's development or is destined to be a sunset industry. Given the power of rapid economic growth to lift populations out of poverty, one view is that it is wasteful to devote any resources to a sector that will inevitably grow relatively more slowly into the future. The contrary viewpoint is that the same argument applied more than 40 years ago and logically should apply even more today, when agriculture's share in GDP has almost halved (from about 37 percent in 1973 to just 19 percent in 2012). Yet recent experience in Bangladesh has shown agriculture to be the main driver of poverty reduction.

Another point relevant to the debate—and supported by considerable evidence—is that overall economic growth continues to be significantly influenced by what happens in agriculture. Considering a simple bivariate relationship, the elasticity of overall GDP growth to agricultural growth is very high at about 0.48, with approximately 53 percent of the variation in overall economic growth explained by the variation in agricultural growth alone.<sup>20</sup> With an average share of 27 percent over the period, agricultural growth's contribution to GDP growth measured as a share is only 15 percent, which implies that the indirect contribution of agriculture is roughly three times higher than its directly observed share in aggregate growth, indicating very high indirect linkage effects with the rest of the economy.

This simple diagnostic is consistent with Razzaque and Raihan's (2012) separate and rigorous empirical examination of the long-run relationship between sectoral outputs. Using time-series data and a suitably adapted and extended dual-sector analytical framework to examine multiple inter-sectoral linkages, Razzaque and Raihan find a strong and robust externality effect of agriculture on overall GDP and other sectors. The analysis, which gives particular attention to inter-sectoral linkages involving agriculture, manufacturing, and services, indicates that these components of GDP move together and form a valid long-run relationship. The effects of agriculture on services are quite large, and there is evidence that agricultural growth causes outputs in other sectors.

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<sup>20</sup> These estimates are based on growth rates from 1974 to 2014. As expected, the hypothesis of non-stationarity is rejected for all three growth rates—GDP, agriculture, and non-agriculture. Including a time trend to control for temporal divergence, the elasticity of GDP to agricultural growth rates remains at a substantial 0.4, suggesting a robust long-term relationship. Using an alternative specification to test the relationship between non-agricultural and agricultural growth gives an elasticity of 0.26.

At the micro level, strong empirical evidence has emerged recently on agriculture's multiplier effects, suggesting that through intricate farm–non-farm linkages, agriculture has and will continue for some time to have a major indirect role in spurring rural non-farm incomes and growth. Khandker and Samad (2014) use HIES data to convincingly show the strong and positive role of agriculture as a driver of non-farm income.<sup>21</sup> They find that a 10-percent increase in farm income growth increases non-farm income growth by 6 percent, implying a high elasticity of non-farm growth to farm income growth (Table 2.10). Khandker and Samad also apply this methodology to the more poverty-focused longitudinal survey, the WBI household panel of about 1,600 households between 1991/92 and 2010/11, and find a similar effect.

**Table 2.10: Role of farm income growth in non-farm income growth**

*Dependent variable log non-farm income in BDT per year.*

Explanatory variable	HIES data (N=9,134)	Panel data (N=1,590)
	<i>Upzila FE with IV</i>	<i>HH FE with IV</i>
Year is 2005 (1=yes, 0=no)	2.792 (0.37)	-
Year is 2010 (1=yes, 0=no)	2.544 (0.34)	-
Year is 1998/99 (1=yes, 0=no)	-	0.837 (0.93)
Year is 2010/11 (1=yes, 0=no)	-	1.847 (0.76)
Log farm income (BDT/yr)	0.573** (2.23)	0.525* (1.82)
R <sup>2</sup>	0.111	0.158
Endogeneity test for endogenous regressors	$\chi^2(1)=7.477$ , p=0.006	$\chi^2(1)=3.924$ , p=0.048
Overidentification test for instruments (Hansen J statistics)	$\chi^2(5)=0.912$ , p=0.969	$\chi^2(3)=3.366$ , p=0.339
Underidentification test for instruments (KP statistics)	$\chi^2(6)=11.589$ , p=0.072	$\chi^2(4)=5.951$ , p=0.203
Weak identification for instruments (CD statistics)	F=5.012	F=2.491
Stock-Yogoweak identification test critical value for 5% bias	19.28	16.85

*Source:* Khandker and Samad (2014) using HIES and WBI surveys.

*Note:* Figures in parentheses are t-statistics. For IV implementation, agricultural potential (using as proxy the share of village agricultural land irrigated, share of high land in *upzila* (subdistrict), and share of land suitable for boro rice production) and their interactions with household education and landholding are used as the excluded instruments for farm income in the first stage. Regression also controls for household and community characteristics, and in addition, exogenous characteristics of the initial year and household occupation dummies based on major income source. \* and \*\* refer to statistical significance level of 10% and 5%, respectively.

Another study provides insights into the impacts of agricultural productivity on employment growth and structural transformation of non-farm activities. From several sources of official data,<sup>22</sup>

<sup>21</sup> To address potential endogeneity and establish the direction of change from farm to non-farm income, Khandker and Samad (2014) use exogenous agroclimatic endowments to instrument farm income growth, which is expected to affect non-farm income only indirectly through the induced effects on farm income (using a fixed effects instrumental variables model, controlling for a set of household and community characteristics that may influence both farm and non-farm income growth, including initial characteristics). Statistical tests confirm that agricultural income growth can be a good predictor of non-farm income growth.

<sup>22</sup> Economic Censuses of 2000, 2006, and 2009; population censuses of 1990, 2000, and 2010; HIES 2000, 2005, and 2010; and rainfall data from the Climate Research Unit of the University of East Anglia.

Shilpi and Emran (2015) create a unique set of panel data at the *upzila* (subdistrict) level. Using rainfall as an instrument for agricultural productivity, they find that growth in agricultural productivity has significant positive impacts on the growth of employment in informal (small-scale) manufacturing and skilled services. For formal employment, the impact is found to be largest for samples including urban areas and rural towns relative to rural areas. The study thus provides independent, rigorous confirmation of agricultural productivity's significant impact in inducing structural transformation—within the services sector, employment in formal and skilled services grows faster than employment in low-skilled services.

## ***Conclusions and Implications***

Rural Bangladesh is growing and transforming rapidly. Agricultural growth began to accelerate steadily after the mid-1990s, when wide-ranging reforms (implemented in 1991–96) came to an end. The reforms concentrated on macro-economic stability, growth led by the private sector, and trade and wider economic liberalization. These critical reforms added impetus to the earlier agricultural reforms of the 1980s, with the result that the trend growth rate for agriculture (over rolling 10-year periods) reached an unprecedented high of 5 percent in 2010–11. Since the 2000s, agricultural growth has also been less volatile, partly owing to chance (fewer natural disasters occurred) and partly to purposive efforts to make agriculture more resilient. In sum, the main drivers of higher and more stable agricultural growth have been the spread of irrigation, the spread of new agricultural technology, and periodic strong contributions by agriculture's three main components—crops, livestock, and fisheries.

Even under the much-improved policy framework, elements of bias against agriculture persist. Policy protection has remained for the manufacturing sector, creating an implicit bias against agriculture and distorting domestic incentives against agriculture. Some of the effects of liberalized domestic markets and a neutral, non-distortionary trade policy were swept away in the global food price crisis of 2007/08. In this sense, agriculture's strong performance over the past two decades is even more impressive, because it was achieved in the face of some adverse incentives created by macro policies—in essence, while “swimming against the tide.”

The surge in growth—in agriculture and the overall economy—brought a significant reduction in poverty. The poverty headcount ratio fell from 58.4 percent in 1991/92 to 31.5 percent in 2010. The pace of poverty reduction was faster in the 2000s, with faster income growth. Bangladesh has also made progress on non-income poverty measures, as noted in the PAR, as well as in food security.

The statistics in the previous passage are significant, and the gains they represent are far from superficial, but they tell only part of the story. Serious concerns remain. Rural poverty is still high at 35.2 percent in 2010, and it is deeper and more concentrated than urban poverty. Static poverty

trends (estimates at discrete points of time) show a steady decline in poverty, but many households rise out of poverty only to fall back—and sometimes repeat the cycle again.

A dynamic analysis of poverty provides insights into the remaining challenges of attaining sustained poverty reduction and shared prosperity. Panel data that track the same households over a long period clearly show that pathways out of poverty are neither linear nor predictable. A large share of the households (39 percent of the sample) “churned” in and out of poverty during a period of robust growth between 2000 and 2013, indicating a high level of vulnerability. For example, while three-quarters were not poor in 2013, more than one-third of those households were highly vulnerable. The dynamic analysis emphasizes that lasting and sustained poverty reduction will require policy and strategic attention to be broadened to include the significant share of the population that is just above the poverty line.

A better understanding of the dynamics and drivers of rural poverty requires a deeper look at the transforming rural economy, especially the changing characteristics of rural households, their diverse sources of income, and the status and pattern of employment of their members. The key forces that appear to be driving growth and poverty include technology and investments in physical and human capital. Owning land, or having access to land, often determines who exits from poverty and manages to stay out of poverty. The changes in household endowments that are correlated with poverty outcomes are increases in agricultural capital per agricultural worker and improvements in households’ human capital endowment. Another notable driver is the demographic composition of households—smaller families with more workers are better able to move out of poverty. Households that fell into poverty lost natural assets (land). And while the nature of employment does not appear to be correlated with movements out of or into poverty, an important trend is that households descending into poverty lost non-agricultural physical capital faster than they lost agricultural capital per worker.

A notable feature of the structural transformation of the rural economy, rapid in the 2000s, is that much of it appears to be taking place within the rural space itself. Rural non-farm employment has grown at a faster pace than urban employment. But the process of change has not been uniform either temporally or spatially. There is a steady, though not dramatic, transformation in the aggregate structure of economic activities. Within the post-2000 period, the early years saw the non-farm sector grow faster than the farm sector, but the latter years saw a shift in the relative contribution, with the farm sector growing more rapidly.

An analysis of the dynamics of household incomes and poverty status at different points in time highlights the importance and varying contributions of different sources of income (farm, non-farm, and remittances) to household welfare. Upwardly mobile households rely on multiple income strategies as mutually reinforcing pathways out of poverty. Similarly, households that managed to stay out of poverty employed multiple income strategies to maintain their economic status. Agriculture was a major source of growth for most of the dynamic poverty groups. Yet when households descended into poverty, the source of income that declined the most was non-

farm income, highlighting the risks associated with non-farm sources of income, particularly trade and business activities. Finally, remittances are an important driver of incomes and poverty reduction for those who had the opportunity to benefit, but many of the poor have not been able to participate.

Not surprisingly, an increasing share of rural households, up from 80 percent in 2000 to 87 percent in 2010, relied on agriculture for at least part of their income, while 65 percent have incomes from both farm and non-farm sources. Most rural households thus retain one “leg” in agriculture as central to their strategy to climb out of poverty. The share of households receiving remittances has remained steady at about 23 percent, as has the share of remittances in average household income (rising from 8 to 10 percent between 2000 and 2010).

The primary conclusion of this analysis is that both the farm and non-farm sectors must be targeted for sustaining the progress in growth and poverty reduction. There is strong evidence on the reinforcing and inter-dependent nature of the individual parts of the rural economy. Agriculture’s contribution to growth is both direct and indirect—its direct share in GDP has declined (to about 20 percent), but every 10 percent of agricultural growth catalyzes another 6 percent of non-farm growth, indicating that strong forward and backward linkages are at work. Given land as a binding constraint, Bangladesh’s current socio-economic conditions, and the higher marginal returns to non-farm activities, it is imperative to achieve growth in rural non-farm incomes.

Against this background, the following chapters look at the dynamics of the farm and non-farm sectors of the rural economy. They seek to understand the major features of each sector, assess the main drivers and constraints to its growth, and identify where attention must be focused to promote faster and more sustainable growth. As noted, this study treats remittances as distinct from other non-farm sources of income. Migration is a rapidly growing phenomenon in Bangladesh, and remittances are an important source of household income. Proactive promotion of migration requires actions that differ from actions needed to stimulate drivers of the local economy, and as such they have different implications for policy. A deeper analysis of the drivers and determinants of migration requires more detailed analysis that is beyond the scope of this study and remains an important area for future research.

## References

- Ahmed, M., and M. Gautam. 2015. “What Drives Rural Incomes in Bangladesh? The Evolution of Farm, Non-Farm and Migration Incomes.” Background paper for “Dynamics of Rural Growth in Bangladesh,” GFADR, World Bank, Washington, DC.
- Ahmed, N., Z. Bakht, P.A. Dorosh, and Q. Shahabuddin. 2009. “Bangladesh.” Chapter 9 in *Distortions to Agricultural Incentives in Asia*, edited by K. Anderson and W. Martin. Washington, DC: World Bank.
- Anderson, K. 2009. “Distorted Agricultural Incentives and Economic Development: Asia’s Experience.” *The World Economy*. 32(3): 351–84.
- Anderson, K., and S. Nelgen. 2012. “Updated National and Global Estimates of Distortions to Agricultural Incentives, 1955 to 2011.” Database. World Bank Agricultural Distortions website.



- BBS (Bangladesh Bureau of Statistics). Various years. Reports on Household Income and Expenditure Survey (HIES) for 2000, 2005, and 2010. Dhaka.
- Various years. Reports on Labour Force Surveys (LFS) for 2005 and 2010. Dhaka.
- Deininger, K., D. Narayan, and B. Sen. 2009. "Politics of the Middle Path: Agrarian Reform and Poverty Dynamics in West Bengal." In *The Promise of Empowerment and Democracy in India*. Volume 3 of *Moving Out of Poverty*, edited by D. Narayan. Washington, DC: Palgrave Macmillan and World Bank. Pp. 286–347.
- IFPRI (International Food Policy Research Institute). 2013. Bangladesh Integrated Household Survey (BIHS), 2011–2012. Dataset. Washington, DC.
- Kabeer, N. 2009. "Snakes, Ladders, and Traps: Changing Lives and Livelihoods in Rural Bangladesh 1994–2001." *The Bangladesh Development Studies* 32(2): 1–36.
- Kathuria, S., and M. Malouche. 2016. *Toward New Sources of Competitiveness in Bangladesh: Key Insights of the Diagnostic Trade Integration Study*. The World Bank Group, Washington, DC.
- Khandker, S., and H. Samad. 2014. "Non-Farm Drivers of Rural Growth: A Case Study of Bangladesh." Background paper for "Dynamics of Rural Growth in Bangladesh," GFADR, World Bank, Washington, DC.
- Mujeri, M.K. 2008. "Changes in Policy Framework and Total Factor Productivity Growth in Bangladesh." *The Bangladesh Development Studies* 30(3&4): 1–29. [Journal dated 2004 but published in 2008.]
- Narayan, D., L. Pritchett, and S. Kapoor (eds.). 2009. "Success From the Bottom Up." Volume 2 of *Moving Out of Poverty*. Washington, DC: Palgrave Macmillan and World Bank.
- Rahman, H.Z., and M. Hossain (eds.). 1995. *Rethinking Rural Poverty: Bangladesh as a Case Study*. New Delhi: Sage Publishers.
- Rahman, R.I. 2014. "Growth of Rural Non-Farm Activities in Bangladesh: Implications for Household Income and Employment." Policy Brief No. 1404. Bangladesh Institute of Development Studies (BIDS), Dhaka.
- Ravallion, M. 2001. "Growth, Inequality, and Poverty: Looking Beyond the Averages." *World Development* 29(11): 1803–15.
- 2005. "Inequality is Bad for the Poor." Policy Research Working Paper No. 3677. World Bank, Washington, DC.
- Razzaque, M.A., and S. Raihan. 2012. "Is an Agriculture Focused Development Right Choice for Bangladesh? An Empirical Assessment of Farm-Nonfarm Growth Linkages." Paper prepared for the International Growth Center country project on Bangladesh.
- Sen, B. 2003. "Drivers of Escape and Descent: Changing Household Fortunes in Rural Bangladesh." *World Development* 31(3): 513–34.
- Sen, B., M. Ahmed, and M. Gautam. 2015. "Waves of Change: What Explains Ascent, Descent, and Persistence in Poverty in Rural Bangladesh?" Background paper for "Dynamics of Rural Growth in Bangladesh," GFADR, World Bank, Washington, DC.
- Shilpi, F., and S. Emran. 2015. "Agricultural Productivity and Non-Farm Employment: Evidence from Bangladesh." Columbia University, New York. Processed.
- World Bank. Various years. World Development Indicators. Database. Washington, DC.
- World Bank. 1999. "Bangladesh: From Counting the Poor to Making the Poor Count." A World Bank Country Study. Washington, DC.
- 2012. "Bangladesh: Towards Accelerated, Inclusive, and Sustainable Growth: Opportunities and Challenges." Report No. 69971. Washington, DC.

## Annex 2: Detailed Results of the Analysis of Rural Dynamics

Table A2.1: Marginal effects from probit estimates, movers vs. chronically poor households

	2000-04		2004-08		2000-08	
	Mar. eff.	S. err.	Mar. eff.	S. err.	Mar. eff.	S. err.
Sex (female=1)	0.087	(0.131)	-0.064	(0.102)	0.120	(0.123)
<b>Age group of HH head (Ref: below 30)</b>						
31-45 years	-0.010	(0.050)	0.064	(0.054)	0.044	(0.048)
46-60 years	0.001	(0.059)	0.133**	(0.061)	0.090	(0.059)
60+ years	-0.051	(0.077)	0.053	(0.070)	0.110	(0.077)
Household size	-0.035***	(0.010)	-0.040***	(0.011)	-0.010	(0.010)
Total worker in HHs	0.081**	(0.033)	0.129***	(0.029)	0.082**	(0.033)
Log (own land in base year)	0.017***	(0.006)	0.011	(0.008)	0.018***	(0.006)
Tenant households in base yr (Yes=1)	-0.026	(0.038)	-0.067*	(0.039)	-0.022	(0.039)
Av. schooling yr per worker in base year	0.005	(0.005)	0.015***	(0.005)	0.009*	(0.005)
<b>Migration status in base year</b>						
Domestic migration	0.029	(0.048)	0.060	(0.046)	0.139***	(0.049)
Foreign migration	0.315***	(0.116)	0.377***	(0.106)	0.201	(0.126)
Female participation (Yes=1)	-0.103	(0.099)	0.001	(0.081)	-0.125	(0.101)
<b>Occupation of workers (base: Non-farm only)</b>						
Farm only	-0.079*	(0.046)	-0.052	(0.050)	-0.071	(0.045)
Both	-0.024	(0.073)	-0.103	(0.065)	-0.167**	(0.071)
Log (ag. cap. per ag. worker in base year)	0.003	(0.004)	0.001	(0.004)	0.002	(0.004)
Log (non-ag. cap. per non-ag. worker in base year)	0.013***	(0.002)	-0.001	(0.003)	0.003	(0.002)
NGO loan in base year (Yes=1)	0.046	(0.040)	0.027	(0.042)	0.020	(0.041)
Bank loan in base year (Yes=1)	-0.098	(0.078)	0.180**	(0.075)	0.087	(0.079)
Non-inst. loan in base year (Yes=1)	-0.064	(0.049)	-0.085	(0.055)	-0.007	(0.049)
<b>Infrastructure</b>						
Distance from nearest market	-0.031	(0.034)	-0.034	(0.033)	-0.046	(0.034)
Distance from the capital	-0.156**	(0.070)	-0.008	(0.065)	-0.166**	(0.070)
Urbanization rate in 2000	0.006**	(0.003)			0.005	(0.003)
Density in 2000	-0.000	(0.000)			-0.000	(0.000)
East-West dummy (West=1)	0.112	(0.071)	0.093	(0.075)	0.164**	(0.070)
Agro-ecological zone control	Yes	.	Yes	.	Yes	.
Observations	795		719		795	
Pseudo R <sup>2</sup>	0.08		0.13		0.11	

Note: Standard errors in parentheses, \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ .

**Table A2.2: Marginal effects from probit estimates, faller vs. never poor households**

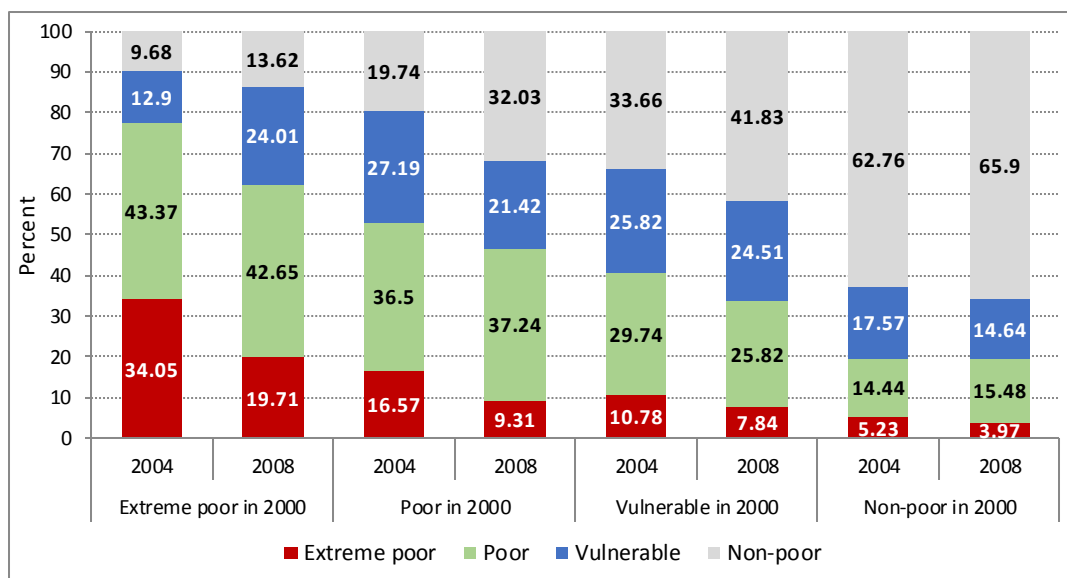
	2000-04		2004-08		2000-08	
	Mar. eff.	S. err.	Mar. eff.	S. err.	Mar. eff.	S. err.
Sex (female=1)	0.054	(0.117)	0.034	(0.084)	-0.020	(0.100)
<b>Age group of HH head (Ref: below 30)</b>						
31-45 years	-0.009	(0.048)	-0.087*	(0.048)	-0.094*	(0.049)
46-60 years	-0.085*	(0.050)	-0.14***	(0.050)	-0.120**	(0.050)
60+ years	0.001	(0.070)	-0.109*	(0.057)	-0.090	(0.068)
Household size	0.013	(0.009)	0.012	(0.008)	0.014	(0.009)
Total worker in HHs	0.029	(0.024)	-0.010	(0.020)	-0.040*	(0.024)
Log (own land in base year)	-0.02***	(0.007)	-0.022**	(0.009)	-0.013**	(0.006)
Tenant households in base yr (Yes=1)	0.014	(0.035)	-0.038	(0.030)	0.038	(0.033)
Av. schooling yr per worker in base year	-0.02***	(0.004)	-0.02***	(0.004)	-0.02***	(0.004)
<b>Migration status in base year</b>						
Domestic migration	0.020	(0.042)	-0.11***	(0.034)	0.012	(0.040)
Foreign migration	-0.084	(0.055)	-0.18***	(0.046)	-0.039	(0.050)
Female participation (Yes=1)	-0.011	(0.089)	-0.067	(0.062)	-0.025	(0.082)
<b>Occupation of workers (Ref: Non-farm only)</b>						
Farm only	0.115***	(0.045)	0.055	(0.038)	0.021	(0.040)
Both	-0.012	(0.052)	-0.009	(0.042)	0.058	(0.056)
Log (ag. cap. per ag. worker in base year)	-0.001	(0.004)	0.000	(0.003)	-0.007*	(0.004)
Log (non-ag. cap. per non-ag. worker in base year)	-0.01***	(0.002)	-0.003	(0.002)	-0.004*	(0.002)
NGO loan in base year (Yes=1)	0.004	(0.041)	0.028	(0.031)	0.094**	(0.037)
Bank loan in base year (Yes=1)	-0.016	(0.052)	-0.14***	(0.051)	0.009	(0.048)
Non-inst. loan in base year (Yes=1)	0.021	(0.055)	0.019	(0.053)	-0.005	(0.056)
<b>Infrastructure</b>						
Distance from nearest market	-0.026	(0.030)	0.008	(0.025)	-0.001	(0.029)
Distance from the capital	0.105**	(0.051)	0.109***	(0.041)	0.129***	(0.049)
Urbanization rate in 2000	0.003	(0.002)			-0.001	(0.002)
Density in 2000	-0.000	(0.000)			0.000	(0.000)
Health shock between the period (Yes)	0.039	(0.031)	-0.027	(0.029)	-0.015	(0.118)
East-West dummy (West=1)	-0.147**	(0.066)	-0.119**	(0.056)	-0.121*	(0.063)
Agro-ecological zone control	Yes		Yes		Yes	
Observations	766		879		766	
Pseudo R <sup>2</sup>	0.09		0.14		0.10	

Note: Standard errors in parentheses, \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ .

**Table A2.3: Poverty and vulnerability among panel households, 2000–08**

	2000		2004		2008	
	Freq.	%	Freq.	%	Freq.	%
Extreme poor	279	17.44	242	15.13	148	9.25
Moderate poor	537	33.56	477	29.81	472	29.5
Vulnerable non-poor	306	19.13	345	21.56	327	20.44
Richest non-poor	478	29.88	536	33.5	653	40.81
<b>Total</b>	<b>1,600</b>	<b>100</b>	<b>1600</b>	<b>100</b>	<b>1600</b>	<b>100</b>

**Figure A2.1: Dynamics of the poverty status of household, 2000–2004–2008**



**Figure A2.2: Sectoral contributions to income growth for different income groups, 2000–08**

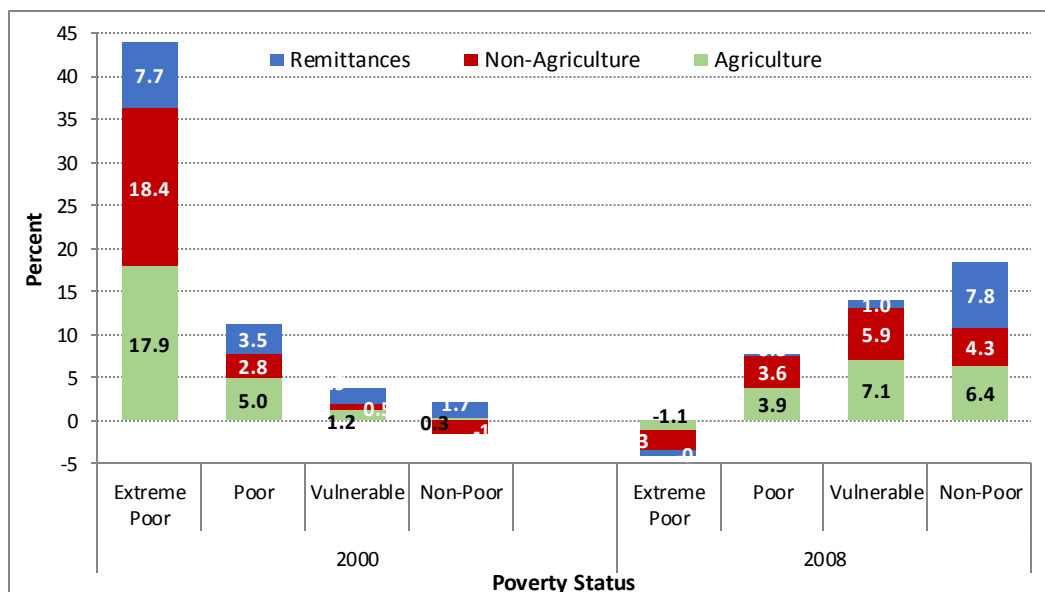


Table A2.4: Dynamic earnings function: Regression results

Dep. var: Change in Log per capita income	Full sample	Extreme poor	Poor	Vulnerable	Non- poor
Lag of Log real income	-0.78*** (0.02)	-0.95*** (0.05)	-0.89*** (0.04)	-0.92*** (0.07)	-0.68*** (0.05)
Female->Male	0.17 (0.14)	-0.06 (0.26)	0.30 (0.32)	0.17 (0.26)	0.22 (0.28)
Male->Female	0.07 (0.12)	-0.12 (0.24)	0.23 (0.22)	-0.10 (0.24)	-0.04 (0.19)
Male->Male	0.27*** (0.10)	0.08 (0.25)	0.48** (0.22)	0.12 (0.22)	0.11 (0.16)
Change in Log age	0.10* (0.05)	0.10 (0.14)	0.11 (0.09)	0.12 (0.11)	0.18* (0.11)
Lag of Log age	0.12*** (0.05)	0.21* (0.12)	0.16* (0.09)	0.09 (0.10)	0.12 (0.09)
Change in Log land	0.05*** (0.01)	0.04*** (0.01)	0.03*** (0.01)	0.07*** (0.02)	0.09*** (0.02)
Lag of Log land	0.05*** (0.01)	0.03** (0.02)	0.03*** (0.01)	0.10*** (0.02)	0.07*** (0.02)
Change in Log HH size	-0.68*** (0.06)	-0.81*** (0.12)	-0.60*** (0.08)	-0.54*** (0.14)	-0.82*** (0.08)
Lag of Log HH size	-0.50*** (0.04)	-0.62*** (0.11)	-0.53*** (0.06)	-0.53*** (0.09)	-0.44*** (0.08)
Change in Log worker's edu	0.02*** (0.00)	0.02** (0.01)	0.03*** (0.01)	0.01 (0.01)	0.02*** (0.01)
Lag of Log worker's edu	0.02*** (0.00)	0.01 (0.01)	0.03*** (0.01)	0.02** (0.01)	0.02** (0.01)
Change in Log ag capital	0.02*** (0.00)	0.02** (0.01)	0.03*** (0.01)	0.01 (0.01)	0.03*** (0.01)
Lag of Log ag capital	0.03*** (0.00)	0.03*** (0.01)	0.03*** (0.01)	0.01 (0.01)	0.03*** (0.01)
Change in Log non-ag capital	0.05*** (0.00)	0.05*** (0.01)	0.05*** (0.01)	0.05*** (0.01)	0.05*** (0.01)
Lag of Log non-ag capital	0.05*** (0.00)	0.06*** (0.01)	0.05*** (0.01)	0.05*** (0.01)	0.05*** (0.01)
Institutional loan					
No->Yes	-0.00 (0.03)	-0.15* (0.08)	0.01 (0.05)	0.00 (0.07)	0.10* (0.05)
Yes->No	0.04 (0.03)	-0.05 (0.09)	0.06 (0.06)	0.11 (0.08)	0.01 (0.06)
Yes->Yes	0.01 (0.03)	-0.01 (0.08)	0.06 (0.05)	0.01 (0.06)	0.02 (0.05)
Non-inst. loan					
No->Yes	-0.02 (0.04)	0.05 (0.07)	-0.01 (0.07)	-0.14 (0.08)	-0.01 (0.07)
Yes->No	-0.01 (0.04)	0.05 (0.08)	0.01 (0.07)	-0.05 (0.12)	0.02 (0.09)
Yes->Yes	-0.04 (0.08)	0.04 (0.12)	0.08 (0.13)	-0.35** (0.14)	-0.15 (0.28)
Occupational mobility					
Farm->Both	0.21*** (0.05)	0.37*** (0.10)	0.17* (0.10)	0.18* (0.11)	0.16 (0.11)
Farm -> Non-farm	0.20*** (0.05)	0.28** (0.13)	0.11 (0.07)	0.05 (0.11)	0.34*** (0.09)
Both -> Farm	-0.06 (0.05)	-0.04 (0.12)	0.02 (0.09)	-0.16 (0.16)	-0.16* (0.10)
Both -> Both	0.12** (0.05)	0.08 (0.15)	0.23*** (0.08)	0.18* (0.11)	-0.01 (0.09)
Both->Non-farm	0.14** (0.06)	0.33** (0.16)	0.28*** (0.11)	0.22 (0.16)	0.01 (0.10)
Non-farm -> Farm	-0.10** (0.05)	-0.07 (0.12)	-0.04 (0.08)	0.05 (0.10)	-0.24** (0.10)
Non-farm -> Both	0.11* (0.06)	-0.09 (0.19)	0.09 (0.09)	0.27** (0.12)	0.13 (0.10)
Non-farm -> Non-farm	0.20*** (0.03)	0.31*** (0.10)	0.25*** (0.06)	0.30*** (0.07)	0.18*** (0.07)
Female participation					
Non-part->Part	0.09 (0.06)	0.07 (0.13)	-0.03 (0.13)	0.20 (0.15)	0.14 (0.10)
Part->Non-part	0.11* (0.07)	0.24** (0.12)	0.06 (0.11)	-0.05 (0.20)	-0.02 (0.11)
Part->Part	0.14** (0.07)	-0.20 (0.21)	0.33** (0.16)	0.16 (0.16)	0.01 (0.10)
Change in migration status					
Non-mig->Dom mig	-0.01 (0.04)	-0.02 (0.10)	0.02 (0.07)	-0.06 (0.11)	0.10 (0.07)
Non- mig ->For mig	0.76*** (0.07)	0.85*** (0.16)	1.06*** (0.15)	0.59*** (0.14)	0.69*** (0.12)
Dom mig ->Dom mig	0.04 (0.05)	-0.00 (0.12)	0.12 (0.09)	-0.14 (0.10)	0.12 (0.08)
For mig ->For mig	0.90*** (0.06)	1.62*** (0.40)	0.91*** (0.15)	0.83*** (0.21)	0.82*** (0.08)
Head's base year's education					
Primary	0.03 (0.03)	-0.12* (0.06)	0.06 (0.04)	-0.04 (0.06)	0.14** (0.06)
Secondary incomplete	0.06* (0.03)	-0.05 (0.09)	0.08 (0.06)	-0.09 (0.07)	0.15** (0.06)
Secondary complete	0.24*** (0.04)	-0.20 (0.13)	0.15* (0.08)	0.11 (0.08)	0.31*** (0.07)
.	.	.	.	.	.
2008	-0.03 (0.02)	0.00 (0.06)	-0.06 (0.04)	0.01 (0.04)	0.07* (0.04)
Division	.	.	.	.	.
Chittagong	-0.42*** (0.10)	-0.22 (0.22)	-0.48*** (0.14)	-0.60*** (0.21)	-0.38 (0.24)
Sylhet	-0.40*** (0.11)	-0.50** (0.21)	-0.43* (0.22)	-1.24*** (0.22)	-0.30 (0.19)
Dhaka	-0.03 (0.06)	-0.23 (0.16)	-0.04 (0.09)	-0.32** (0.14)	0.13 (0.11)
Khulna	-0.02 (0.07)	-0.48** (0.21)	-0.03 (0.16)	-0.28* (0.15)	0.14 (0.13)
Rajshahi	0.12 (0.12)	0.10 (0.27)	0.19 (0.19)	-0.40* (0.24)	0.25 (0.29)
Agro-eco zone control	Yes .	Yes .	Yes .	Yes .	Yes .
Constant	7.16*** (0.31)	8.70*** (0.74)	7.86*** (0.59)	9.32*** (0.73)	5.94*** (0.69)
Observations	3118	528	1060	594	936
Adjusted R <sup>2</sup>	0.497	0.575	0.430	0.447	0.491

Note: Standard errors in parentheses. \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ .



### 3 Agricultural Growth and Its Drivers

Bangladesh overcame dire expectations of widespread starvation in the early 1970s to attain its goal of self-sufficiency in rice, its main staple.<sup>23</sup> Table 3.1 provides a snapshot of agriculture’s massive and laudable achievements since that time. Some of those challenges persist—the very limited land base with virtually no room to bring more land under cultivation; one of the highest population densities in the world; extreme vulnerability to natural disasters (also among the highest in the world); an undiversified production base; and poor infrastructure, including roads, power, and irrigation.

**Table 3.1: Bangladesh has transformed agriculture since the early 1970s**

Early 1970s (1972–73)	Early 2010s (2012–13)
Total food grain production: 10 million t	Total food grain production: 34–35 million t
Average rice yield: 1 t/ha	Average rice yield: 3 t/ha
Less than 7% of net cultivated area is irrigated	More than 80% of net cultivated area is irrigated
Fertilizer use at 45 kg/ha (net sown area basis)	Fertilizer use at 530 kg/ha (net sown area basis)
Rainfed aus and aman = 78% of rice output	Irrigated boro = 57% of rice output
Total population: 71 million	Total population: 157 million
Food grain availability per capita: 410 g per day	Food grain availability per capita: 616–632 g per day

Source: Updated from Hossain and Bayes 2009.

Note: Aus = rice sown in March/April and harvested in the summer; aman = rice sown or transplanted in spring or summer and harvested in November–December; boro = rice grown in the October–March dry season.

The improved performance of agriculture owes a significant debt to proactive economic and social policies. Significant demographic changes, specifically falling family sizes and rising human capital, together with technological change have contributed to the impressive growth in output per capita. The reduction in family size and entry of large numbers of better-educated young people into the workforce are delivering a “demographic dividend” in overall productivity to Bangladesh.

As noted in Chapter 2, agriculture (directly or indirectly) remains a major driver of Bangladesh’s increasingly complex rural economy, with its widening array of inter-related sectors. Agriculture’s relative size in the economy, shown earlier in Chapter 1, Figure A1.1, is becoming smaller, which is typical for a transforming economy, but this trend does not indicate that agriculture is becoming irrelevant. In a transforming economy, agriculture’s role changes from being a direct or primary contributor to economic output to making a more leveraged contribution through powerful farm–non-farm linkages that have long been recognized in development economics.

As structural transformation proceeds, an increasingly non-agricultural population will heighten the demand on the resources (human and land) remaining in the sector to be more productive.

<sup>23</sup> Average imports of rice in recent years have been equivalent to less than 2 percent of domestic production.

Agriculture will be called upon to sustainably meet the growing demand for basic foods; accommodate the changing dietary patterns arising from rising incomes and urbanization; and meet the growing imperatives for more diverse, safer, and more nutritious foods.

For agriculture to fulfill this expanding role, Bangladesh must ensure that the transformation of its economy is accompanied by a smooth transition to a more productive, climate-resilient, and diversified agriculture. Progress has been slower than expected. Structural shifts within agriculture have been limited, and they remain the biggest challenge facing the sector. The main tasks of this chapter are to analyze drivers of past growth and identify priority actions going forward.

## *Evolving Structure of Agriculture*

The direct contribution of agriculture to the overall economy and the changing role of agriculture are reflected in the sector's performance and composition. Table 3.2 summarizes how the size of the sector has evolved; Table 3.3 shows how growth rates of the various agricultural subsectors have evolved.

**Table 3.2: Subsectoral shares of GDP and composition of agricultural value-added (%)**

	1980/81	1989/90	1999/00	2009/10	2011/12
<b>Share in GDP</b>					
Crops	21.1	18.0	14.0	11.4	10.9
Livestock	4.2	3.6	2.9	2.6	2.5
Forestry	2.2	2.0	1.8	1.7	1.7
Fisheries	4.7	4.2	5.9	4.5	4.4
<i>Total</i>	<i>32.2</i>	<i>28.6</i>	<i>24.6</i>	<i>20.2</i>	<i>19.4</i>
<b>Share in agricultural GDP</b>					
Crops	65.6	65.5	57.1	56.3	58.8
Livestock	13.0	12.6	11.8	13.1	12.9
Forestry	6.8	7.1	7.3	8.5	8.8
Fisheries	14.6	14.8	23.8	22.1	22.7
<i>Total</i>	<i>100.0</i>	<i>100.0</i>	<i>100.0</i>	<i>100.0</i>	<i>100.0</i>

Source: BBS.

**Table 3.3: Growth rates, 1990–2014**

	1990–2014	1990–99	2000–09	2000–04	2005–09	2010–14
Agriculture, of which:	3.7	2.3	4.2	2.7	5.0	3.2
Crop and horticulture	3.4	0.9	4.0	2.5	5.0	1.8
Animal farming	2.1	2.2	2.0	2.0	2.2	2.7
Forestry	4.5	3.3	5.0	4.9	5.3	5.3
Fishing	5.7	7.0	5.8	2.5	6.8	5.9
GDP	5.2	4.5	5.6	4.5	6.1	6.1
Population	1.6	2.1	1.3	1.5	1.1	1.2

Source: National Accounts GDP data in constant 2005/06 prices from BBS; and population growth rate from WDI.

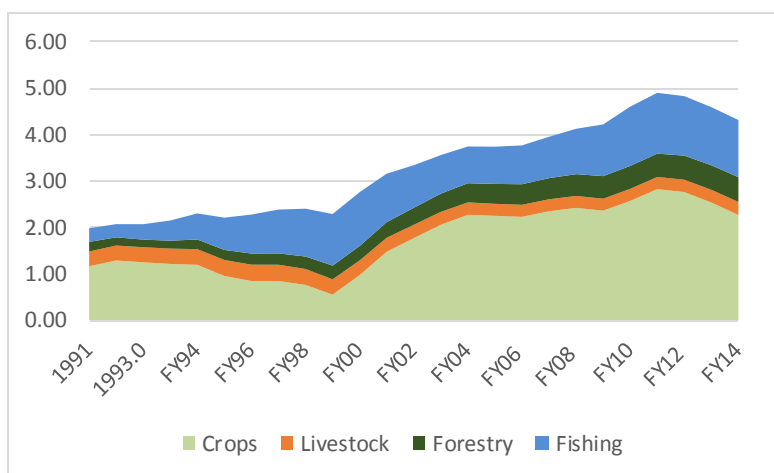
Note: Growth rates are trend growth rates for the specific periods.



For reasons discussed later, the strength of agriculture's contribution to the rural economy has varied over time. The sector's growth in recent years—over 5 percent per year in 2009–10 and in 2010–11—and its contribution to reducing rural poverty are well established. Nevertheless, this impressive performance continues to be peppered with periodic shocks, as in 2012–13, when the overall growth rate plummeted because of unfavorable weather. In addition, the moderation in real prices since 2010 has led to a slowing of growth in the crops subsector to less than 2 percent. The periodic shocks underscore the continuing vulnerability of Bangladeshi agriculture to climate shocks, even though it is less than in the past.<sup>24</sup>

The broad subsectoral composition of agricultural GDP has changed to a limited extent. Crops, particularly rice, still dominate the sector, currently contributing about 58 percent of sectoral GDP, a relatively small decline from 64 percent in the early 1980s (see Annex 3, Figure A3.1). Growth is relatively less stable in crops than in the other subsectors, which have grown much faster and more consistently over time. All subsectors, as well as the overall economy, experienced a slowdown in the early 2000s, but outside that brief period, forestry and fisheries have recorded consistently high growth rates, with fisheries emerging as an increasingly important driver of growth across the agricultural sector. Figure 3.1 and Figure 3.2 illustrate these points.

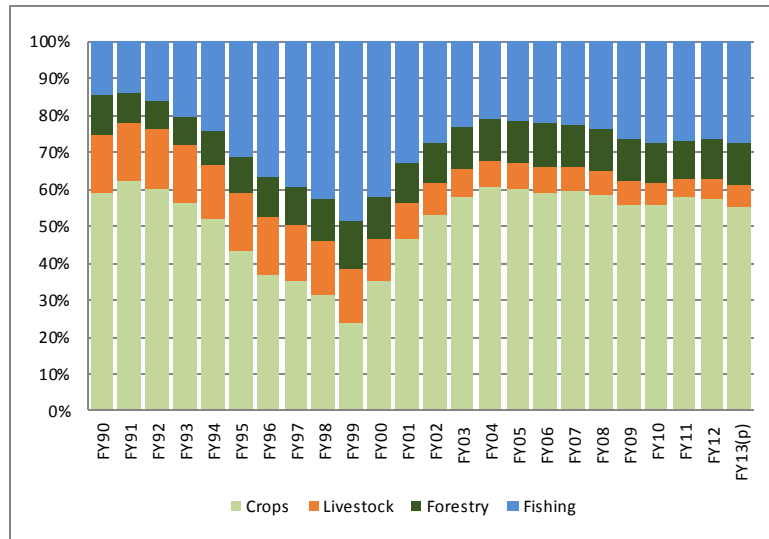
**Figure 3.1: Subsectoral agricultural growth**



Source: Authors, using BBS data.

<sup>24</sup> The volatility in agricultural growth has diminished significantly because about 80 percent of cultivated area is now irrigated and major floods have been few in recent years. Distinct episodes of strong subsectoral performance have also contributed to the stability of overall agricultural growth. For example, from the 1980s through the 1990s, growth in the crops subsector was positive but slowed considerably. At the same time, the fisheries subsector did exceptionally well, contributing to most of the growth in agriculture and driving agricultural GDP higher despite the slowdown in the crops subsector. In the 2000s, growth in fisheries slowed, but crops initiated a strong recovery. Growth in the livestock and (to a lesser extent) forestry subsectors also accelerated.

**Figure 3.2: Subsector shares in agricultural GDP growth**

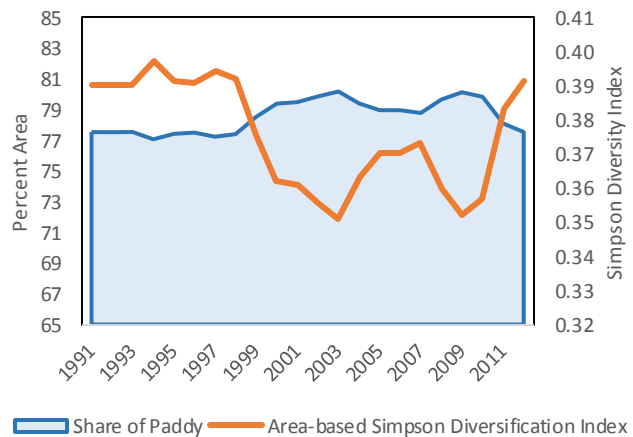


Source: Authors, using BBS data.

### Crops subsector

Within the crops subsector, the broad structure of production appears to have changed little. Diversification (Figure 3.3), calculated using the area-based Simpson diversification index,<sup>25</sup> is low, reflecting the substantial 77–80 percent of cultivated land devoted to paddy. The area under paddy has increased in recent years, contrary to what may be expected or desirable; the area allocated to rice in the 2000s was higher than in the 1990s (although in 2012 it fell to the 1990 level). This trend partly reflects the introduction of newer and better rice varieties—in other words, new technology appears to have reversed diversification out of rice. In

**Figure 3.3: Trend in crop diversification, 1991–2012**



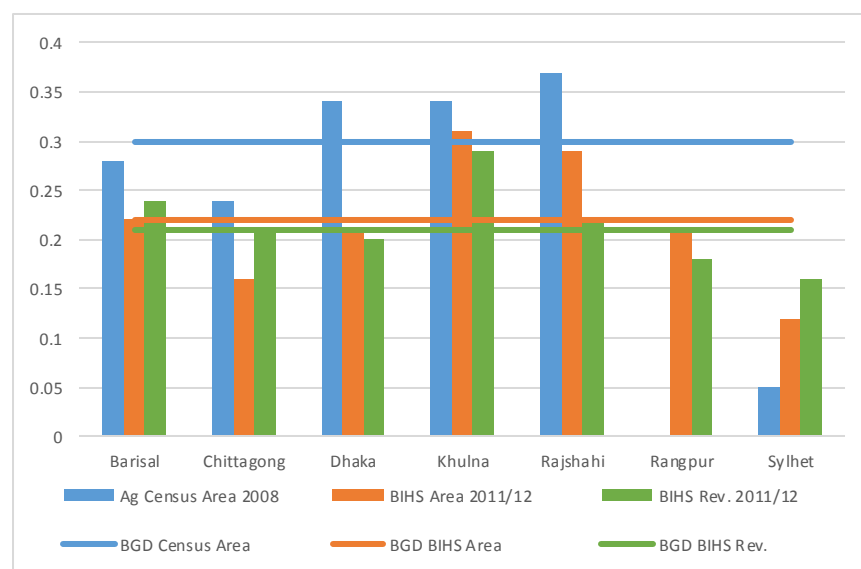
Source: Authors, using FAOSTAT.

<sup>25</sup> The Simpson diversification index is calculated as  $SID = 1 - \sum_{i=1}^n P_i^2$ , where  $P_i$  is the proportionate area (or production value for a value-based index) of the  $i^{\text{th}}$  crop in gross cropped area (total production value).

rice prices have induced an increasing emphasis on rice, and the rising prices of high-value crops have caused the remaining area to be reallocated to them. In value terms, the share of rice has registered a modest decline from 74 to 66 percent of the value of output for crops (see Annex 3, Figure A3.2). These trends are consistent with evidence from the micro level, discussed later.

The level of diversification is analyzed at a more disaggregated level (by division) using the two data sources that allow reliable calculation—the Agricultural Census of 2008 and the nationwide BIHS (IFPRI 2013) of 2011/12. The Agricultural Census allows only area-based diversification to be estimated, as it does not have price data (for the six original divisions).<sup>26</sup> The BIHS allows estimations of area and revenue diversification indices for the seven divisions (Figure 3.4) in Bangladesh. Estimates from the two sources differ somewhat, but in both cases, the micro-level household surveys show a lower level of diversification than national aggregates.<sup>27</sup>

**Figure 3.4: Diversification by division**



Source: Authors, using BBS 2008 and BIHS 2011/12 (IFPRI 2013).

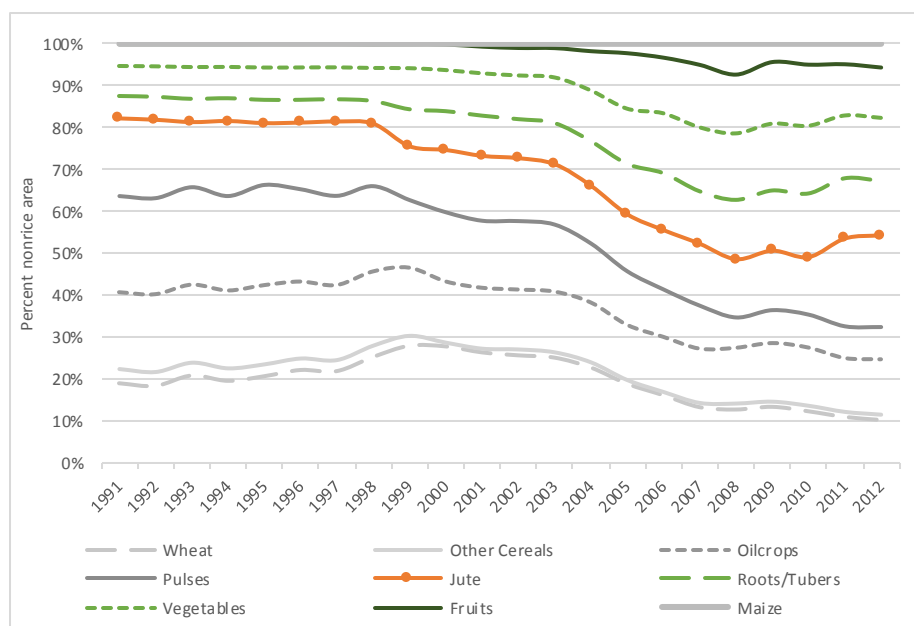
Overall, both the revenue and area diversification indices show heterogeneity across divisions. Diversification in the eastern divisions (Chittagong, Dhaka, and Sylhet) is lower than in the western divisions (Barisal, Khulna, and Rajshahi), showing consistent patterns for area- and value-based indices.

<sup>26</sup> The Agricultural Census database classified the current Rajshahi and Rangpur Divisions under the older classification as Rajshahi, and hence is reported as such.

<sup>27</sup> Each micro-level data source has limitations, either in the coverage of crops or availability of price/value data. Most sources have data on the area under specific crops, which was compared for consistency across the FAO database, Agricultural Census of 2008, and the BIHS 2011/12, as they are likely to be more representative than other sources.

For crops other than rice, important changes are taking place, reflecting evolving demand patterns and preferences (Figure 3.5). An important shift is the decline in wheat and other cereals, oilseeds, and pulses, which are being replaced by maize, fruits and vegetables, roots and tubers, and jute. Over the long term, wheat area and production have moved up and down, but pulses and oilseeds have steadily declined, superseded by strong growth in vegetables, potatoes, and spices since the 1980s (Annex 3, Table A3.1).

**Figure 3.5: Area planted to crops other than rice**



Source: Authors, using FAOSTAT.

Rice remains the largest contributor to growth in the crops subsector, but as noted, its contribution is proportionately less than its share in the value of output (Table 3.4). Recent strong performers include root crops, jute, maize, and to some extent wheat and vegetables. (Among the root crops, potato area got a particularly strong boost, maintained with the opening in 1998 of the Jamuna Bridge, which connects the western districts to Dhaka and Chittagong and facilitates their access to national and global economic opportunities.) Rapid growth in disposable income has spurred demand for the highly income elastic horticultural crops, helping horticultural crops (especially vegetables) record impressive growth records. Growth has been variable, however; the major problem faced by producers of horticultural crops is the volatility in both production and prices. Jute is experiencing something of a renaissance owing to growing global demand for natural fibers. Maize is another crop that stands out for its growth performance (Table 3.5), following the rapid emergence of the poultry industry and the private sector's introduction of new varieties (hybrids).

**Table 3.4: Shares of crop groups in growth of the crops subsector and value of output**

	Growth	Average share of output and growth (2006–12, %)	
		Output	Growth
Paddy	3.7	65.9	57.2
Roots/tubers	8.3	10.2	20.1
Jute/fibers	9.4	2.8	6.3
Spices	4.0	5.4	5.1
Maize	9.1	1.6	3.5
Wheat	5.5	2.2	2.8
Vegetables	4.7	2.3	2.5
Fruits	1.5	5.5	2.0
Oil crops	5.1	1.1	1.3
Soybean	2.0	0.2	0.1
Other cereals	-12.3	0.0	0.0
Cash crops	-0.1	2.1	-0.1
Pulses	-6.6	0.6	-0.9

Source: Authors, using BBS data.

**Table 3.5: Maize production, area, and yield, 1981–2012**

Crops	Annual average, 2006–12				Growth rate			
	1981–90	1991–00	2001–05	2006–12	1981–90	1991–00	2001–05	2006–12
Production (t)	2	3	307	1104	15.01	0.79	46.10	--
Area (000 ha)	3	3	55	179	6.19	-1.04	26.64	--
Yield (t/ha)	0.76	1.05	5.66	6.17	8.30	1.85	15.36	--

Source: BBS.

### ***Non-crop agriculture: Livestock and fisheries***

The livestock and fisheries subsectors are strategically important for Bangladesh because they buffer volatility in the sector's overall growth, augment food and nutritional security, contribute to poverty reduction, and generate jobs. Poultry and dairy farming have specific advantages over crops, fisheries, and forestry because these operations require less land and are not significantly affected by seasonality. Fisheries are an important traditional source of protein in the Bangladeshi diet, and the subsector makes an important contribution to export growth.

The fisheries subsector has performed consistently better than livestock, as reflected in the estimates of GDP by subsector (shown earlier in Table 3.2). Since the early 1990s, except for the years between 2000 and 2004, fisheries experienced higher and more consistent growth than livestock.

The official data provide a somewhat contradictory picture of the livestock subsector's contribution, however. The subsector has made a continuous but low contribution to overall GDP growth, and the share of animal farming declined steadily from about 15 percent of agricultural GDP in the early 1980s to about 11 percent over 2009–15 (Figure A3.1 in Annex 3). Yet other official sources of data on physical production trends for three key livestock products (milk, meat, and eggs) show a different, more positive picture than the GDP estimates for the subsector (Table 3.6).<sup>28</sup> Growth rates for milk, meat, and egg production improved in the 1990s but have become much more volatile since 2000. In 2000–05, meat production grew by more than 14 percent annually, milk production by nearly 7 percent, and egg production at 12 percent. In 2005–10, growth in production slowed sharply for all three products but then rebounded to grow at phenomenally high rates: 29 percent for meat, 27 percent for milk, and 16 percent for eggs. These growth rates suggest that producers have responded strongly to the growing demand for these income-elastic foods (with rapid GDP growth and the implied increase in incomes in recent years).

While these livestock products have shown robust growth, the growth in livestock numbers has been modest. Over the past five years (to 2014), poultry numbers grew at 3 percent, followed by goats/sheep at 2.8 percent.<sup>29</sup> Cattle numbers, on the other hand, have grown at the very low rate of about 0.4 percent over the same period.

**Table 3.6: Trends in milk, meat, and egg production, 1991–2014**

Item	1991	1995	2000	2005	2010	2014	Annual average growth (%)				
							1991–95	1995–2000	2000–05	2005–10	2011–14
Milk (million t)	1.34	1.41	1.6	2.14	2.37	6.09	1.31	2.69	6.75	2.15	25.6
Meat (million t)	0.45	0.51	0.62	1.06	1.26	4.52	3.33	4.31	14.19	3.77	29.1
Eggs (million)	2,040	2,530	3,500	5,623	5,742	10,168	6.0	7.67	12.13	0.42	15.9

Source: Shahabuddin 2014; Finance Division 2014.

Numbers of all three major types of livestock—cattle and buffaloes, sheep and goats, and poultry—declined on medium farms (from 2.5 to less than 7.5 acres) and large farms between 1996 and 2008 (Ali and Hossain 2014). In contrast, on marginal and small farms (less than 2.5 acres) livestock numbers increased over the same period, displaying impressive growth (36.0 percent for cattle and buffaloes, 28.4 percent for goats and sheep, and 14.4 percent for poultry). Small and marginal farms continued to dominate the production of all three types of livestock.

The relatively slower growth in stock numbers and faster growth in animal products indicates faster growth in yields. Technology has been quite an important driver of growth in livestock production (similar to its role in crop production), especially through cross-breeding of cattle and goats and disease control in poultry.

<sup>28</sup> See Shahabuddin (2014) and updates from *Bangladesh Economic Review* (Finance Division 2014).

<sup>29</sup> *Bangladesh Economic Review* (Finance Division 2014).

The livestock subsector's varied and uneven growth over time is worrisome in relation to the projected rapid rise in demand for livestock products. Projections of the demand for livestock products show that by 2015, demand for meat will reach over 4 million tons, demand for eggs will rise to more than 10 billion, and demand for milk will reach more than 7 million liters. In contrast, based on current trends, in 2015 Bangladesh will produce 1.4 million tons of meat, 6.1 billion eggs, and 3.9 million liters of milk, leaving a deficit of about 3 million tons of meat, 2.5 billion eggs, and more than 3 million liters of milk.<sup>30</sup>

The fisheries subsector consists mainly of (1) inland open water capture fisheries, (2) inland closed water culture fisheries, and (3) marine fisheries.<sup>31</sup> In 2013–14, total estimated fish production was 3.5 million tons, allocated as shown in Table 3.7.

**Table 3.7: Total fish production, 2013–14**

Type of fishery	Production (t)	% of total
Inland open water capture	995,805	28.1
Inland closed water culture	1,956,925	55.1
Marine	595,385	16.8
<i>Total</i>	<i>3,548,115</i>	<i>100.0</i>

Source: Department of Fisheries 2014.

The overall fisheries subsector has grown more rapidly than the livestock subsector but has also shown some inconsistency, notably declining in 2001–05 but then resuming its longer-term rapid rate of expansion. One possible reason for this growth fluctuation is that a good share of fisheries—inland freshwater capture fisheries—depends on the vagaries of nature, particularly the monsoon. Another may be demand; both domestic demand and exports have grown rapidly since 2000 but can fluctuate due a range of exogenous factors. Another reason, advanced by Shahabuddin (2014), is that the slowdown of 2001–05 was a natural phase of consolidation following the rapid increase of pond fisheries in the earlier period.

Inland fisheries have undergone a structural transformation since 2000. Before then, most fish came from inland freshwater capture fisheries, but now culture fisheries account for 52 percent of fish output versus 42 percent from capture fisheries. The catch from ponds, ditches, and coastal shrimp farms almost doubled between 2001 and 2011. The main source of growth in inland capture fisheries is the floodlands, whereas the major source of growth in culture fisheries is ponds and

<sup>30</sup> Such deficits, if the market operates competitively, will lead to higher prices if supply does not increase in response to rising demand at a rate that is more than what is projected.

<sup>31</sup> *Inland open water bodies*, where capture fishing is mainly carried out, include rivers and estuaries, *beels* (small lakes, low-lying depressions, permanent bodies of floodplain water, or bodies of water created by rains or floods that may or may not dry up in the dry season; in the wet season, *haors* or shallow lakes may be formed as smaller water bodies are joined up), Kaptai Lake (a man-made lake created for hydroelectricity), and floodlands (annually flooded, low-lying areas associated with rivers). *Inland closed water bodies*, where aquaculture (fish farming) at various intensities is carried out, include ponds, *dighis* (big ponds), and *haors* (oxbow lakes), and also some coastal waters. The fisheries subsector also includes brackish water shrimp/prawn production in coastal areas. *Marine fishing* takes place in waters extending over 166,000 km<sup>2</sup> (16.6 million hectares) of sea area, following the 1974 declaration of a 200 nautical mile Exclusive Economic Zone (EEZ), within which Bangladesh also has the right to exploit and manage living and non-living resources. Brackish water shrimp production occurs in coastal areas where shrimp are produced in artificial ponds, primarily for export.

ditches. A comparison of HIES data for 2005 and 2010 also shows consistent shifts in consumption patterns across all incomes groups, with total fish consumption rising but consumption of wild fish declining. It is generally believed, however, that the fish catch (and consequently per capita fish consumption) is underreported, particularly for culture fisheries.

With marine fisheries, primary harvesting has increased between 2001/02 and 2012/13, rising from 415,420 to 588,988 tons, although as a share of total annual fish production it has remained at 18 percent, coming mostly from small-scale coastal artisanal fishers.

While overall fish production has increased over time, and opportunities exist to improve the contribution of fisheries to economic growth, significant challenges remain. For inland freshwater capture fisheries, a key challenge is to continue reforms in the arrangements for leasing water bodies, with a focus on sustainable management and economic returns. Leases for closed water bodies (*Jalmahals*) of less than 8.1 hectares are now negotiated with registered fisher organizations, which can reduce the risk of leases being appropriated by local elites; however, the leasing period remains limited to between one and three years (Toufique and Ahmed 2014). This time frame is too short to provide sufficient incentives for long-term sustainable fisheries management. Alternative approaches to leasing can provide secure use-rights without the government giving up land/water ownership. One option put forward by various experts is a long-term lease (perhaps up to 50 years) at nominal fixed rates per hectare, subject to renewal and extension at 10-year intervals based on satisfactory management and conservation performance by the leaseholder against an approved management plan. Performance could be monitored by district-level *upzila* fisheries committees. Thus communities that continue to meet performance standards will retain long-term, secure use-rights. Other priorities include the need to improve productivity of these water bodies and to support better market access for community-based producer groups and organizations (Milne, Jansen, and Fernando 2009). Destruction of immature fish (ova, larvae, breeding fish) and use of illegal fishing gear is another important internal barrier to growth. Some of the broader issues affecting the productivity of inland water bodies include land degradation (causing siltation), pollution of water bodies from urban and industrial areas, and climate change (Toufique and Ahmed 2014).

For inland culture fisheries, key challenges include improving the arrangements for communities to lease government-owned ponds. Although the leases are issued for a fixed period (in some cases up to 25 years), there are no provisions for renewal, and this uncertainty can reduce incentives for long-term, sustainable management. For private lands, the issue of multiple owners often arises when ponds extend across multiple properties. Other challenges include poor technical management and low productivity, high costs, poor quality of hatchery fry, and market access, including traceability and food safety systems (Miah 2015).

Both of these types of fisheries (inland culture and capture) have a strong role to play in poverty reduction, food production, and in providing protein to the rural poor. The World Fish Centre (2006) has estimated that another 1 million hectares of inland waters could potentially be



developed for productive fishing in floodlands (70 percent of additional area), rivers and estuaries (10–15 percent of additional area), and inland closed waters (10–15 percent of additional area). Bringing this estimated incremental area under well-managed fish production could raise gross revenues from fishing by US\$ 2 billion; generate an additional 1.5 million full-time equivalent jobs, mostly with the rural poor; and create significant upstream and downstream indirect jobs and enterprises.

While some of the external barriers to growth, such as pollution, cannot be easily addressed, substantial scope for improvement exists. The Department of Fisheries has maintained a long association with local and international development partners in piloting new approaches for inland fisheries. As an example, for freshwater capture fisheries in large beels, advanced models involving a Joint Stock Company or Public Limited Company with local fishers holding shares along with landowners have shown great potential to improve production, quality, and incomes. In addition, the government and donors have invested time and resources to develop and pilot community-based fisheries management regimes to better manage capture fisheries. The lessons from these models point to the possibility of crafting relatively more efficient institutions capable of addressing appropriation problems (rent maximization, reducing conflicts, and so on) as well as issues from the open access that currently characterizes the open water fisheries (for example, by helping community groups develop and maintain breeding sanctuaries, using appropriate fishing gear, and enforcing a closed season) (Toufique and Ahmed 2014).

For inland culture fishing, significant improvements in productivity have been demonstrated through the use of integrated aquaculture and livestock models. Promoting community-based management has also helped to improve productivity for government ponds.

Brackish shrimp production along the coast makes a major contribution to exports of fish products. Key challenges are to improve product quality and quality assurance arrangements, support producer groups and marketing systems, and mitigate environmental impacts. Opportunities exist to address these issues by scaling up contract grower schemes that link small producers with large processing companies, expanding training for producers in quality assurance and application of the international Hazard Analysis and Critical Control Points (HACCP) system, as well as training producers in improved environmental management.

For marine fishing, a key challenge is to address issues of overcapacity relative to sustainability and economic performance. A recent study (Moman and Arnason 2007) estimated that the hilsa fisheries were generating almost zero annual net economic returns, but with long-term reforms around fishing rights and capacity reductions, the potential annual net economic returns could be as high as US\$ 260 million. Basic management activities that need to be developed as part of a long-term reform process include updated stock assessments for key species such as hilsa; an effective vessel registration system; use of bio-economic models to identify current and future resource rents for key stocks; implementation of improved education and awareness programs; and piloting community-based fishing for inshore fishers based on stronger resource rights and

well-defined management plans for key fish stocks. For a pro-poor policy, the priority of resource access should be shifted to poor, shore-based artisanal fishers, then to small-scale offshore fishers, then finally to larger commercial trawlers. Some steps have already been taken to address these issues, but much more work remains to be done.

## *Farm growth by ecology*

Another way to assess drivers of agricultural growth is by agro-ecological zone (AEZ). An AEZ is an area characterized by homogeneous agricultural and ecological characteristics. Agro-ecology has an increasingly important role in agricultural planning, technology transfer, and the use of specific biophysical resources, and Bangladesh has delineated 30 AEZs based on four elements: physiography, soil properties (important for plant growth, moisture supply, root aeration, and nutrient supply), land levels in relation to flooding, and agro-climate (which also influences cropping patterns and potential) (Annex 3 Table A3.4).<sup>32</sup>

To facilitate the analysis of agricultural growth, potential, and constraints, the 30 AEZs can be grouped into a more manageable set of 8 clusters based on broadly similar characteristics, as shown in Table 3.8. Crop agriculture has experienced the most growth in three land clusters (the plains, beel lands, and Barind land), where high-yielding *boro* rice varieties for the October–March growing season have led a major boost in crop production. In these clusters, the availability of water (through irrigation using ground and surface water) played a significant role, as did technology and access to markets.

**Table 3.8: Composition of clustered agro-ecological zones and current/future crop options**

Agro-ecological zone (AEZ) cluster	AEZs forming the cluster	Current/future crop options
Plain land	1, 3, 4, 6, 8, 9, 11, 12, 16, 17, 19, 20, 22, and 30	Aman, HYV boro, jute, sugarcane, wheat, maize, potatoes
Char land	2, 7, and 10	Aus, deep-water aman, jute, rabi pulses
Coastal	13, 17, 18, 19, 23, and 24	Aus, HYV boro, wheat, chilli, vegetables
Beel	5, 14, and 15	HYV boro, aus, jute, sugarcane, pulses
Sylhet basin	21	Rabi vegetables, mustard
Barind land tract	25, 26, and 27	Broadcast aman, HYV aus, potatoes, wheat
Madhupur	28	Groundnuts, deep-water aman, mustard
Hills	29	Tea, pulses, cotton

Source: Faruquee 2012.

Note: AEZs are listed and defined in Annex 3. HYV = high-yielding variety. Aman = rice sown or transplanted in spring or summer and harvested in November–December; aus = rice sown in March/April and harvested in the summer; boro = rice grown in the dry season between October and March; rabi = dry season (November–May). Beel land has small (seasonal or permanent) bodies of water; char land is newly formed coastal land.

<sup>32</sup> The database used to delineate AEZs must be updated over time, owing to changes in land types as roads and other structures are built, changes in precipitation and temperature over time, as well as innovations in crop production that make it possible for some crops to tolerate different stresses in the growing environment.

Irrigation as a driver of production growth depends on topography (land level). Bangladesh has four types of land level: highland (above the normal flood level), medium high land (normally flooded to a depth of up to 90 centimeters during the flood season), medium low land (normally flooded 90–180 cm), lowland (normally flooded 180–300 cm), very low land (normally flooded deeper than 300 cm). Bottomland remains wet throughout the year. The depth range for each flooding class is not rigid, however—flood levels in an area may vary by a meter or more in different years, and they may also peak for only a few days at a time during a particular year.

The cropping pattern in each land class depends on the level of flooding anticipated by farmers when they decide which crops to grow in the *kharif* season (April–November, overlapping with the monsoon) on the different land types present on their farms. Farmers’ long experience of cultivation on particular sites guides their choice of crops.

An examination of cropping pattern and cropping intensity by irrigation type and status adds another dimension to the discussion of how agro-ecology affects crop selection and potential. For example, where the main sources of water for crops are rainfall and surface water irrigation, the cropping pattern is paddy cultivation followed by fallow (or paddy followed by a non-paddy crop), but in areas where groundwater is mostly used for irrigation, two consecutive paddy crops is the main pattern. Groundwater irrigation is used on 15–20 percent of the land in areas where rainfall or surface water irrigation form the default water regime. Groundwater irrigation has the advantage of providing a regular supply of water for cropping, but the water supply is irregular where surface water and rainfall dominate.

Crop diversification is more common, to varying degrees, on high and medium land. It is least common on low land, because early flooding negatively affects vegetables, fruits, and other high-value crops. These patterns are borne out by the longitudinal MH panel surveys, which show how technical efficiency in farming (discussed later) and crop diversity vary by ecological area (see Table 3.9).

**Table 3.9: Farm efficiency and crop diversity by broad agro-ecological zone**

Zone	Farm efficiency			Crop diversity index		
	2000	2004	2008	2000	2004	2008
Flood prone	0.737	0.773	0.695	0.232	0.191	0.164
Drought prone	0.715	0.699	0.754	0.243	0.186	0.228
Saline coast	0.702	0.778	0.752	0.187	0.215	0.265
Non-saline coast	0.763	0.762	0.672	0.039	0.0472	0.0517

Source: Ahmed and Gautam 2015.

To assess the impact of ecology on cropping pattern, cultivated land can also be broadly categorized into two main segments—favorable and unfavorable zones. In favorable zones, water is fairly reliably available; no salinity, fear of drought, or excessive flooding are present. In unfavorable zones, natural conditions (mainly soil and water stress) tend to be the main determinant of cropping patterns. Despite the disadvantages of growing rice in unfavorable zones, such as lower yields and lower returns relative to other crops, the lack of alternatives and the need

to secure the food supply compel cropping patterns to relay on rice. For example, in 2008 paddy yields were lowest in coastal areas (Table 3.10). Except for the non-saline coast, where the value of output per hectare is higher for rice than other crops (and households accordingly devote almost all of their cropped area to rice), in all other areas households still invest heavily in paddy. For crops other than rice, some degree of specialization is seen in the drought-prone areas (in jute) and along the saline coast (in pulses and potatoes), whereas crop choice is more diversified in other areas. The concentration in rice, even where agroclimatic conditions are not ideal, suggests a significant opportunity cost in terms of foregone income.

**Table 3.10: Production patterns by broad agro-ecological zone**

Zone	Rice area share	VOP ratio	Paddy yield
Flood-prone	78%	1.1	4.2
Drought-prone	76%	2.4	3.5
Saline coast	77%	1.4	3.0
Non-saline coast	96%	0.6	3.1
Favorable	82%	1.0	3.9

*Source:* Authors, using MH panel surveys.

*Note:* VOP ratio is the ratio of value of production per hectare of non-rice crops to rice, reflecting the non-crop premium over rice.

## ***Policy Reforms and Their Impacts***

In broad aggregate terms, the key driver of agricultural growth has been increased productivity made possible through policy reform. Key reforms since the 1980s have facilitated irrigation through the rapid spread of groundwater pumps, improved technology through the use of high-yielding plant varieties and fertilizer, better connectivity and linkages to packaging, processing, and markets for farm products (and more efficient markets) through investment in roads, and changes in land market operations through mechanization.<sup>33</sup> The roles and contributions of the drivers have varied over time and by area, but the aggregate trends are clear.

Policy reform has been an important driver of agricultural growth both at the macro level and at the sectoral level. Sectoral reforms were initiated in the 1980s when the government made major reforms in agricultural input markets, starting with fertilizer markets. The first stage of reforms liberalized the retail trade in fertilizer, and the second stage liberalized the wholesale market, with progressively greater participation of private traders. The bold steps taken by the government, and the speed with which they were implemented, were supported by donors through financing to import fertilizer and to train farmers to use it alongside new high-yielding varieties.

In tandem, the government took steps to liberalize markets for other inputs, including irrigation and water management, and seeds. The irrigation system, which began with large public irrigation projects, gradually moved to private enterprises. First, low-lift pumps were used by private farmers

<sup>33</sup> See Shahabuddin (2014) for details.

or groups of farmers to draw water from the myriad rivers crisscrossing Bangladesh. Second, privately owned, small-scale tubewells gradually developed for extracting groundwater. Until 1980, BADC<sup>34</sup> (a public institution) procured and distributed small-scale irrigation equipment, such as pumps and shallow tubewells; in 1980, BADC-owned irrigation equipment was privatized. In 1988 the government eliminated restrictions on imports of agricultural equipment, and farmers started investing their own resources to set up shallow tubewells. Informal markets for irrigation water developed quickly with the rapid expansion in privately owned shallow tubewells. In highly land-constrained Bangladesh, the rapid expansion of irrigation increased the productivity of land (yield per hectare) and also facilitated greater intensification (using more inputs per hectare) as well as improved efficiency (using inputs more effectively).

Recognizing the importance of a strong seed sector for technological change, the 1993 National Seed Policy sought to strengthen the seed system (Naher and Spielman 2014). The National Seed Policy changed the seed system from a public sector orientation to involve the public and private sectors as well as civil society organizations. The Seeds (Amendment) Act 1997 and the Seed Rules 1998 further liberalized the regulations for seed certification and allowed the marketing of truthfully labeled seed.

These reforms of seed, fertilizer, and irrigation markets are widely credited for bringing about substantial gains in agricultural production, especially of rice, but few studies have empirically measured the impact of market reforms. Ahmed (1995) estimated the direct impact of liberalized input markets, distinguishing between the pre- and post-liberalization period, and concluded that reforms in fertilizer and irrigation markets could reasonably be credited with the success in rice production in the post-liberalization period (between 1984 and 1992). Specifically, approximately 20–32 percent of the increase in production could be attributed to the impact of the reforms on fertilizer consumption and private irrigation development. In a further study, Ahmed (1999) also concluded that food grain shortages and higher food prices would have persisted without changes in the fiscally unsustainable public intervention in agricultural input markets in Bangladesh.

Important reforms have also been introduced in output markets, and specifically with respect to procurement and trade of food grains. In line with the broader liberalization efforts of the early 1990s, Bangladesh deregulated imports of rice and scaled back public procurement and distribution to allow the private sector to function more freely. The efficacy of these decisions, and the efficiency of Bangladeshi entrepreneurs in responding to the changed policy environment, is evident from the fact that until 2007, when India imposed an export ban on rice, rice prices in Bangladesh remained low and stable. The prices were found to very closely follow the subsidized (Below Poverty Line) public distribution price of India (Dorosh and Rashid 2013), clearly demonstrating smoothly functioning markets. This experience since 1994 demonstrates the important role the private sector has played—even through the massive and devastating flood of 1998—in delivering a period of highly stable domestic prices up to 2007.

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<sup>34</sup> The Bangladesh Agricultural Development Corporation.

Reforms did not continue unabated. Policies in support of market liberalization were partially reversed in the late 1990s, and following the 2007 food crisis, input subsidies and public intervention in grain markets through domestic and international procurement of rice and wheat increased substantially. In 2005, restrictions were introduced in the seed sector prohibiting private sector breeding for notified crops (with the exception of rice), while rules and regulations on the registration and release of varieties were maintained. The adverse effects of those reversals (and remaining policy impediments) were mitigated to some extent by growth in productivity and, more recently, by rising prices for agricultural products. In other words, the reforms unleashed a surge in growth, with sustained—even through periodic reversals—increases in productivity of factors of production.

The new National Fisheries Policy, approved in 1998, included detailed policies for conservation, management, and exploitation of fisheries resources; quality control; planning; monitoring and evaluation; fisheries extension; and human resources development. A comprehensive National Fisheries Strategy and Action Plan was developed in 2006 to guide implementation of the strategy within the overall policy framework. The strategy focused on core areas, including long-term planning; people's participation; coordination, collaboration, and support for the sector; the regulatory framework; pro-poor approaches; gender; alternative sources of income generation for fishers; and environmental management. The more recent National Strategy for Accelerated Poverty Reduction reinforces the government's commitment to implement the fisheries strategy and accelerate growth of the fisheries subsector, especially through the intensification of inland aquaculture, a stronger focus on export-oriented species, ensuring sustainable biodiversity and preserving natural breeding grounds for inland fish, improving product diversification and value addition, and developing appropriate market infrastructure. While these policy and strategy papers provide a strong foundation and a clear roadmap for future fisheries development, their implementation to date has been fairly limited.

Going forward, it is important to address the remaining policy distortions to create a balanced incentive structure across crops and to promote non-crop subsectors. Those distortions are a critical constraint on the next surge in growth, which will have to be driven by diversification. In the broad policy framework, analysis consistently highlights the need to level the policy field that currently bestows significant advantages to rice (through output price support, procurement, and price stabilization); reorient public expenditures toward high-return technology services and infrastructure; and address the remaining regulatory barriers to more effective private sector participation in the seed sector.

## *Sources of Agricultural Growth*

The analysis of the sources of agricultural growth uses two approaches that offer different and complementary insights into the growth process and the implications for public policy. One approach—restricted to the crops subsector, because data are not available to extend the analysis

to the other subsectors—entails decomposing the change in the value of aggregate output into its five main contributing factors: changes in area, prices, yields, and diversification, plus an interaction term that captures the unexplained residual change arising from various interactions among the other four factors. The restriction to crops has limitations for explaining broader growth throughout the sector, but it is still relevant and insightful, because crops dominate agricultural output and contribute the largest share of sectoral growth.

The second approach is a total factor productivity analysis, which explains growth in output in relation to the relative contributions of inputs and the improvement in their productivity. If this analysis were restricted to the crops subsector, in effect it would build upon the analysis based on revenue decomposition by looking at the factors driving yields, and specifically at the roles of technology and policy in driving the more effective use of inputs to raise yields. In this instance, however, a broader total factor productivity analysis can be done by using an aggregate output index that incorporates crop and livestock outputs (though not fisheries).

### ***Decomposition of crop revenue growth***

Growth in aggregate crop revenues could arise from increases in area, yield, or prices (real) or from switching from low-value, low-productivity crops to high-value, high-productivity crops. Using the methodology described by Minot et al. (2006), crop revenues are decomposed into these four components, and an interaction term is used to capture the residual that cannot be explained by the four individual components but arises through various interactions among them.

The analysis uses data for 1996–2011 from FAO, the only source of consistent annual time-series data on prices, area, and production by crop for Bangladesh. The analysis is done at the national level, again due to data limitations; an attempt was made to compile a district database, but the data were incomplete, covered a very limited time period, and were outdated. For the analysis, the time series for area, production, and prices are smoothed to remove the large annual fluctuations and better identify the underlying trends.

Figure 3.6 presents year-on-year changes in crop revenue growth for each of the components, providing an idea of the changes over the 15-year period. The figure shows that growth in the value of crop output behaved in cyclical manner, falling during the 1990s and recovering around 2000, increasing to 2008, and then declining somewhat since then. These trends are consistent with the trends in GDP for the crops subsector shown in Figure 2.1.

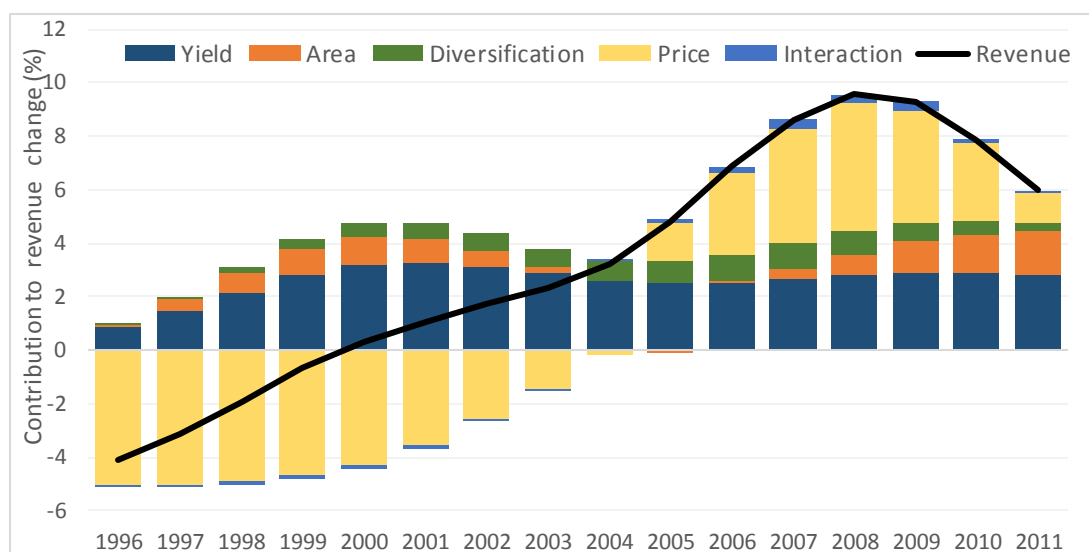
The dominant driver has been prices. Prices fell in the 1990s and constrained revenue growth until 2004, when they rose sharply, contributing significantly to growth during 2007 and 2008, the years of the food price crisis. Prices returned to a more moderate level by 2011, which reduced growth from those unprecedented—and unsustainable—levels. The figure shows quite clearly that despite price fluctuations, yield (a product of technological innovation) has made a consistently high contribution to growth throughout the period after the mid-1990s—confirming the widely held view that land productivity (represented by yields) has risen significantly. How much of the

increase in yields came from inputs and how much came from using those inputs more effectively—the true measure of productivity—is discussed in the section that follows.

As expected, the contribution of area to growth in crop revenue has remained low, reflecting the limited availability of land. The noticeable increase in recent years has resulted mainly from the increase in irrigated area planted to boro rice.

A worrisome trend is the low and fading contribution of diversification. This trend continues to concern policy makers, because it represents an important constraint to accelerating and sustaining future growth and meeting the growing demand for a diversified food supply.

**Figure 3.6: Decomposition of aggregate crop revenue growth, 1996/97–2011/12**



Source: FAOSTAT, World Bank.

## Total factor productivity

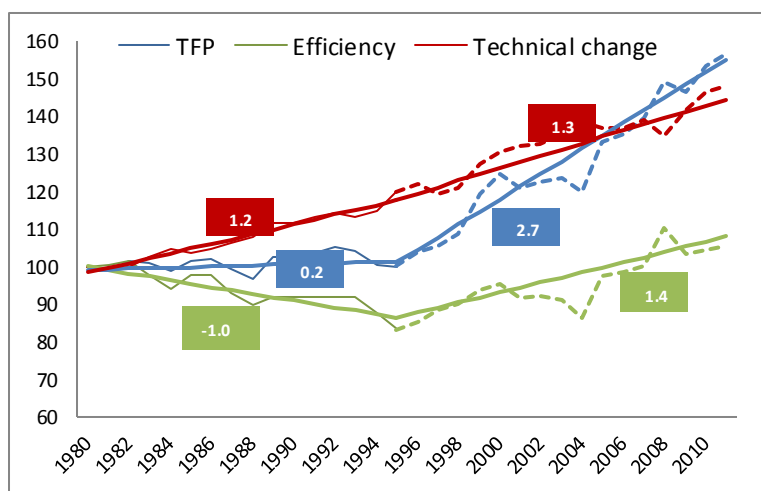
Estimates of total factor productivity (TFP), which captures the relative contributions of technology and efficiency, show that at the aggregate sectoral level agricultural TFP has been rising rapidly since the mid-1990s. Applying a hybrid methodological model (growth accounting combined with non-parametric decomposition of TFP using the Data Envelopment Analysis or DEA) to FAO country-level data, Nin-Pratt (2015) estimates the country-specific TFP index for agriculture and decomposes TFP growth into a technical change component and an efficiency component. The derived TFP index (setting 1980=100) is shown in Figure 3.7 (blue line), in which the trend is essentially flat until the mid-1990s and then rises sharply, indicating sustained and robust TFP growth. This break in the mid-1990s coincides almost perfectly with the structural break detected in 1996 in the agricultural GDP growth trend (discussed at the beginning of Chapter 2).



Splitting the period of analysis from 1980 to 2011 into two periods (1980–95 and 1995–2011) highlights the sharp difference in growth rates for the two periods. TFP grew at an anemic 0.2 percent per year prior to 1995 but at a remarkable 2.7 percent after 1995—a trajectory sustained largely throughout the 15-year period (with the exception of the slowdown in the early 2000s).

The decomposition of TFP into two components (technical change and efficiency) shows that Bangladesh has experienced sustained growth in technical change, reflecting the impressive contribution of agricultural research and technology—the main story behind the long-term growth in rice yields. As noted, this technological impact was facilitated by important policy changes that created more responsive and flexible input and output markets. The deep impact of policy reforms is clearly visible in the striking turnaround in the trend in the efficiency component of TFP, the component most expected to be affected by policies. The declining –1.0 percent annual growth in efficiency prior to 1995 becomes a positive 1.4 percent after 1995. The change in efficiency explains the entire change in TFP between the two periods. In summary, the deep impact of policy reforms is evident in the trend in efficiency growth, and the returns to investment in technology are evident from the strong continuous performance of technical change in driving growth.

**Figure 3.7: TFP, efficiency, and technical change in agriculture, Bangladesh**



Source: Authors, using estimates from Nin-Pratt 2015.

Similar trends (Table 3.11) are obtained applying the standard growth accounting methodology to the global productivity database developed by Fuglie (2012), also using FAO data. Growth in output was largely driven by inputs from 1980 to 1995, but TFP has been the main driver of growth ever since. After 1995, output growth more than doubled, while input growth slowed sharply. A depiction of the progression in the drivers of growth by decade from the 1970s to the 2000s (Figure 3.8) shows that the rapid expansion in irrigation prompted most input growth in the 1980s and 1990s. By enabling farmers to plant in the dry season, irrigation has permitted the multi-cropping that has effectively expanded cultivated area. What is impressive in the figure is the steady and sustained growth in TFP since the 1990s (which the previous figure shows to have started in 1995),

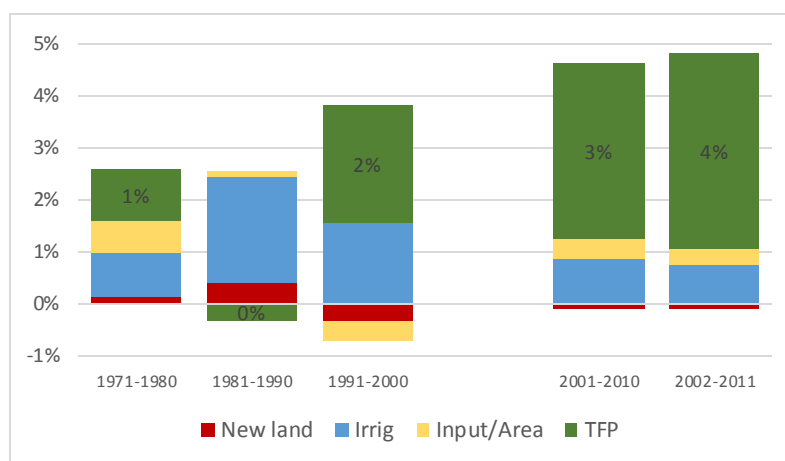
reflecting a combined impact of technology (embodied in access to better quality inputs such as seeds, helped by key regulatory reforms) and efficiency (with policy reforms creating an enabling environment for farmers to make better decisions in response to more market-based incentives).

**Table 3.11: Agricultural total factor productivity growth, 1980–2011**

	1980–95	1995–2011	1995–2000	2000–04	2005–11
TFP	-0.22	2.91	4.10	-0.10	4.47
Output	1.86	4.20	4.88	1.56	5.08
Inputs	2.10	1.28	0.78	1.66	0.61

Source: Fuglie 2012.

**Figure 3.8: Breakdown of productivity growth by decade**



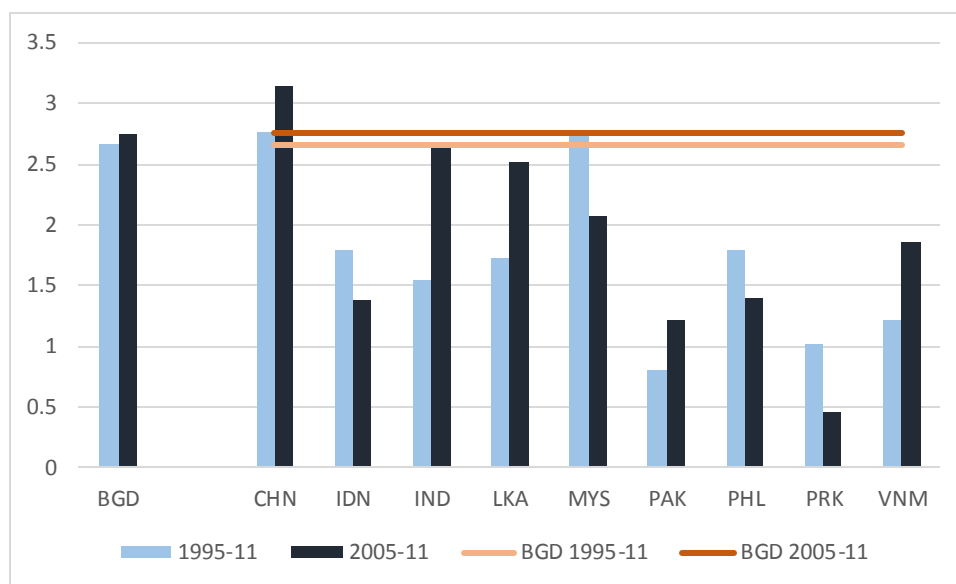
Source: Authors, using Fuglie 2012.

Bangladesh's performance since 1995 (TFP growth of 2.7 percent per year, according to the more conservative mixed-methodology estimate) is one of the best TFP growth rates globally over this extended period. Figure 3.9 shows the TFP performance for Bangladesh in the post-reform period compared to TFP for some major agricultural economies of South and East Asia. The estimates cover a longer period (1995–2011) and more recent period (2005–11). Since 1995, TFP in Bangladesh grew as fast as TFP in the best performers among the comparators (China and Malaysia) and better than the others. Since 2005, China has been the only comparator with higher TFP growth; Bangladesh's performance has surpassed even the storied performance of Thailand and Vietnam, East Asian agricultural stalwarts.

Even within that period of excellent performance, the going was not always smooth. The rapid growth of the late 1990s was succeeded by stagnation in the early 2000s, which did not end until after the major flood year of 2004, when TFP started growing at a historically high rate. This outcome is a result of faster output growth, reflecting the strong impact of technology and improved efficiency, and a reduction in input use that is indicative of mechanization and more

effective use of inputs. Clearly Bangladeshi agriculture now (post 2004) is qualitatively different than it was in the 1980s and early 1990s.

**Figure 3.9: Cross-country comparison of total factor productivity, 1995–2011**



Source: Authors, using Nin-Pratt 2015.

Note: BGD (Bangladesh), CHN (China), IDN (Indonesia), IND (India), LKA (Sri Lanka), MYS (Malaysia), PAK (Pakistan), PHL (Philippines), PRK (Korea, Dem. Rep.), VNM (Vietnam).

These findings on TFP are similar to those of Rahman and Salim (2013), who look at TFP growth in Bangladeshi agriculture over six decades (1948–2008). They find that very long term growth in TFP (over the entire 60 years) is 0.57 percent. They do not provide estimates for subperiods or the more recent performance, and hence do not analyze the likely impact of differential policy regimes. Nevertheless, their long-run estimate is similar to the TFP estimate obtained using Fuglie's database (the only other source covering a long period), which is 0.78 percent per year between 1961 and 2011 or 0.64 percent between 1961 and 2008.

The very consistent findings and conclusions from the various sources (Rahman and Salim, Nin-Pratt, and Fuglie) offer complementary insights into the dynamics of TFP. Rahman and Salim conclude that technological progress has been the main driver of TFP growth and that efficiency has stagnated over the long term—a conclusion that is consistent with the findings discussed above, with the exception that the subperiod analysis for this report highlights the critical role of policy reform in efficiency (and hence TFP). Rahman and Salim take their analysis a step further in assessing the drivers of TFP growth. They find the dominant drivers of TFP growth to be farm size, crop specialization, investment in agricultural research and development (R&D), and extension services. Education has a negative impact, suggesting that perhaps more educated individuals may be leaving agriculture for other jobs.

One drawback that remains in the analytical toolkit is that the costs of environmental and resource degradation cannot be incorporated into the estimation of TFP. Given this shortcoming, other

analyses need to be considered to address these increasingly pressing concerns. An especially important issue is the declining water table in parts of Bangladesh. Alauddin and Sharma's (2013) analysis of differences between districts in the productivity of water used to produce rice finds that the overall productivity of water used to grow rice in Bangladesh is relatively low, both by South Asian and international standards, and that it varies significantly across districts. While the diffusion of technology was the key factor explaining differences in water productivity by district, Alauddin and Sharma also conclude that further technological advances are needed—specifically a renewed focus in research to develop high-yielding varieties for the kharif (wet) season, as well as varieties that tolerate salinity and drought. Improvements in water-use efficiency and water-saving technologies are other important avenues for research. Finally, an outstanding question for research—and an especially critical question for assessing the long-term sustainability of current production patterns and technology—is how to incorporate resource “costs” in the estimation of TFP.

### ***Drivers of technical efficiency: Evidence from the micro (farm) level***

Evidence at the micro level provides important insights into the changes taking place on farms in Bangladesh. Detailed data on households' agricultural and related activities from the MH panel surveys point to a number of important issues that are highly relevant for policy and strategy.<sup>35</sup> The analysis that follows focuses on the changing organization of production at the farm level, farm-level technical efficiency and its drivers, and the impact of connectivity. The implications for policy and strategy are discussed in detail at the end.

#### **Organization of production**

As discussed elsewhere in this report, important shifts are underway in the rural economy and in how agricultural production is organized, reflecting a range of demographic, physical, and institutional developments. Table 3.12 summarizes some of the major changes occurring from 2000 to 2013.

The stabilization of the land/worker ratio is an important trend. Despite falling farm sizes, evident from the decreasing amounts of land owned per household as well as the shift in the pattern of land ownership toward the landless and smaller ownership categories, a simultaneous fall in family size has meant that per capita as well as per worker, cultivated land area has stabilized (though it remains very low).

An important factor behind the land/worker ratio is the share of households renting in land, mostly among the landless and functionally landless households. Almost one-third of households rent land to supplement their holdings, indicating that the land rental market is active and contributes to improved efficiency in farming by making land accessible to the more efficient farmers (as shown later). Within the rental market, tenurial arrangements have undergone important changes that are

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<sup>35</sup> For detailed results, see Gautam and Ahmed (2015) and Ahmed and Gautam (2015).

now contributing to growth. Exploitative sharecropping tenancy, which discourages agricultural investments and the adoption of new, input-intensive technologies, is giving way to fixed-rent tenancy and medium-term leasing arrangements. The area under share tenancy has declined from 91 percent of the tenanted area in 1960 to 74 percent in 1983–84, 62 percent in 1996, and 39 percent in 2008. Pressure from the market, social, and demographic forces encouraging the adoption of new technologies is thus changing Bangladesh’s agrarian institutions (Hossain and Bayes 2009).

**Table 3.12: Structural changes in agriculture, 2000–13**

	2000	2004	2008	2013
<b>Labor force</b>				
Number of earners	1.56	1.63	1.58	1.51
Number of agricultural workers	0.89	0.93	0.84	0.63
Number of non-agricultural workers	0.67	0.69	0.73	0.88
Number of female workers	0.09	0.12	0.18	0.19
Female heads of household (%)	5.89	6.94	13.53†	14.75
<b>Land</b>				
Total owned land (ha)	0.53	0.48	0.47	0.44
Total cultivated land (ha)	0.42	0.38	0.32	0.27
Per capita owned land (ha)	0.11	0.11	0.10	0.11
Per capita cultivated land (ha)	0.07	0.07	0.06	0.08
Per agricultural worker cultivated land (ha)	0.42	0.37	0.35	0.42
Proportion of irrigated land	0.66	0.77	0.80	97.1
Proportion of groundwater-irrigated land	0.55	0.61	0.67	
<b>Land ownership group (%)</b>				
Absolutely landless	7.2	2.8	3.1	1.7
Functionally landless ( $\leq 0.2$ ha)	43.0	50.8	51.1	51.1
Marginal farmer (0.2–0.4 ha)	15.2	12.7	13.5	16.0
Small farmer (0.4–1.0 ha)	19.3	20.1	19.3	19.3
Medium farmer (1.0–2.0 ha)	10.1	8.9	8.5	8.1
Large farmer (2.0+ ha)	5.2	4.7	4.4	3.7
Percent of households renting in land	32.3	36.8	27.2	31.7
<b>Human capital assets</b>				
Average years of schooling of agricultural workers	3.33	3.46	3.7	3.87
Average years of schooling of non-agricultural workers	5.1	5.57	5.35	5.50
<b>Inputs and mechanization</b>				
Percent of cultivator households using fertilizer	96.8	96.4	97.7	
Percent of cultivator households with high-yielding varieties	83.9	86.6	84.5	
Percent of cultivator households mechanized	66.2	82.3	88.7	
Percent of households with electricity	46.1	61.3	82.5	
Agricultural capital (per agricultural worker, 2008 BDT)	8,158	8,434	11,758	
Non-agricultural capital (per non-agricultural worker, 2008 BDT)	15,523	11,514	12,939	
<b>Income from activities related to agriculture (2008 BDT)</b>				
Total agricultural income (per capita)	17,696	18,734	20,475	24,430
Rice income (per capita)	3,043	3,004	3,281	
Non-rice crop income (per capita)	1,449	1,927	2,155	
Non-crop agricultural income (per capita)	2,373	2,367	2,258	
Agricultural wage income (per capita)	1,102	1,207	1,430	

Source: Authors, using MH panel surveys.

† The jump in the proportion of female-headed households is consistent with the 15.3% estimate of female-headed rural households from HIES 2010.

Human capital assets appear to be rising modestly, but these figures must be interpreted with caution, as the younger adults are probably splitting from the parental household of origin and starting their own families, in effect making the average household education level across household members to appear lower.

Technological progress in agriculture is clearly evident, as the vast majority of producers now use fertilizer, modern varieties, and irrigation—the key components of modern production technology. The continued strong rise in mechanization is consistent with the falling number of workers on farm. All of these trends are consistent with capital deepening in the agricultural sector (in contrast to the non-agricultural sector), where agricultural capital per agricultural worker is rising. Households' evident confidence in agriculture is undoubtedly a function of agriculture's rising profitability (as seen in the consistent increase in per capita agricultural incomes). A breakdown of the sources of farm income shows that while rice income per capita has risen over time, a bigger jump has come from non-rice crops, suggesting that those crop have grown more in value. Non-crop agricultural incomes have remained static, an unexpected outcome given the rapidly rising demand for products such as eggs, meat, and fish—but the silver lining is that the livestock and fisheries subsectors are potentially important future sources of growth.

To sum up, the key drivers of agricultural growth in Bangladesh have been the liberalization of input markets, the adoption of modern varieties, greater use of machinery, better access to markets, and the rising prices for agricultural products. The roles played by these drivers have varied in importance over time. In recent years, for example, mechanization and price hikes have had a more critical role in promoting agricultural growth than other drivers. Evidently the role of mechanization is widely appreciated; the headline article in the *Daily Star* of December 6, 2014 proclaims that it has been the key to the production surge occurring in the last few years.

### **Productivity and technical efficiency**

Stochastic frontier analysis helps to clarify how sensitive production is to different inputs and makes it possible to determine the level of relative technical efficiency for each household in the sample. The analysis also helps identify the drivers of production efficiency. At the whole-farm level, the analysis shows that the average farm operates at a reasonably high level of (relative) technical efficiency (75 percent), which has been maintained over the eight-year period for which the data are available (Figure 3.10).

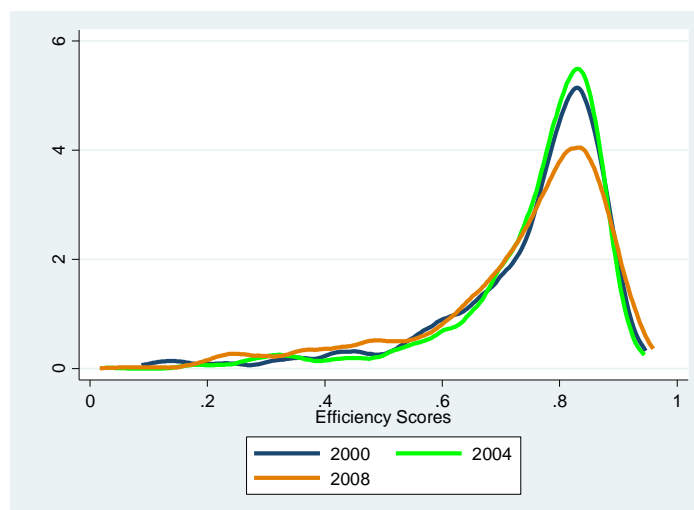
The median level of efficiency is estimated at a high 79 percent, implying that more than half of the households in the sample operate at a high level of efficiency, and three-quarters operate at more than 70 percent efficiency. Some farmers (the bottom 25 percent) could improve their performance, but on the whole, differences between households appear to be low, and the potential to improve productivity also appears relatively low. Detailed data on individual crops are available only for boro and *aman*<sup>36</sup> rice, and crop-level estimates for these crops provide a similar and

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<sup>36</sup> Rice sown or transplanted in spring or summer and harvested in November–December.

consistent story, with boro production being more efficient (about 82 percent) than the more risky aman paddy (70 percent). Interestingly, boro efficiency has remained steady from 2000 to 2008, whereas aman efficiency has fallen from about 76 percent to 70 percent.

**Figure 3.10: Distribution of farm-level technical efficiency across households, 2000–08**



*Source: Ahmed and Gautam 2015.*

The regression analysis of the determinants of farming efficiency has several implications for policy. The regression results in Table 3.13 show a positive and significant impact of farm size on efficiency, suggesting that the very small sizes some farms are tending toward may not be as efficient. Demographic characteristics such as age and gender of the household head are no longer such significant determinants of efficiency as they have been in the past, suggesting that controlling for other factors, experience (proxied by age) and gender of the household head are no longer a disadvantage in farming. A surprisingly consistent result across all specifications is the significant negative impact on efficiency of access to formal bank loans.

The analysis also confirms the importance of key public services. Access to electricity strongly improves farmers' technical efficiency, probably for a number of reasons, such as the greater inclination of farm households with electricity to use agricultural machinery, compared to farm households with no access to electricity. Mechanization was more prevalent (by 6 percentage points in 2008) among farmers with access to electricity than among farmers without access.

**Table 3.13: Determinants of technical efficiency at the farm level**

	(1) Unbalanced panel	(2) Balanced panel	(3) 2000	(4) 2004	(5) 2008
Log (total cultivated land)	0.025***	0.027***	0.031***	0.033***	0.010
Sex of the head (male=1)	0.006	0.018	0.087***	0.008	-0.024
Age of head	0.000	-0.000	0.000	-0.001*	-0.000
<b>Migration dummy</b>	.	.	.	.	.
Domestic migrant	-0.017*	-0.010	-0.006	-0.006	-0.022*
Foreign migrant	-0.019*	-0.025*	-0.015	-0.003	-0.023
<b>Loan dummy</b>					
Loan from bank	-0.025***	-0.029***	-0.036**	-0.029**	-0.009
Loan from NGO	0.004	0.014*	0.026*	0.010	-0.005
Loan from non-institutional source	-0.019*	0.000	-0.057***	0.026*	-0.018
<b>Education dummy</b>					
Primary education	0.004	0.007	0.015	0.012	-0.015
Secondary education	0.011	0.013*	0.018	0.020*	-0.011
Secondary School Certificate and above	-0.010	-0.001	-0.029	-0.012	0.007
<b>Access to electricity (yes=1)</b>	<b>0.027***</b>	<b>0.021***</b>	<b>0.016</b>	<b>0.040***</b>	<b>0.025*</b>
<b>Land-related variables</b>					
Proportion of groundwater land	0.010	0.010	0.002	0.003	0.029**
Proportion of surface water land	-0.021**	-0.013	-0.030	-0.011	-0.011
Proportion of rented land	0.046***	0.051***	0.058***	-0.017	0.016
Proportion of sharecropped land	0.007	0.002	0.031**	0.014	0.010
Land fragmentation index	-0.069***	-0.072***	-0.070***	-0.071***	-0.044**
Crop diversity Index	0.008	0.020	0.087**	0.033	-0.111**
Monocropped household (Yes=1)	-0.004	-0.003	0.019	-0.008	-0.030
<b>Connectivity</b>					
Log (distance from market in km)	0.009*	0.005	0.010	0.026***	-0.019**
Log (distance from Thana in km) <sup>†</sup>	-0.024***	-0.034***	-0.046***	-0.033***	0.004
Log (distance from Dhaka in km)	-0.028***	-0.036***	-0.030***	-0.021**	-0.015
Constant	0.943***	1.023***	0.964***	0.984***	0.892***
Observations	2712	1876	951	1037	872
Adjusted R <sup>2</sup>	0.053	0.062	0.087	0.112	0.046

Source: Ahmed and Gautam 2015.

Note: Standard errors in parentheses. \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ . Estimates for two specifications are presented in the table. Column (1) presents the results based on the unbalanced panel data, and column (2) presents results based on the balanced panel data. As is often the case, some farms do not apply specific inputs. The resulting truncated independent variable may potentially bias the production function estimates. Arbitrarily dropping these observations would also introduce a selection bias. To test for the sensitivity of estimated coefficients and the robustness of the specification to truncated independent variables, dummy variables were included in the model specification to avoid such biases.

<sup>†</sup> Thana is where most administrative facilities and agricultural extension services are located.

Most irrigated area is irrigated with groundwater. The regression results indicate that beyond the substantial positive impact of irrigation on productivity (in the production function estimates), the proportion of land irrigated with surface water is less efficient compared to irrigation by



groundwater, suggesting a need to improve the delivery of publicly managed surface water schemes.

Two significant findings related to land are that rented land is associated significantly with higher efficiency, and land fragmentation is significantly and negatively associated with farming efficiency. Both results are intuitive to agricultural analysts and confirm long-standing conceptual arguments related to land markets. They suggest that land markets are inefficient and that better functioning land and lease markets would allow more efficient households to rent in land (or, perhaps equally important, allow inefficient households or absentee households to rent out land without fear of losing it). In a rural economy where population is still growing at a rate higher than the natural rate of reproduction, curbing land fragmentation is challenging, but as the descriptive analysis has shown, rural households appear to be working around this problem by establishing land leasing and tenancy relationships.

Both international and domestic migration have negative signs. International migration is statistically insignificant in all cross-section estimations, while the effect of domestic migration is significant and negative in 2008. The descriptive statistics indicate that 2008 was the most successful year for farm households in terms of farm income, and the regression results for domestic migration in 2008 seem to suggest that the skills transferred out of agriculture through migration may be having a negative impact on farming efficiency. Migration may have a less negative effect on efficiency, however, if remittances generated by migration encourage farm mechanization. Farm households with foreign migrants are generally much more inclined to use agricultural machinery compared to households with no migrants. In the two earlier rounds of the survey, farm households with domestic migrants lagged in adopting mechanization compared to households with international migrants or no migrants, but by 2008 they had surpassed the other two groups.

### **Impact of connectivity on agriculture**

The substantial payoffs and potential impact from connectivity and the investments made so far in physical infrastructure in Bangladesh are apparent from the positive impact on farming efficiency of the different variables on connectivity. A major finding is that connectivity is having a much deeper impact on efficiency than improved access to and increased use of inputs. As farm size declines, improved competitiveness through more effective and efficient use of inputs, especially land and labor, is critical.

Distance from the capital city, Dhaka, reduces farming efficiency significantly. The negative impact of living in remote areas on farming efficiency has moderated over time. By 2008, the impact is not significant, which is consistent with the improvements in connectivity following increased investments in roads. Distance from Thana, where most administrative facilities and agricultural extension services are located, also matters for farming efficiency. Farm households living farther from Thana are less likely to interact with agricultural extension officers or to access other public services; they are found to be less efficient compared to households living close to the

Thana headquarters. Poor access to markets also seriously limits farming efficiency, a finding that reinforces others findings on the economic importance of local connectivity.<sup>37</sup>

The HIES 2010 data revealed a sharp fall in poverty rates in Rajshahi and Khulna Divisions in the second half of the 2000s, indicating a potential convergence of poverty rates between western and eastern Bangladesh. The Jamuna Bridge is believed to be a major catalyst of this convergence, connecting the western districts with major growth poles such as Dhaka and Chittagong and with national and global economic opportunities. A national labor market has also emerged, in which migration from the western districts has taken on an important role in reducing the welfare gap between the two regions (Sen, et al. 2014).

In line with these trends, the farm efficiency analysis provides consistent results using two tests (Ahmed and Gautam 2015). A simple test of the differences between farm households in western and eastern Bangladesh shows that although no difference in efficiency was distinguished in 2000, western farmers became progressively more efficient, and a statistically significant difference in efficiency was evident by 2008. A second, more rigorous test distinguishes between farm households that are located in the western districts but relatively closer to the Jamuna Bridge than other households in the western districts. The results are clear and consistently significant. Households farther away from the bridge were significantly less efficient in 2000, but by 2008 their efficiency was not statistically different from that of households in eastern districts. Households living closer to the bridge were more efficient to begin with and have since maintained their edge.

## ***Sustaining Productivity Growth: Challenges and Opportunities***

Sustaining and furthering the impressive gains in agricultural productivity will be more challenging in the future than it was in the past. The main driver of crop productivity, boro rice production, is nearing the limits of current technological potential, land expansion is not feasible (and in fact is expected to decline with faster urbanization), and the expansion of irrigation is also at its limits. Perhaps the biggest challenge facing agriculture is the overuse, degradation, and change in quality of critical natural resources (land and water). Falling groundwater levels in parts of northern Bangladesh and increasing salinity in parts of southern Bangladesh are examples of the emerging constraints.

Climate change will add unprecedented pressures and risks. A recently completed, comprehensive analysis of the likely impacts of climate change on food security in Bangladesh (Yu et al. 2010) finds that the largest impact (due to rising temperatures, increasing rainfall variability, and rising sea level) will probably be a reduction in rice production by 3.6–4.3 percent, with the bulk of the

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<sup>37</sup> In the regression results reported here, the impact of markets is muted because this variable is correlated with distance to Thana. Consistent with this result, the impact of distance to market is highly negatively significant when village effects are controlled for.

impact on boro rice production. The study concluded that the best “no-regret” strategy to build resilience against climate change would be to focus on diversifying household incomes and increasing agricultural (crop) productivity. Closing the current large yield gaps and diversifying the production base have the potential to more than offset the predicted losses. The strategy to achieve these objectives would prioritize investments in R&D, education, skills development, and water and land management.

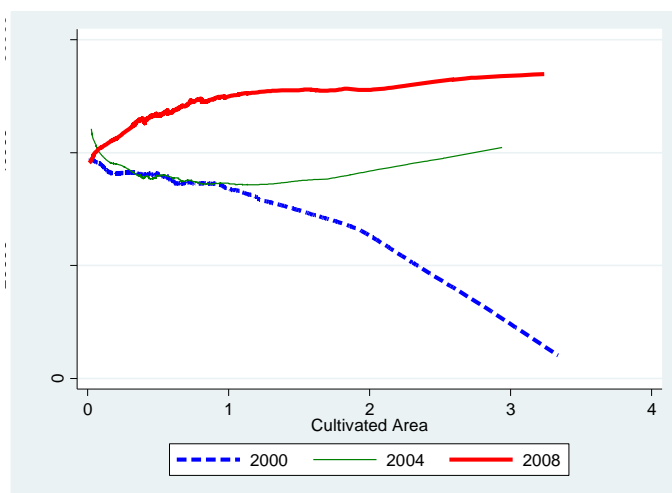
The empirical analysis of the previous sections provides evidence on the crucial role of connectivity in triggering productivity and efficiency in previously lagging regions of the country. It also highlights a number of processes within agriculture that are critical to building resilience. Among these, four strategically important issues are highlighted: the changing relationship between farm size and returns to farming, mechanization, changes in technology, and diversification

### *Changing production relations: Farm size and returns to farming*

The panel structure of the MH surveys allows a unique insight into what appears to be a dramatic shift in the traditional production relations in agriculture. The efficiency analysis showed technical efficiency increasing with farm size—not a traditional finding, but readers should keep in mind the extremely small size of farms in Bangladesh. Using the panel survey data to estimate gross margins at the farm level (returns to family labor and land), the trends also show that the traditional inverse relationship between farm size and returns to farming appears to have changed (Figure 3.11). This shift is significant, especially considering that the panel surveys cover such a short

period (eight years), and it appears to be driven primarily by increased diversification on the relatively larger farms.

**Figure 3.11: Relationship between gross margins and farm size, 2000–08**



Source: Authors, using MH panel surveys.

Although the value of output per hectare (or land productivity) declined with farm size in 2000, in 2008 no trend was apparent, which is indicative of constant returns to scale. When costs of inputs other than family labor and own land are taken into account, however, the gross margins show a shift from an inverse relationship in 2000 to a more flat one in 2004 and a positive one in 2008. The trend levels off just beyond the 0.5-hectare threshold, suggesting that some farms may perhaps be getting too small.

This changing relationship between the viability of small farms and the earlier results on the strong negative effects of fragmentation, combined with the positive impact of renting on farming efficiency, underscores the need to pay more attention to the smooth functioning of land markets, especially for leasing in land. As urbanization proceeds, pressure to convert farm land to other uses will increase (in fact, this pressure already appears to be occurring). These developments add to the urgency of ensuring that farm productivity is maintained and improved, both through further technological advances and through more efficient use of this scarce resource.

## ***Mechanization***

With limited scope for land expansion and labor increasingly seeking non-farm work, intensive farming through more mechanized farm operations becomes imperative. Mechanization has indeed expanded rapidly since 1989, when the removal of restrictions on machinery imports and the standardization of agricultural machinery spurred a rapid increase in machinery imports and marketing by the private sector (Mandal 2014). Evidence from the MH panel surveys shows that since 2000 a vast majority of households are using some form of mechanization. Rapid farm mechanization has had a strong, positive impact on labor and land productivity in Bangladeshi agriculture (Table 3.14). Farmers have readily adopted small machinery (such as power tillers and small tractors), which has allowed them to release labor for other (mostly non-farm) activities and diversify their incomes, while becoming more productive, efficient, and achieving higher gross margins on the farm.

The shortage of labor (family) and access to electricity have been important drivers of farm mechanization, along with proximity to infrastructure and services (using distance to Thana and public transport as proxies; see Gautam and Ahmed 2015). The finding that tenurial arrangements and holding size are not strongly correlated with the adoption of mechanization indicates widespread use of mechanization. Thriving leasing and rental markets have allowed easier access to farm machinery, with significant positive impacts on agricultural productivity; 80 percent of households use mechanization, and of those, the vast majority (over 95 percent) are renting in machine services.

**Table 3.14: Farm mechanization and farm performance indicators (values in 2008 prices)**

	2000		2004		2008	
	Non-adopter	Adopter	Non-adopter	Adopter	Non-adopter	Adopter
Farm households (number)	386	755	226	1,023	128	1,003
Farm households (%)	33.83	66.17	18.09	81.91	11.32	88.68
Output (per ha)	56,793	68,271	47,471	67,893	68,852	80,343
Crop diversification index	0.171	0.215	0.168	0.166	0.135	0.175
Farm efficiency score	0.736	0.757	0.767	0.757	0.727	0.734
Gross margin (per ha)	33,421	35,700	29,424	35,853	59,377	66,185
Hired labor cost (per ha)	6,913	11,355	4,797	10,167	12,142	12,141

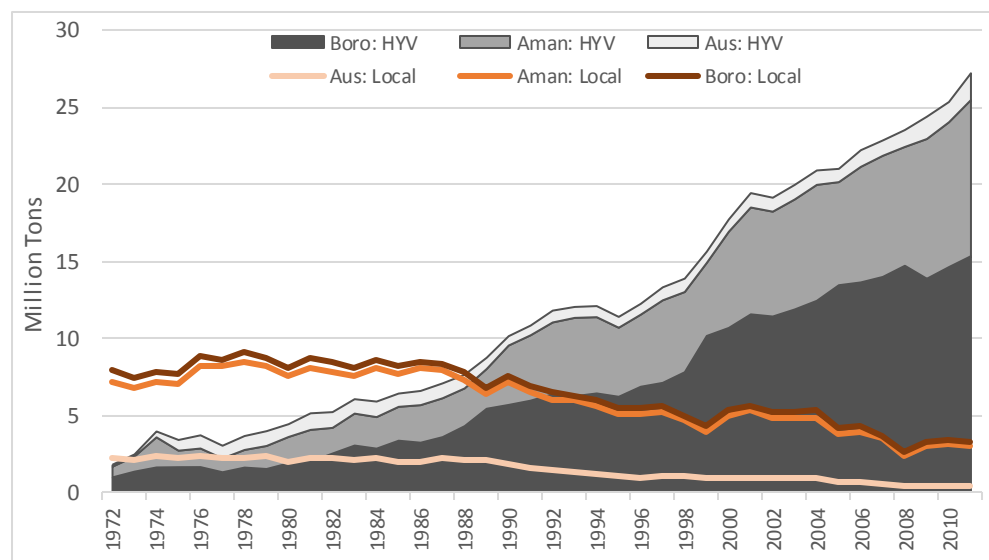
Source: Authors, using MH panel surveys.

## Changes in technology

Since the early days of the green revolution in the 1960s and 1970s, technology has consistently and steadily driven growth and agricultural productivity. Policy reforms in the 1980s and 1990s created the enabling environment for the private sector to become a key driver of agricultural growth, particularly in the crops subsector. Water use (especially use of private shallow tubewells), fertilizer markets, access to improved seed, and better functioning output markets all significantly helped to improve the performance of agriculture in various phases of its growth.

Given the dominance of rice in agriculture, the most prominent contribution of technological change has occurred in rice production in the form of high-yielding rice varieties. In addition to delivering varieties with higher yield potential in the early years, research has continuously expanded rice production in different agro-ecologies; prominent recent contributions that have helped to maintain aggregate growth in rice production include the development of varieties that tolerate salinity and a high-yielding variety of aman. Figure 3.12 depicts the impressive, continuous shift in the composition of rice production, from risky rainfed *aus*<sup>38</sup> to boro rice as irrigation spread and cropping intensity increased, as well as from lower- to higher-yielding varieties. Long-term changes in the performance of rice by variety in terms of area, yield, and output are given in Annex 3, Tables A3.2 and A3.3.

**Figure 3.12: Changes in the composition of rice production, 1970s to 2010s**



Source: BBS.

<sup>38</sup> Rice sown in March/April and harvested in the summer.

A large number of modern, high-yielding varieties have been developed by the national agricultural research system.<sup>39</sup> Among crops, rice has received the most attention over the years, with the release of 78 varieties for various seasons and ecologies between 1972 and 2013. The adoption of improved varieties is widespread; in 2013 almost 99 percent of boro production and 80 percent of aman and aus production came from improved varieties. Of the 78 varieties released, a few have remained popular with farmers. The most popular aman variety, released in 1980, is BR11 (covering 18 percent of the aman area). The most popular boro varieties, both released in 1994, are BRRI Dhan 28 and BRRI Dhan 29 (covering 32 and 35 percent of the boro sown area, respectively).<sup>40</sup> A few Indian varieties such as Swarna and Shatabdi have moved into Bangladesh through farmer-to-farmer exchange because of their special characteristics, such as improved grain quality, shorter time to maturity, and performance under low levels of input use. The widely popular Swarna covers about 14 percent of the rice area in border districts during the aman season (data from the Department of Agricultural Extension).

The production frontier has advanced in recent years with the introduction of hybrids, mostly from China. A substantial number of farmers have started growing hybrid rice, which now covers almost 14 percent of boro area. At the same time, some private firms in Bangladesh have started producing seed of hybrid rice (and maize) through contract farming. Major characteristics of the improved rice cultivars are noted in Table 3.15.

**Table 3.15: Characteristics of popular improved rice cultivars in Bangladesh**

	BR11	BRRI Dhan 28	BRRI Dhan 29	Hybrids	
Year of release	1980	1994	1994	Various	2010
Growing season	Aman	Boro	Boro	Boro	Aman
Plant height (cm)	115	90	95	Approx. 1 m	112
Growth duration (days)	145	140	165	115–135	118
Average yield (t/ha)	6.5	5.5	7.5	8.0–9.0	6.5

Source: Hossain and Bayes 2009; BRRI 2015.

## Yield gaps

The higher yields, reduced unit production costs, and increased profitability of rice farming have been powerful drivers of the gradual adoption of new rice technologies (in the form of modern varieties) and replacement of low-yielding traditional varieties. These findings are consistent with the findings from the decomposition of TFP, which also showed that technological progress has been a major driver of productivity growth. The natural question that arises is how much more room there is for farmers' yields to grow. The prospects for future growth lie in the current yield gaps—in improving the average yields currently obtained by farmers to approach the potential yields reported for those same varieties by BRRI. Using the maximum yield potential of the

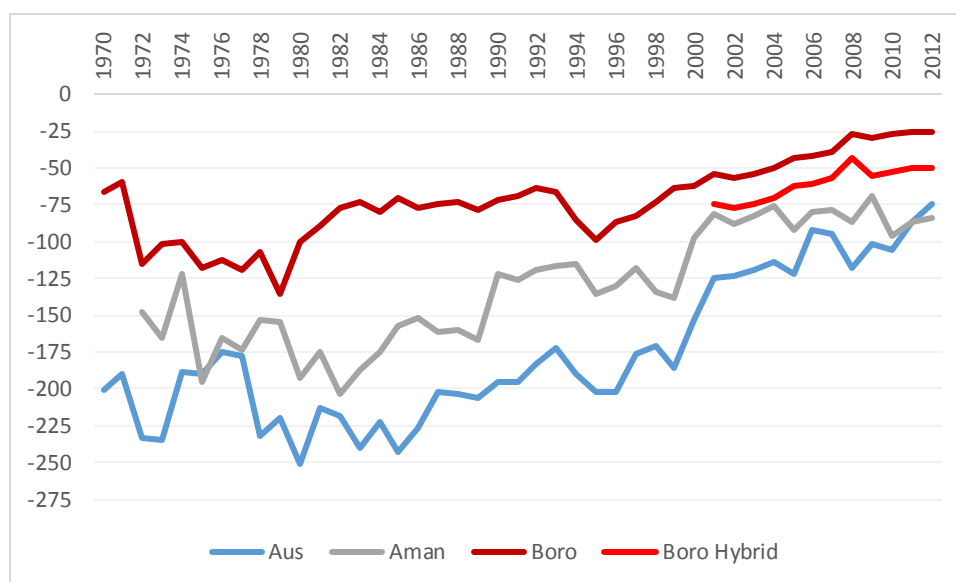
<sup>39</sup> BRRI data on registered rice varieties; Hossain, Bose, and Mustafi (2006).

<sup>40</sup> BRRI is the Bangladesh Rice Research Institute.

varieties released since the early 1970s (obtained from data on yield potential of those varieties published by BRRI), Figure 3.13 shows the closing of the yield gap in aman, aus, and boro rice.<sup>41</sup>

The yield gaps in Figure 3.13 are based on national average yields for aus, aman, and boro. Even with the impressive progress in yield potential and adoption of improved varieties, it appears that farmers could still substantially improve the yields they obtain from their current technology for aus and aman. Yield gaps remain very large—more than 75 percent for each of the two seasons. The current boro yield gaps are about 25 percent for non-hybrids and about 50 percent for hybrids. The room to close those gaps may be limited, however, considering that global experience has shown that almost no country has been able to reduce the yield gap below 20 percent (Fischer, Byerlee, and Edmeades 2014). Given strong consumer and producer preferences, the feasibility of further adoption of hybrids remains to be seen, but some potential remains for further yield gains in hybrid boro.

**Figure 3.13: Progress in closing rice yield gaps**



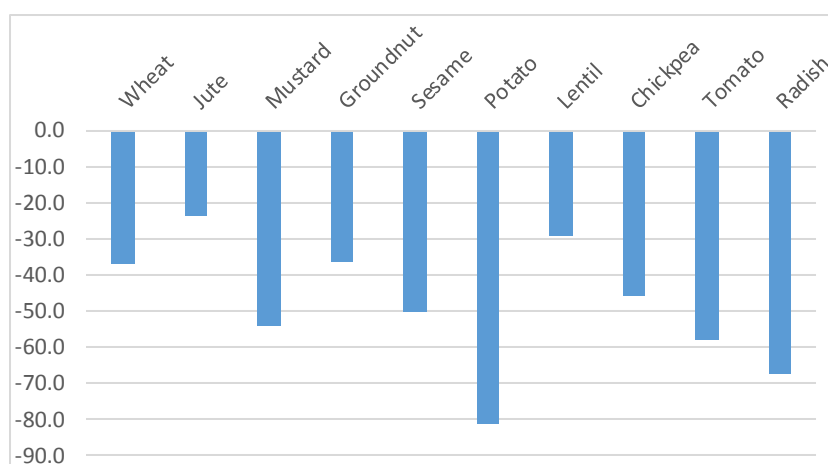
Source: Authors, using data from BRRI (2015).

For crops other than rice, current yields gaps also remain substantial, with significant room for improvement in most crops except jute and lentils (Mondal 2011) (Figure 3.14). An important point to note here is that while new varieties have been introduced for some crops, progress in expanding yield potential has been more limited. Past efforts have understandably focused on rice, with good results, but research now needs to be rebalanced to give more attention to other crops and promote diversification and growth.

<sup>41</sup> The yield gap is measured as the ratio of the difference between average observed (farmer) yields and potential (research) yields to the observed (farmer) yields. It thus gives the percentage increase relative to current observed yields.

The analyses described here have important policy implications. First, given the widespread adoption of high-yielding varieties in all three seasons (it is almost 100 percent for boro), future yield gains will come mostly from providing better extension services to close the knowledge and skills gap that appears to be keeping farmers' current yields well below their potential, despite widespread use of high-yielding varieties. Second, for boro and for stressed environments, which have been the main engine of past growth in overall production, the priority is to invest in research to continue to expand the production frontier (potential yields). Finally, crops other than rice urgently require more attention from research to expand yield frontiers in addition to addressing specific biotic and abiotic stresses afflicting these crops.

**Figure 3.14: Yield gaps for crops other than rice**



Source: Mondal 2011.

### Seed sector development

Seeds embody technological change and are at the core of the productivity agenda. As is clear from the discussion so far, improved varieties have driven past success in raising productivity and achieving food security. The focus now has to be on consolidating the gains in rice (maintaining and improving rice yields) while at the same time diversifying into higher-value and nutrient-rich crops. The latter have received little attention in the past. The most prolific release of varieties has been for hybrid rice, maize, and vegetables—mostly by the private sector (Naher and Spielman 2014).<sup>42</sup> Farmers have readily adopted the new varieties, indicating that they are not averse to purchasing seed.

Naher and Spielman (2014) lay out steps that can be taken to reduce the remaining barriers to developing a more robust seed sector. First, public sector research must focus more strongly on

<sup>42</sup> In the post-liberalization period, 1994–2012, the private sector registered 89 hybrid rice varieties, 98 maize varieties, and 1,064 vegetable varieties. During that same period, the public sector released 3 hybrid rice varieties, 19 maize varieties, and 116 vegetable varieties. The private sector has shown little interest in modern rice varieties (3 releases compared to 40 by the public sector) and pulses (4 releases compared to 50 by the public sector). For the other notified crops, the private sector is shut out from the seed industry, while public releases have been relatively few, with the exception of potatoes (27).



crops other than rice. Second, level the playing field for the private sector to operate, and explore prospects for public-private partnerships to spur the development of better varieties of open-pollinated crops. Third, rationalize the cumbersome, lengthy process for registering new varieties, giving attention to harmonizing varietal testing with India and other suitable countries.

In addition to traditional genetic improvement research, the responsible application of biotechnology offers potentially huge gains for agriculture, especially considering the significant biotic and abiotic stresses encountered in different parts of the country.<sup>43</sup> A carefully considered policy needs to be in place, along with regulations under international standards of biosafety, along the lines of the Cartagena Protocol on Biosafety.

### Fertilizer use

Fertilizer use has increased significantly, tripling in terms of total fertilizer applied per hectare between 1980 and 2011. The growth rate has varied over time, but except for 2008 and 2009, following the spikes in fertilizer prices globally, fertilizer use has increased steadily over the past three decades. As discussed, fertilizer policy underwent significant changes over the same period, moving from state control to complete liberalization and then reverting since the mid-1990s to government intervention. The sector is now also subsidized, at substantial public cost. Past subsidy policies have favored nitrogenous fertilizers, leading to a significant imbalance in the use of nitrogen relative to other nutrients. In recent years, the government has addressed concerns about resource degradation resulting from an overuse of nitrogen by increasing subsidies for the other two macro-nutrients, potassium and phosphorous.

Household data are useful for assessing the effectiveness of fertilizer use on rice (boro and aman), identifying where fertilizer intensity is highest, and demonstrating the impact of interventions in fertilizer markets. As expected, subsidies encourage farmers to use fertilizer, but at the current prices a substantial number of farmers are applying too much fertilizer—so much that the additional application is not translating to additional production per hectare, as seen in the simple statistics in Table 3.16. The median farmer appears to be using close to the recommended amount of fertilizer (a composite aggregate quantity of commercial product that is consistent with the recommended content of nitrogen, phosphorus, and potassium). A farmer using the recommended level of fertilizer in 2008 could expect to produce about 5.8 tons of paddy per hectare. The incremental yield gains between users at the 25<sup>th</sup> percentile of fertilizer intensity and those at the median level of intensity are significant, but higher levels of application are not beneficial—yields obtained between the 50<sup>th</sup> and the 75<sup>th</sup> or 90<sup>th</sup> percentile of fertilizer users are either lower or the same. This finding holds for both boro and aman rice. High fertilizer use thus does not appear to be translating into productivity gains, and it may actually be contributing to current and future declines in productivity through resource degradation. Excessive applications of nitrogen and other

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<sup>43</sup> Bangladesh is the first country in South Asia to undertake field testing of a Bt variety of eggplant.

fertilizer chemicals can compromise sustainability and provoke the degradation of critical soil and water resources by leaching into groundwater or washing into rivers and streams.

**Table 3.16: Fertilizer use and yields of boro and aman rice**

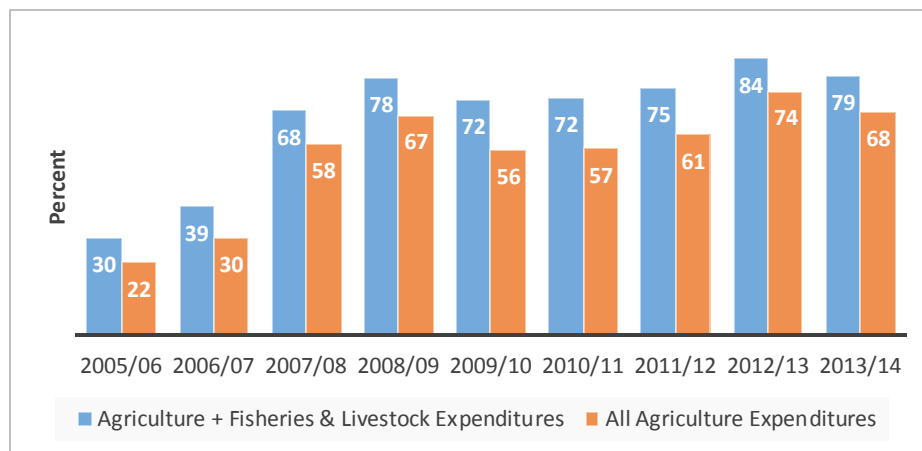
	Boro season			
	Average yields (kg/ha)		Fertilizer use per ha (mean)	
	2004	2008	2004	2008
Top 10 percentile of fertilizer users	5,268	5,746	576.7	541.9
Top 25 percentile of fertilizer users	5,218	5,695	511.4	479
Median 50 percent of fertilizer users	4,906	5,820	342.5	340.2
Bottom 25 percentile of fertilizer users	4,665	4,986	194.6	216.6
	Aman season			
	Average yields (kg/ha)		Fertilizer use per ha (mean)	
	2004	2008	2004	2008
Top 10 percentile of fertilizer users	2,808	2,818	401.4	362.4
Top 25 percentile of fertilizer users	3,159	3,051	317.8	303.3
Median 50 percent of fertilizer users	3,151	2,823	175.5	168.3
Bottom 25 percentile of fertilizer users	2,571	2,230	81.3	75.7

*Source:* Authors, using MH panel surveys. Fertilizer use per ha is kg of commercial products per ha.

Findings such as these raise questions about the most effective use of public expenditures, especially since some priority areas, such as extension and advisory services and other tried and tested productivity-enhancing investments, need additional support. Public expenditure on fertilizer subsidies has increased significantly in recent years, partly to rebalance nutrient use, but even so, fertilizer use remains very high.<sup>44</sup> The magnitude of the public expenditure on fertilizer subsidies is shown in Figure 3.15, as a share of in recurrent public expenditures since 2005/06. For the past three years, subsidies amounted to an overwhelming 80 percent of the public recurrent expenditures for agriculture, livestock, and fisheries put together (World Bank 2015).

<sup>44</sup> For example, household-level estimates show that the median urea application for boro is about 250 kilograms per hectare (consistently across the survey years), well above the recommended 200 kilograms per hectare (which is on the higher side, given fertilizer recommendations for more sites in Bangladesh). In other words, more than half of the farmers apply too much urea.

**Figure 3.15: Fertilizer subsidies as share of recurrent public expenditures on agriculture**



Source: Ministry of Finance.

Note: "All Agriculture" includes expenditures by the Ministries of Agriculture, Environment and Forests, Fisheries and Livestock, Water Resources, and Land.

## Diversification

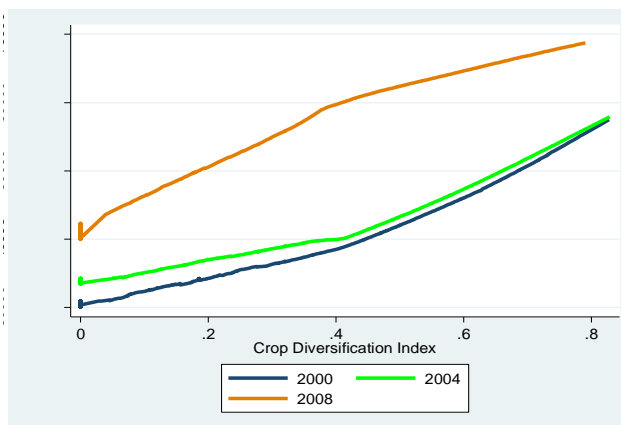
The past focus on food security has made rice self-sufficiency an overriding objective of agricultural strategies. Looking to the future, diversification into high-value agriculture is a priority for faster productivity and income growth, but it is important to neither neglect nor overemphasize the rice sector. This objective is feasible to achieve by exploiting the remaining yield gaps, but as noted earlier, it will require investments in traditional and non-traditional technologies and leveraging the private sector to move the current technology frontiers.

Bangladesh also has a comparative advantage in growing aman rice at export parity, indicating significant potential to profitably increase rice production (Shahabuddin 2002, Hossain and Deb 2009). This shift in focus would help to free boro areas for a more diverse range of high-value crops (such as vegetables, roots, and tubers) that are more suited to the winter-season boro land. Aside from boosting productivity and income, this approach has the advantage of reducing boro's environmental footprint by making more productive use of the increasingly scarce groundwater presently used to irrigate boro rice (Amarasinghe et al. 2014).

An important factor in making this change happen is a reassessment of the policies shaping the relative incentives for rice and other crops. Support prices, price stabilization, and public procurement, import, and distribution, even though seemingly small in magnitude, likely have a large influence on market outcomes, potentially distorting incentives facing farmers.

Another important factor for diversification is infrastructure development. By significantly improving connectivity with major urban centers, the Jamuna Bridge unlocked a big increase in the production of high-value agricultural produce, such as vegetables, to meet urban needs, and in the process catalyzed related changes in diversification, land markets, and mechanization. Development of the road network has also promoted diversification in agriculture, but not all farm households have diversified production or seem able to do so. Farm households with land holdings around the median are more diversified than households with large or small holdings. More than half of the households show no diversification, however, remaining heavily invested in rice in terms of land allocation despite opportunities to earn more income by producing crops other than rice. Figure 3.16 shows the strong positive relationship (consistent over time) between gross margins from agriculture and production diversification (using the area-based Simpson diversification index).

**Figure 3.16: Farm gross margins and production diversity**



Source: Authors, using MH panel surveys.

A number of other factors also influence the level of diversification, including agro-ecological, socio-economic, and household characteristics. For example, in low-lying, flood-prone areas, alternatives to rice may be limited because other crops cannot tolerate so much water. But in favorable areas, at least at the lower end of the farm scale, diversification can significantly increase farm incomes. In general, the western divisions have a higher level of diversification, given their agro-ecological advantages in growing high-value horticultural crops. This comparative advantage was augmented after the Jamuna Bridge opened, and Rajshahi, Rangpur, and Khulna were especially active in diversifying production. This diversification has been a strong driver of income growth and significantly contributed to poverty reduction. Diversification has also increased significantly in Barisal but appears to be declining in Dhaka, Chittagong, and Sylhet.

## ***Conclusions and Implications***

Bangladesh has come a long way from the dire outlook of the 1970s to achieve self-sufficiency in rice. But agriculture's role is significantly larger than providing rice. Its role is also changing from being a direct or primary contributor to economic output toward a more leveraged contribution.

Powerful farm–non-farm linkages, long recognized in development economics, continue to be an important factor behind agriculture’s significant contribution to poverty reduction in Bangladesh.

Agriculture’s performance has improved steadily over the past three decades, but within agriculture, little structural change has occurred. Crops still dominate, accounting for 58 percent of sectoral GDP. Farmers have not greatly diversified their crop choices. Rice occupies 77–80 percent of cultivated area; in fact, the area under paddy increased in recent years, contrary to what may be expected or desirable. Better rice varieties and better price incentives in recent years are likely to be responsible for reversing the diversification out of rice. At a more disaggregated level, the spatial picture shows some variation: diversification in eastern areas (Chittagong, Dhaka, and Sylhet) is lower than in western areas (Barisal, Khulna, and Rajshahi).

For non-rice crops, recent changes reflect both demand/consumer preferences and local agro-ecological endowments. The traditional non-rice crops (other cereals, pulses, oilseeds, and sugarcane) are giving way to maize, potatoes, and vegetables; jute has undergone something of a renaissance. Change is particularly noticeable in the western districts, where horticultural production has expanded more rapidly. These changes reflect economic efficiency gains as the structure is evolving toward crops in which Bangladesh has a comparative advantage.

The livestock and fisheries subsectors are strategically important for Bangladesh—for smallholders’ incomes, creating jobs, and improving nutrition. Although GDP data show only a modest 2 percent annual rate of growth for the livestock subsector, production of the three main livestock products—milk, eggs, and meat—has grown at exceptionally high rates in recent years. The slow growth in livestock numbers (poultry, goats, sheep, and cattle) suggests that technology, such as improved breeds and disease control, is driving gains in livestock productivity. The fisheries subsector has performed much better and more consistently. Within the fisheries subsector, production has shifted from the traditionally dominant capture fisheries to culture fisheries. Culture fisheries now provide more fish (52 percent) than capture fisheries (48 percent).

Agro-ecological conditions are a critical factor in agriculture. Analysis based on clusters of areas with a common set of agro-ecological traits indicates that crop agriculture has grown the most in the plains cluster, the beel cluster, and the Barind cluster, with irrigation and technology driving rice production (high-yielding boro varieties). Agro-ecology also determines the potential for crop diversification. Regular flooding makes low-lying or flood-prone areas unsuitable for growing vegetables, fruits, and cash crops. Crop diversification is thus lowest at low elevations and relatively high at medium and high elevations.

What have been the drivers of agricultural growth? Agricultural growth has been primarily rooted in productivity improvements, driven by policy reforms and strategic investments. The rapid spread of groundwater irrigation, new technology (seed and fertilizer), investments in better road connectivity, more efficient markets, and increased mechanization have all gained impetus from important policy reforms since the early 1980s.

During the mid-1980s, the government undertook major reforms in agricultural input markets, starting with the liberalization of fertilizer markets, followed by irrigation and farm machinery import regulations and seed sector reforms. The early 1990s also saw bold reforms in output markets, with large benefits to Bangladesh in terms of low and stable food prices. Some of these policies have been partially reversed since then, but the growth momentum continued because of the cumulative effect of the different reforms and the continued development of technology. Some of the momentum may be waning, however, with subsequent policy reversals in the fertilizer, seed, and food grain output markets. In particular, the unintended consequences of some initiatives are becoming apparent. Fertilizer subsidies increased significantly following the food crisis of 2007 to keep domestic fertilizer prices low in the face of high world prices. They account for a large share of public expenditures, while the allocations to other public goods that are critical for enhancing productivity (such as extension and research, especially on non-rice crops, livestock, and fisheries) remain low. Farm-level analysis indicates that a significant share of farmers (as high as half) are overusing fertilizers, to the point where fertilizer use is not generating additional output. This practice amounts to a wasteful use of fertilizers and promotes resource degradation, an outcome that is contrary to the objective of increased productivity.

Technology has been the core driver of agricultural productivity since the green revolution days. The most prominent contribution of technology has been in rice, through the development and use of high-yielding rice varieties. Rice research has increased the yield potential in favorable areas and has continuously expanded to cover other agro-ecologies where rice is grown; prominent recent contributions include varieties suited to saline conditions and a high-yielding variety of aman rice. Technologies have also been effectively transmitted to farmers' fields, so the gap between the highest yields achieved by researchers and the yields obtained by farmers is narrowing.

For future growth, significant unexploited potential remains for aman and aus. New hybrid varieties of boro are creating additional room for yields to grow (in a context where most farmers are already realizing most of the gains from non-hybrid varieties). Developing technology and closing the yield gaps for crops other than rice remains a very high priority. Here the role of the private sector needs to be exploited more. The private sector has been prolific in introducing new varieties of hybrid rice, maize, and vegetables—the areas of the seed sector where it has been allowed to operate more freely. Creating space for the private sector to participate more widely in developing technology is a high priority that can be achieved by removing the remaining regulatory and institutional barriers to participation.

The roles played by various factors in driving and sustaining production growth are clearly delineated in the analysis. A decomposition of the value of crop output shows the varying role of yields over time—they fell in the 1990s, constraining revenue growth for a decade, and then rose sharply in the mid-2000s to increase growth significantly through the late 2000s. As expected, the contribution of area has remained low. The trend that calls for concern is the low and fading contribution of diversification. The recent role of high prices may appear worrisome, but it should

be seen as rebalancing the earlier decline in farmer incentives, and an important factor in driving recent growth and agricultural commerce. The real worry is the prediction that global prices will fall in coming years, highlighting the urgent need to focus on raising productivity and shifting into higher-value agriculture to maintain agricultural growth and poverty reduction.

Given the steady and substantial contribution of rising yields to agricultural growth, it is vital to understand how those increases have come about. From an economic and ecological sustainability perspective, TFP is the relevant measure to distinguish the contribution of inputs to output (yield) from the effectiveness with which the inputs are used to produce that output. TFP is further disaggregated into the contributions of technology and efficiency, which helps identify areas for additional policy attention.

The analysis shows a dramatic improvement in performance starting around 1995, when growth in TFP went from an anemic 0.2 percent to a remarkable 2.7 percent after 1995. Bangladesh's TFP growth since 1995 surpasses that of almost all South and East Asian countries; it is comparable to TFP growth in the best performer—China. The decomposition of TFP into subcomponents (technical change and efficiency) highlights two important trends. First, technical change has been the dominant driver of TFP, reflecting the impressive contribution of agricultural R&D. Second, technical efficiency shows a striking reversal from a declining to a rising trend in 1995, clearly demonstrating the far-reaching impact of sector and macro policy reforms on the enabling environment for productive efficiency.

Farm-level analysis provides more granular insights related to the changing organization of production, technical efficiency at the farm level (and its drivers), progress in mechanization, and structural change—with additional implications for policy. Bangladesh's agrarian institutions are changing under the pressure of market, social, and demographic forces to modernize and adapt. Tenancy contracts are a prime example. Exploitative sharecropping tenancy, which creates disincentives for agricultural investment and the adoption of modern, input-intensive technologies, is giving way to fixed-rent tenancy and medium-term lease arrangements. The traditional relationship between farm size and productivity also appears to be changing. Various indicators (negative impact of land fragmentation, farm size, and a positive impact of renting on efficiency) suggest that very small farms are now less efficient and less viable than the relatively larger farms—a significant shift from the traditional farm-size–productivity relationship, which further highlights the need to promote more efficient land markets. Access to public services is another important factor for efficiency improvements. Connectivity (roads and especially the Jamuna Bridge) had a strong stimulatory effect on productivity in the previously poorly connected parts of the country, especially the western districts. Similarly, access to electricity had a strong impact on raising farmers' technical efficiency.

These findings have a number of implications for strategy and policy:

- The agricultural strategy should neither neglect nor overemphasize the rice sector. Bangladesh has a comparative advantage in rice production, particularly in the aman

season, which (given the remaining yield gaps) can be more fully exploited to increase production, even with the current technology. Analysis of comparative advantage suggests that in the winter season, production of most non-rice crops (particularly high-value horticulture) is economically efficient and may be a better option. A strategy of seasonal specialization (rice production alternating with high-value crops) would benefit farmers and consumers while safeguarding food security. The key here is to level the policy playing field (addressing the distortions created by price support, procurement, and price stabilization) to create more balanced incentives across crops, and beyond crops for the non-crop subsectors.

- The time is opportune to explore the most effective and efficient ways to support agriculture. Significant potential remains to increase productivity and incomes in agriculture, while making it more responsive to climate change and nutritional needs. Farmers remain heavily invested in rice, even as other crops and non-crop agriculture offer significantly higher incomes. To induce farmers to pursue agricultural enterprises other than rice production, their returns need to be further stabilized and solidified through tried and tested productivity-enhancing public investments, including research (especially on the long-neglected non-rice crops, livestock, and fisheries), water control and irrigation, and rural roads. Yet the much-needed public investment in these public goods remain very low, with the largest share of the public expenditure on agriculture now going to fertilizer subsidies. Past support has no doubt helped increase fertilizer use, but evidence now suggests that almost half of the farmers appear to be overusing fertilizer, but that additional fertilizer (beyond the dose recommended by research) is not apparently translating into additional output. Importantly, the overuse of fertilizer can entail large potential environmental and health costs, and in the long run it can compromise productivity itself through resource degradation. Aside from providing appropriate technical advice to farmers, a priority to address this issue is to remove the remaining incentives that lead farmers to overuse inputs.
- Technology has served Bangladesh extremely well; it is now urgent to broaden the focus of research and advisory services on non-rice and non-crop agriculture. Some of these R&D areas are of interest to the private sector, and the strategy should be to better leverage the contributions of the private sector, especially the private seed sector, more than in the past. In some areas, such as research to develop open-pollinated varieties, the private sector has less interest, because they are not commercially viable. In that case, public-private partnerships to complement public R&D are essential to move the production frontier. The remaining regulatory barriers to more effective, wider private sector participation in the sector need to be removed.
- Another important area of action is to strengthen food quality control measures. This topic is not analyzed in any depth in this report, but as previous analyses have established quite well, food quality and safety are critical to the growth of high-value agricultural products for both internal and external markets. Improved food safety, achieved through better



sanitary and phytosanitary measures, is necessary for better nutrition domestically and for Bangladeshi products to compete in lucrative external markets that impose exacting quality standards.

- The fisheries, poultry, and livestock industries are strategically important for promoting more rapid income growth, creating rural jobs, and improving nutritional outcomes. These subsectors have historically received much less attention from policy and investment than their potential contribution to growth warrants. In the livestock subsector, development and increased productivity will depend on increasing the productivity of small-scale producers; promoting commercial production; providing extension advice, treating livestock diseases, and supplying other services to poor farmers; and strengthening market linkages for small and poor farmers. The fisheries subsector requires separate sets of policies for capture and culture fisheries. For capture fisheries, appropriate community-based fisheries management is a priority. A cautious approach is needed to promote floodplain aquaculture. Technical assistance, with institutional and policy support, will be essential for sustainable development of aquaculture in Bangladesh. The availability of quality fish seed is a specific area that needs attention.

## References

- Ahmed, M., and M. Gautam. “Impact of Connectivity on Farm Efficiency: Evidence from a Longitudinal Survey in Bangladesh.” Background paper for “Dynamics of Rural Growth in Bangladesh,” GFADR, World Bank, Washington, DC.
- Ahmed, R., 1995. “Liberalization of Input Markets in Bangladesh: Process, Impact, and Lessons.” *Agricultural Economics* 12(2).
- . 1999. “Assessment of Past Policies.” In *Bangladesh Agriculture in the 21<sup>st</sup> Century*, edited by R. Faruquee. Dhaka: University Press Ltd.
- Alauddin, M., and B.R. Sharma. 2013. “Inter-District Rice Water Productivity Differences in Bangladesh: An Empirical Exploration and Implications.” *Ecological Economics* 93: 210–18.
- Ali, Z., and I. Hossain. 2014. “Barriers to Development of Livestock Sector in Bangladesh.” BIDS Policy Brief No. 1408. Bangladesh Institute of Development Studies (BIDS), Dhaka.
- Amarasinghe, U.A., B.R. Sharma, L. Muthuwatta, and Z.H. Khan. 2014. “Water for Food: Outlook to 2030.” Research Report No. 158. International Water Management Institute (IWMI), Colombo.
- BBS (Bangladesh Bureau of Statistics). Various years. Reports on Household Income and Expenditure Survey (HIES). Dhaka.
- BRRI (Bangladesh Rice Research Institute). 2015. “Released Rice Varieties of BRRI.” accessed from BRRI website at [bri.portal.gov.bd](http://bri.portal.gov.bd).
- Department of Fisheries, Ministry of Fisheries and Livestock, Government of Bangladesh. 2014. Fisheries Statistical Report of Bangladesh, 2013–14. Processed.
- Dorosh, P., and S. Rashid. 2013. “Trade Subsidies, Export Bans, and Price Stabilization: Lessons of Bangladesh-India Rice Trade in the 2000s.” *Food Policy* 41: 103–111.
- FAO (Food and Agriculture Organization of the United Nations.) Various years. FAOSTAT database. <http://faostat.fao.org>.

- Faruquee, R. 2012. Stock-taking of Major Studies and Reports on Agriculture and Rural Development in Bangladesh. World Bank, Washington, DC. Processed.
- Finance Division, Ministry of Finance, Government of Bangladesh. 2014. *Bangladesh Economic Review*. Dhaka. <http://www.mof.gov.bd>.
- Fischer, R.A., D. Byerlee, and G. Edmeades. 2014. "Crop Yields and Global Food Security: Can Continuing Crop Yield Increases Feed the World?" Australian Centre for International Research (ACIAR), Canberra.
- Fuglie, K.O. 2012. "Productivity Growth in the Global Agricultural Economy and the Role of Technology Capital." In *Productivity Growth in Agriculture: An International Perspective*, edited by K.O. Fuglie, S.L. Wang, and V.E. Ball. Wallingford, UK: CAB International.
- Gautam, M., and M. Ahmed. 2015. "Structural Change and Dynamics of Farming in Bangladesh." Background paper for "Dynamics of Rural Growth in Bangladesh," GFADR, World Bank, Washington, DC.
- Hossain, M., and A. Bayes. 2009. *Rural Economy and Livelihoods: Insights from Bangladesh*. Dhaka: AH Development Publishing House.
- Hossain, M., M.L. Bose, and B.A.A. Mustafi. 2006. "Adoption and Productivity Impact of Modern Rice Varieties in Bangladesh." *The Developing Economies* 44(2): 149–66.
- Hossain, M., and U. Deb. 2009. "Food Security and Containing Price Escalation: Facts and Implications for Policy." In *Development of Bangladesh with Equity and Justice*. Dhaka: Centre for Policy Dialogue.
- IFPRI (International Food Policy Research Institute). 2013. Bangladesh Integrated Household Survey (BIHS), 2011–2012. Dataset. Washington, DC.
- Mandal, M.A.S. 2014. "Growth of Agricultural Mechanization in Bangladesh: Policies and Missing Links." Presentation at the 8<sup>th</sup> International Conference of Asian Society of Agricultural Economists on Viability of Small Farmers in Asia. BRAC Centre for Development Management, Dhaka, October 15–17.
- Miah, H. 2015. "Agriculture Sector Development Strategy." Background paper for preparation of the 7<sup>th</sup> Five Year Plan. Planning Commission, Dhaka.
- Milne, G., Jansen, J., and N. Fernando 2009. Identification mission report: Development and management of fisheries. Mission scoping report. World Bank, Washington, DC. April. Processed.
- Minot, N., M. Epprecht, T.T.T. Anh, and L.Q. Trung. 2006. "Income Diversification and Poverty in Northern Uplands of Vietnam." Research Report No. 145. International Food Policy Research Institute (IFPRI), Washington, DC.
- Moman, M.A., and R. Arnason. 2007. "The Potential of Artisanal Hilsa Fishery: Economic Efficient Fisheries Policy." The United National University Fisheries Training Program, Reykjavic.
- Mondal, M.H. 2011. "Causes of Yield Gaps and Strategies for Minimizing the Gaps in Different Crops of Bangladesh." *Bangladesh Journal of Agricultural Research* 36: 469–79.
- Naher, F., and D.J. Spielman. 2014. "Seeding the Future: An Analysis of Seed System Development in Bangladesh." Paper presented in a workshop on Evidence-Based Policy Options for Food and Nutrition Security in Bangladesh, organized by the Bangladesh Policy Research and Strategy Support Program, International Food Policy Research Institute (IFPRI), Dhaka, October.
- Nin-Pratt, A. 2015. "Inputs, Productivity, and Agricultural Growth in Africa South of the Sahara." Discussion Paper No. 01432. International Food Policy Research Institute (IFPRI), Washington, DC.
- Rahman, S., and R. Salim. 2013. "Six Decades of Total Factor Productivity Change and Sources of Growth in Bangladesh Agriculture (1948–2008)." *Journal of Agricultural Economics* 64(2): 275–94.
- Sen, B., M. Ahmed, M. Yunus, and Z. Ali. 2014. "Regional Inequality in Bangladesh in the 2000s: Re-visiting the East-West Divide Debate" Research Endowment Fund Study Report. Bangladesh Institute of Development Studies, Dhaka.
- Shahabuddin, Q. 2002. "Assessment of Comparative Advantage in Bangladesh Agriculture." *The Bangladesh Development Studies* 26(1): 37–76.

- 2014. “Bangladesh: Agriculture and Food Security Policies.” Background paper for “Dynamics of Rural Growth in Bangladesh,” GFADR, World Bank, Washington, DC.
- Toufique, K.A., and N. Ahmed. 2014. “Barriers to Developing the Fisheries Sector in Bangladesh.” Policy Brief No. 1407. Bangladesh Institute for Development Studies, Dhaka.
- UNDP and FAO (United Nations Development Programme and Food and Agriculture Organization). 1988. “Land Resources Appraisal of Bangladesh for Agricultural Development, Report 2: Agroecological Regions of Bangladesh.” Rome.
- World Bank. Various years. World Development Indicators. Database. Washington, DC.
- World Bank. 2015. “Bangladesh: More and Better Jobs to Accelerate Shared Growth and End Extreme Poverty: A Systematic Country Diagnostic.” Washington, DC.
- WorldFish Centre. 2006. “Aquaculture Brief: A Low-cost Option for Economic Growth in Bangladesh.” Policy Brief. Penang.
- Yu, W., M. Alam, A. Hassan, A.S. Khan, A. Ruanne, C. Rosenzweig, D. Major and J. Thurlow. 2010. *Climate Change Risks and Food Security in Bangladeshi*. London: Earthscan.

## Annex 3: Structure and Performance of Crop Agriculture

Figure A3.1: Subsector composition of agricultural GDP, 1980 to present.

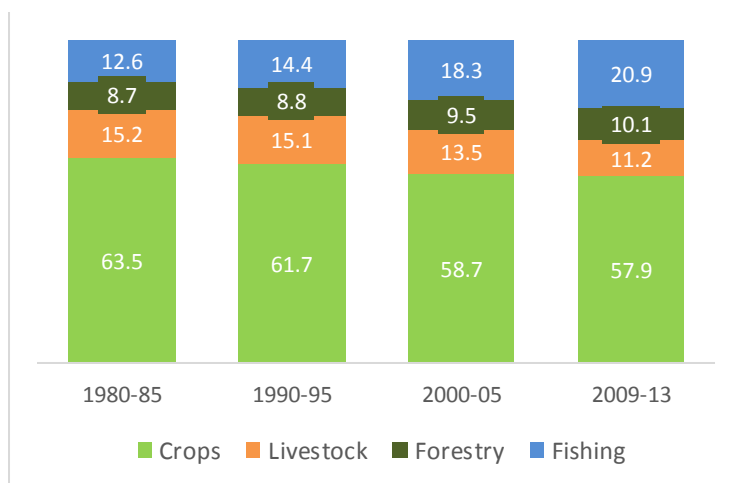
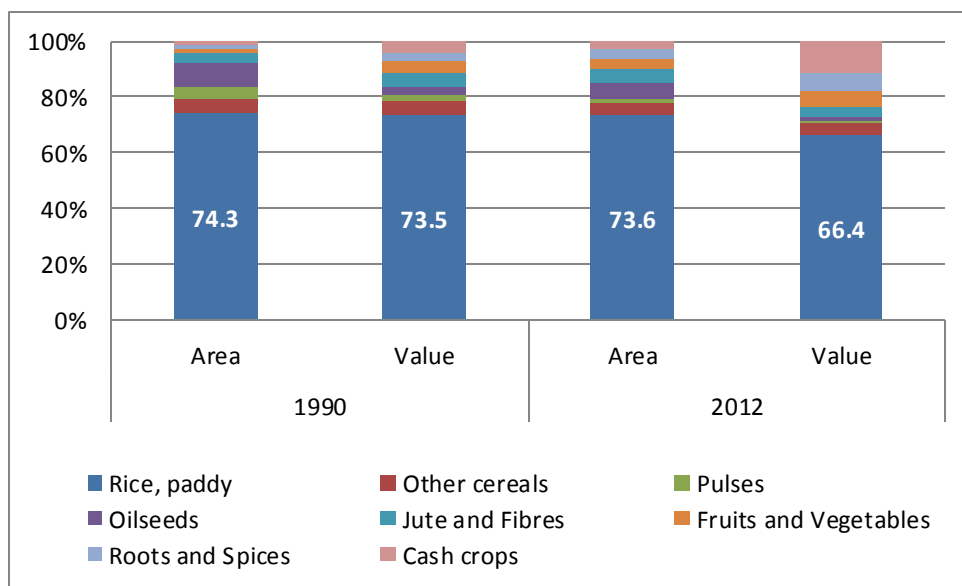


Figure A3.2: Change in the structure of agriculture: Area and value of output



**Table A3.1: Growth rates in area, production, and yield of major non-rice crops in Bangladesh (%)**

Crops	1972/73-2009/10			1972/73-1979/80			1980/81-1989/90			1990/91-1999/00			2000/01-2009/10		
	A	Y	Q	A	Y	Q	A	Y	Q	A	Y	Q	A	Y	Q
Wheat	3.1	1.7	4.8	16.8	13.3	30.0	0.7	-2.1	-1.4	4.6	3.1	7.8	-9.4	0.4	-9.0
Pulses	0.0	0.7	0.7	2.5	-1.6	0.9	-2.7	0.8	-1.9	-3.1	0.4	-2.7	-9.5	2.2	-7.4
Oilseeds	0.8	2.3	3.1	1.5	0.5	2.0	-1.8	1.0	-0.8	-1.1	3.5	2.4	-1.8	11.8	10.0
Vegetables	3.5	1.1	4.6	1.9	-0.4	1.5	2.7	-0.6	2.1	4.3	-0.2	4.0	6.2	1.4	7.5
Potatoes	4.2	1.4	5.6	2.3	0.5	2.8	0.1	0.4	0.5	6.7	1.4	8.1	7.0	1.8	8.8
Spices	2.2	1.7	3.9	0.7	-2.0	-1.2	-0.3	2.2	1.9	5.8	-3.8	2.0	2.0	14.4	16.4
Tea	0.7	1.4	2.1	-0.2	6.0	6.2	0.7	-0.4	0.2	0.2	1.9	2.1	1.3	-0.3	1.0
Jute	-1.9	1.6	-0.3	-0.7	2.1	1.5	-1.0	1.9	0.9	-2.4	8.9	6.5	-0.7	1.9	1.1
Sugarcane	0.0	-0.1	-0.1	1.4	0.6	2.0	1.6	-1.4	0.3	-1.2	0.3	-0.8	-4.0	-0.4	-4.4

Source: Shahabuddin 2014.

Note: The trend growth rates have been computed by fitting semi-log function to the data. A stands for area, Y for yield, and Q for production.

**Table A3.2: Trend growth rates in area, yield, and production of rice crops in Bangladesh (1972–2010) (%)**

Crops	1972/73-2009/10			1972/73-1979/80			1980/81-1989/90			1990/91-1999/00			2000/01-2009/10		
	A	Y	Q	A	Y	Q	A	Y	Q	A	Y	Q	A	Y	Q
Aus (local)	-5.9	1.4	-4.5	-1.7	0.9	-0.8	-3.2	1.9	-1.3	-6.3	0.2	-6.2	-12.1	0.5	-11.6
Aus (HYV)	2.0	-0.4	1.6	23.3	-3.4	19.8	-1.7	-2.7	-4.4	2.4	1.0	1.4	4.4	1.5	5.8
Aus (total)	-3.9	1.8	-2.1	0.1	2.8	2.9	-2.9	0.8	-2.1	-4.1	0.9	-3.2	-3.7	2.4	-1.3
Aman (local)	-3.0	0.6	-2.4	0.5	3.4	3.9	-3.0	1.2	-1.8	-2.9	-0.8	-3.7	-6.3	-0.6	-6.9
Aman (HYV)	6.1	0.5	6.6	2.3	0.6	2.9	5.5	0.8	6.2	2.3	-0.5	1.8	3.4	-0.2	3.3
Aman (total)	-0.2	1.8	1.6	0.7	2.9	3.6	-1.2	1.9	0.7	-0.8	0.1	-0.7	-0.6	0.6	0.0
Boro (local)	-3.7	1.1	-2.6	-3.8	-1.5	-5.3	-3.6	-2.4	-6.0	-2.5	1.4	-1.1	-7.5	0.3	-7.2
Boro (HYV)	6.6	0.9	7.5	4.6	-2.5	2.1	11.3	-0.7	10.6	4.2	1.8	6.0	3.5	0.8	4.4
Boro (total)	4.8	1.8	6.6	0.8	-0.8	0.1	8.1	0.4	8.4	3.6	2.1	5.7	2.9	2.8	5.6
Rice (local)	-3.7	1.1	-2.6	-0.5	2.4	1.9	-3.1	1.2	-1.9	-3.8	-0.2	-4.0	-8.0	-0.4	-8.3
Rice (HYV)	5.8	0.8	6.6	6.1	-1.3	4.8	7.0	0.1	7.1	3.2	1.0	4.2	3.8	1.0	4.8
Rice (total)	0.2	2.6	2.8	0.5	2.3	2.8	-0.1	2.4	2.3	0.0	1.8	1.8	0.2	2.6	2.8

Source: Shahabuddin 2014.

Note: The trend growth rates have been computed by fitting semi-log function to the data. A stands for area, Y for yield, and Q for production.

**Table A3.3: Area, yield, and production of rice crops in Bangladesh, 2010–13**

Crops	2010-2011			2011-2012			2012-2013		
	Area (acres)	Yield (mds/acre)	Prod. (MT)	Area (acres)	Yield (mds/acre)	Prod.(MT)	Area (acres)	Yield (mds/acre)	Prod. (MT)
Aus (local)	7,80,426	13.15	3,93,543	7,08,486	13.95	3,68,986	6,52,905	13.82	3,36,763
Aus (HYV)	19,69,589	23.66	17,39,278	21,03,957	25.00	19,63,166	19,49,392	25.03	18,21,474
<i>Aus (total)</i>	<i>27,50,015</i>	<i>20.78</i>	<i>21,32,821</i>	<i>28,12,443</i>	<i>22.21</i>	<i>23,32,152</i>	<i>26,02,297</i>	<i>22.22</i>	<i>21,58,238</i>
Aman (broadcast)	10,52,822	12.95	5,09,032	9,49,018	12.77	4,52,422	9,12,926	12.85	4,38,002
Aman (local transplant)	32,51,031	17.64	21,40,729	31,89,969	17.57	20,92,313	31,27,941	17.32	20,21,776
Aman (HYV)	96,47,080	28.16	1,01,41,737	96,50,145	28.47	1,02,53,533	98,22,394	28.47	1,04,37,432
<i>Aman (total)</i>	<i>1,39,50,933</i>	<i>24.56</i>	<i>1,27,91,498</i>	<i>1,37,89,132</i>	<i>24.86</i>	<i>1,27,98,268</i>	<i>1,38,63,261</i>	<i>24.92</i>	<i>1,28,97,210</i>
Boro (local)	1,95,300	22.21	1,61,903	1,79,012	20.93	1,39,847	1,62,957	22.50	1,36,836
Boro(HYV)	99,67,871	41.20	1,53,29,343	1,01,13,855	41.32	1,55,97,503	1,00,81,907	41.86	1,57,51,828
Boro (hybrid)	16,24,807	51.33	31,25,534	15,93,185	50.81	30,21,862	15,17,708	51.00	28,89,492
<i>Boro (total)</i>	<i>1,17,87,978</i>	<i>42.31</i>	<i>1,86,16,780</i>	<i>1,18,86,052</i>	<i>42.28</i>	<i>1,87,59,212</i>	<i>1,17,62,572</i>	<i>42.77</i>	<i>1,87,78,154</i>
<b>Rice (local)</b>	<b>52,79,579</b>	<b>16.26</b>	<b>32,05,207</b>	<b>50,26,485</b>	<b>16.27</b>	<b>30,53,568</b>	<b>48,56,729</b>	<b>16.18</b>	<b>29,33,377</b>
<b>Rice (HYV)</b>	<b>2,32,09,347</b>	<b>35.02</b>	<b>3,03,35,892</b>	<b>2,34,61,142</b>	<b>35.21</b>	<b>3,08,36,064</b>	<b>2,33,71,401</b>	<b>35.42</b>	<b>3,09,00,226</b>
<b><i>Rice (total)</i></b>	<b><i>2,84,88,926</i></b>	<b><i>31.54</i></b>	<b><i>3,35,41,099</i></b>	<b><i>2,84,87,627</i></b>	<b><i>31.87</i></b>	<b><i>3,38,89,632</i></b>	<b><i>2,82,28,130</i></b>	<b><i>32.11</i></b>	<b><i>3,38,33,602</i></b>

Source: BBS.

Note: Mds = maunds.

**Table A3.4: Agro-ecological zones (AEZs) of Bangladesh**

SI No	Name of AEZ	Crops
1	Old Himalayan Piedment Plain	Transplanted aman, wheat, potato, sugarcane
2	Active Tista Floodplain	Cheena, kaon, limited area of sugarcane
3	Tista Meander Floodplain	Tobacco, potato, vegetables, spices, aus, jute, wheat
4	Karatoya Bangali Floodplain	Wheat, potato, mustard, chilli, HYV boro
5	Lower Atrai Basin	HYV boro
6	Lower Punarvaba Floodplain	Deepwater aman
7	Active Brahmaputra Jamuna Floodplain	Aus, jute, deepwater aman, cheena, mustard, rabi pulses, rabi groundnut
8	Young Brahmaputra and Jamuna Floodplain	Jute, transplanted aman, wheat, barley, cheena, maize, kaon, mustard, groundnut, pulses, chilli
9	Old Brahmaputra Floodplain	Sugarcane, wheat, lentil, potato, vegetables, khesari
10	Active Ganges Floodplain	Jute, sugarcane, khesari, lentil, chickpea, mustard, cheena, groundnut, chilli, spices, tobacco
11	High Ganges River Floodplain	Aus, jute, sugarcane, tobacco, cotton, garlic, onion, banana, mango, HYV boro
12	Low Ganges River Floodplain	Aman, deepwater aman, tobacco, banana, spices
13	Ganges Tidal Floodplain	Aus, khesari, chilli, coconut, HYV boro, betel leaf
14	Gopalgangs Khulna Bils [beels]	HYV boro, aus, jute, sesame, transplanted aman, sugarcane
15	Arial Bil [beel]	Mixed aus, pulses, mustard, wheat
16	Middle Meghna River Floodplain	Jute, HYV boro, groundnut, chilli, mustard, wheat, khesari, sweet potato
17	Lower Meghna River Floodplain	Chilli, potato, wheat, mustard, kaon, transplanted aman
18	Young Meghna Estuarine Floodplain	Aus, transplanted aman, khesari, lentils
19	Old Meghna Estuarine Floodplain	Aus, transplanted aman, HYV boro, wheat, potato, mustard, kaon, sesame, khesari
20	Eastern Surma Kusiara Floodplain	Aus, transplanted aman, spices, sweet potato, potato, pulses, mustard
21	Sylhet Basin	Mustard, rabi vegetables
22	Northern and Eastern Piedmont Plains	HYV boro, deepwater aman, tea
23	Chittagong Coastal Plain	Deepwater aman, cowpea, coconut, betel nut
24	St Martin Coral Island	Coconut, betel nut
25	Level Barind Tract	HYV aus, aman, potato, wheat
26	High Barind Tract	Broadcast aman, mustard
27	North Eastern Barind Tract	Sugarcane, aus, mesta, mustard, maskalai, potato, HYV boro
28	Madhupur Tract	Sugarcane, groundnut, mustard, potato, deepwater aman
29	Northern and Eastern Hills	Shifting Jhum cultivation to cultivate comilla cotton, rubber, tea, pulses, gourds
30	Akhaura Terrace	Aus, transplanted aman, jackfruit, HYV boro

Source: UNDP and FAO (1988).





## 4 Growth of the Non-farm Sector and Its Drivers

The rural non-farm (RNF) sector<sup>45</sup> is a key source of productive employment, especially before the formal non-farm sector starts to absorb surplus rural labor,<sup>46</sup> and many East Asian economies have shown that the RNF sector can also be a key driver of overall economic growth.<sup>47</sup> In Bangladesh the farm sector has traditionally dominated employment and growth in rural areas, but the RNF sector has also long been recognized for its role in the growth of the rural economy.<sup>48</sup> The increased importance of the RNF sector as a source of household income, provider of employment, and driver of poverty reduction is apparent throughout the discussion in Chapter 2. The extremely narrow scope for expanding agricultural land, the growing and more educated labor force,<sup>49</sup> and the growing demand for non-farm goods and services all imply that future growth and poverty reduction in Bangladesh will require robust growth of the RNF sector.

For these reasons, an investigation of the factors affecting the performance and growth of the RNF sector is central to understanding the dynamics of rural growth. One hypothesis is that substantial public investments in infrastructure such as roads and bridges and better communication technologies will lead to better rural-urban linkages and facilitate the creation of jobs in services, trade, and micro-enterprises. Yet these outcomes could be the result of investments from many other sources, such as higher farm profits, remittances from migrants, better access to financing for micro, small, and medium enterprises, and transfer payments. An understanding of these dynamics is also important because literature on the growth of the RNF sector in Bangladesh<sup>50</sup> and the data used<sup>51</sup> are often dated, and earlier findings may not reflect current dynamics.<sup>52</sup>

The RNF sector by definition is very broad, covering all income-generating activities and other sources of income in villages, rural towns, and peri-urban areas, excluding the primary production of crops, fish, trees, and livestock. Aside from the services sector, where the more productive or higher-paying jobs tend to require substantial human capital (education or skills), the organized

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<sup>45</sup> RNF activities have long been recognized as an integral part of the rural economic landscape; see Lanjouw and Lanjouw (2001); Lanjouw and Feder (2001).

<sup>46</sup> See, for example, Timmer (2002); Chawanote and Barrett (2012).

<sup>47</sup> Lin and Yao (1999); Lanjouw and Lanjouw (2001); McCulloch, Timmer, and Weisbrod (2007).

<sup>48</sup> Bhattacharya (1996); Mahmud (1996); Sen (1996); World Bank (2007).

<sup>49</sup> Given the current age structure, the labor force is expected to continue expanding for some time, even as the population growth rate continues to decline.

<sup>50</sup> For example, World Bank (2004).

<sup>51</sup> For example, in Islam, Zohir, and Hossain (2011).

<sup>52</sup> The main sources of information on activities in the RNF sector used in this report are (at the national level): (1) HIES 2000, 2005, 2010 and (2) LFSs 2002/03, 2005/06, and 2010. At the micro level, the main sources of information are: (1) the BIDS-IRRI-BRAC Household Panel Surveys (1987–2013) (5 rounds); (2) the WB-BIDS-InM longitudinal panel surveys (1991/92–2010/11, 3 rounds); and (3) the BIHS IFPRI Survey of 2011/12 (1 round).

micro-enterprise and the small and medium enterprise (SME) sectors<sup>53</sup> appear to offer great potential for economic growth and rapid employment creation. A number of studies include remittances as part of non-farm sources of income. As noted in Chapter 2, detailed analysis of migration and remittances is beyond the scope of this study; it remains an important part of the future analytical agenda.

The analysis below pays particular attention to micro-enterprises—enterprises employing less than 10 employees—as they have traditionally dominated the RNF economy. Survey data from the 2001 and 2003 rounds of the Economic Census and the 2005 National Report of BBS suggest that 64 percent of enterprises and half of employment in manufacturing, trade, and service enterprises are in rural areas (Islam, Zohir, and Hossain 2011). Ninety-nine percent of RNF enterprises are micro-enterprises, accounting for almost 90 percent of workers employed at RNF enterprises. Income from micro-enterprises appears to have a greater role in poverty reduction than other non-farm sources of income.<sup>54</sup> Although households with business enterprises appear to be better off (Annex 4, Table A4.1), a surprising finding from the HIES data, discussed in Chapter 2, is that the share of micro-enterprise owners among rural households declined from 2000 to 2010. Understanding why the decline occurred is an important outstanding question.

## *Changing Profile and Role of Rural Non-farm Activities*

A detailed profile of the RNF activities in which rural households are involved is helpful for understanding the nature and drivers of these activities and their future prospects. A major challenge is that different surveys use different definitions for the types of activities that households or individuals pursue and for their sources of income. A second major challenge is that households engage in multiple activities, both on and off the farm, and the shares of income from those activities change over time (Table 4.1), depending on the prevailing circumstances and the performance of sectors, making it difficult to categorize households by a single type of farm or non-farm activity. As applicable, the analysis that follows uses total household income earned by all household members from various sources, rather than using the household head's occupation

**Table 4.1: Percentage of rural households earning income from different sources, HIES data**

	2000	2005	2010
Crop farming	64.5	64.2	63.8
Non-crop farming	64.1	30.8	70.8
Agricultural wage	34.6	25.4	25.9
Enterprise	30.7	24.8	22.6
Wage and salary	26.5	41.8	36.2
Remittance	27.3	30.0	23.4
Other Income	51.4	56.5	28.9
Total farm income	79.9	80.8	87.2
Total non-farm income	83.1	89.1	77.4
<i>Farm + non-farm income</i>	<i>62.9</i>	<i>69.9</i>	<i>64.5</i>

Source: BBS.

<sup>53</sup>More specifically, micro-enterprises are defined to include manufacturing and processing industries, transport, trade, services, and other miscellaneous activities. They do not include farm-related activities such as crop production, poultry raising, cow fattening, fish farming, and other small farm activities.

<sup>54</sup> See, for example, Deininger and Jin (2007); Khandker and Samad (2014).

or income. If necessary, a household is classified by type of occupation based on the source of the majority of its income.

As a first step in understanding the RNF profile, Figure 4.1 and Figure 4.2 show the relationship between non-farm income and total household income. Both the HIES and WBI survey data show a similar non-linear pattern for all survey years, with the share of non-farm income initially rising and eventually declining with per capita household income.

**Figure 4.1: Trend in the share of non-farm income in household income (WBI panel data)**



Source: WB-BIDS surveys, 1991/92, 1998/99, and WB-InM survey, 2010/11.  
Note: Shaded area represents bandwidth for 95 percent confidence interval.

**Figure 4.2: Trend in the share of non-farm income in household income (HIES data)**

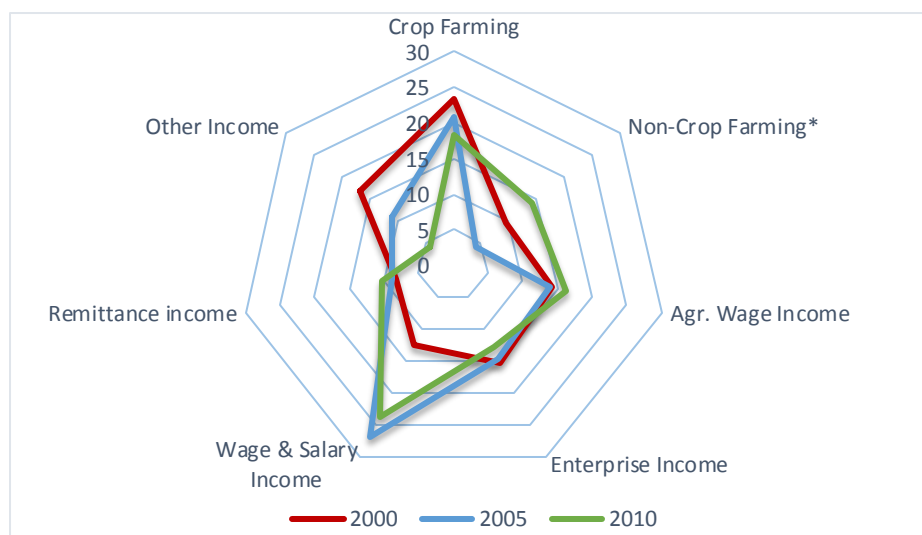


Source: HIES 2000, 2005, and 2010.

## Temporal and Spatial Patterns of Income

Figure 4.3 shows changes in the share of household income from different sources between 2000 and 2010. Within agriculture there is an increase in non-crop agriculture. Within the RNF sector, enterprise-based incomes declined somewhat, but households made a significant shift from “other” (undefined) sources to wages and salaries, indicating a sharp rise in service- and wage-based RNF activities.

**Figure 4.3: Change in rural income sources, 2000–10**

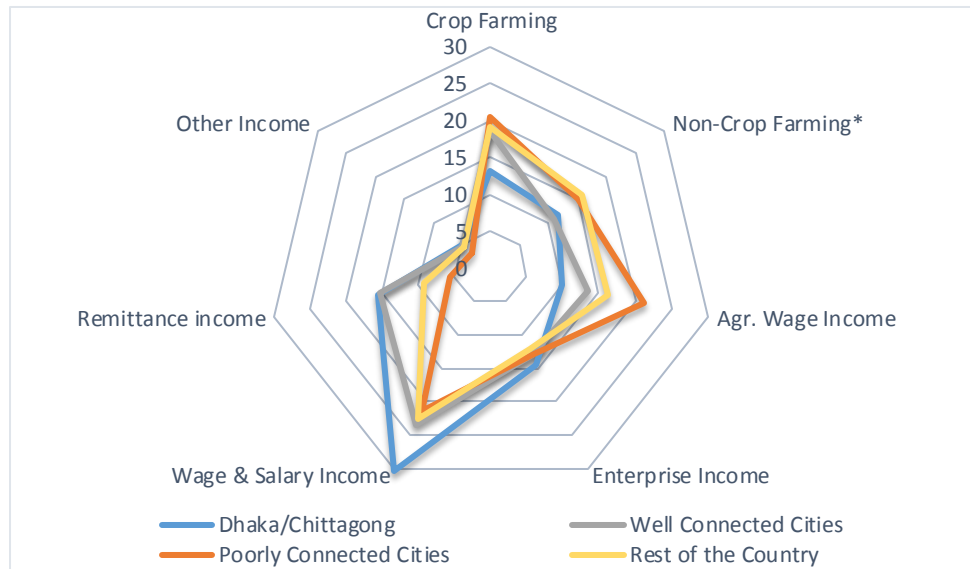


Source: HIES data, 2000, 2005, and 2010.

Patterns in income sources have an important spatial dimension. To show the effects of proximity to urban areas, traditionally the major stimulant for RNF jobs, as well as the effects of connectivity (in terms of road access to Dhaka), Figure 4.4 shows how income patterns vary depending on whether households are located close to Dhaka (defined as living in districts adjacent to Dhaka), close to secondary cities with good connectivity, close to cities with poor connectivity, or in the rest of the country.

Households living near Dhaka and Chittagong, as well as households in better connected cities, rely significantly more on wages and salaries and also have higher remittance incomes than those living in poorly connected or mostly rural settings. The share of enterprise incomes is surprisingly uniform across spatial settings, and relatively low.

**Figure 4.4: Spatial profile of income distribution, 2010**



Source: HIES 2010.

The kinds of activities pursued by rural households have changed significantly over time. Non-farm activities have always been a part of the rural economy in Bangladesh; traditionally they have consisted of crafts and cottage industries (which supplied utensils, storage pots, clothing for day-to-day use, and numerous other items) and personal services. Some traditional crafts and cottage industries required a significant level of skill and artistic sophistication; the locally produced muslin cloth was appreciated throughout neighboring countries, Europe, and the Far East. Groups settled in a particular area and sometime belonging to particular Hindu castes specialized in various crafts. For example, bamboo products, metal items, clay items, and livestock products were provided by castes specializing in their production for countless generations. Over time, as caste boundaries weakened or blurred, this specialization declined, and the technology used in many traditional activities changed dramatically. As new marketing channels opened, traditional crafts were increasingly replaced by the cheaper, mass-produced products of modern manufacturing.

The expansion of the RNF sector in Bangladesh during recent decades therefore includes the development of activities in new sectors and subsectors. New needs and demands in agriculture, both upstream and downstream (that is, in input and output markets), have led to the introduction of new value chains and processing activities (modern rice milling, feed preparation, agro-processing, and the like) and growth in trading and related services for the use of modern inputs (including leasing and rental markets for machinery and primary processing, as well as services for maintaining and renting that equipment and machinery).

In Bangladesh, few RNF activities are now based on the use of natural raw materials. Therefore the concentration of non-farm activities may be the outcome of three factors. First, it may be based on traditional skills, which may be concentrated in certain regions. Second, RNF activities may

become concentrated in areas where workers have been pushed out of farm activities by the limited availability of land or the poor quality of land. These areas would offer cost advantages resulting from lower wage levels. A third possibility is that higher incomes (from agriculture or from other sources like remittances) in some areas may increase the demand for non-farm goods and services.

## *Nature of Rural Non-farm Activities*

The available data indicate that RNF activities include a highly heterogeneous collection of trading, commercial, and service activities, agro-processing, and manufacturing. The development of a detailed profile of the non-farm sector and its drivers is hampered by a lack of data, as noted, and by the challenges presented by the data that are available: the classification of activities varies by data source, and different researchers have used different lenses to look at RNF activities and employment. Although these limitations mean that only a broad profile of the non-farm sector can be pieced together, it is nevertheless useful.

At the national level, using HIES data, the shares of RNF workers engaged in different activities show that the broad structure of employment has not changed significantly since 2000 (Table 4.2). Manufacturing (aggregated across categories), trade, transport, and high-skilled services are the main activities rural households are engaged in. Within the services sector there is a small shift from low-skilled to high-skilled jobs, and an increase in construction jobs. Among manufacturing jobs the largest share is in the handloom and tailoring business.

**Table 4.2: Share of rural non-farm workers involved in different sectors, 2000–10**

Sector	Type of occupation	2000	2005	2010
Services	High-skilled (professional)	13.4	15.2	15.0
	Semi-skilled (office-related jobs)	3.2	3.7	3.7
	Low-skilled (domestic/personal)	6.5	4.2	4.4
	Construction	4.1	4.9	6.5
	Transport	14.5	17.1	15.3
	Trade/sales	28.5	25.8	25.3
	Hospitality	2.1	2.6	1.6
Business/ manufacturing	Handloom/tailoring	8.1	8.6	8.9
	Food processing	3.0	1.9	3.6
	Furniture makers	4.3	4.3	4.8
	Other manufacturing	7.4	5.8	6.6
	Others	4.8	5.8	4.5

Source: HIES data, 2000, 2005, and 2010.

Hossain (2004) makes a useful distinction among RNF activities by classifying them as based on (1) manual labor, such as self-employment in cottage industries; (2) human capital, such as salaried work; and (3) physical capital, such as businesses or enterprises like shop-keeping and trading. The World Bank (2004) provided another profile of the non-farm sector based on a survey in 2003.

As for the relative size and trends of farm and non-farm activities, an updated version of the employment patterns from Hossain (2004), extended to include later years of the MH panel database, is presented in Table 4.3, showing how the same rural households have fared over time. Non-agricultural jobs have grown since 1987, but most of the change appears to have happened between 1987 and 2000, as the shares of employment have stayed relatively flat in the 2000s. Among RNF activities, shares of employment in services and business have increased, but other categories have remained relatively static.

**Table 4.3: Distribution of rural workers by type of employment, 1987–2008 (%)**

Category of employment	Primary occupation			
	1987	2000	2004	2008
Agricultural, of which:	66.1	54.5	56.9	56.8
Farming	65.4	75.6	79.4	74.3
Agricultural wage based	32.8	22.2	18.8	23.6
Livestock and fisheries	1.8	2.2	1.8	2.1
Non-agricultural, of which:	33.9	45.5	43.1	43.2
Services	45.7	38.2	47.6	44.7
Business	22.4	28.6	28.8	30.6
Shop-keeping	4.4	5.3	3.0	2.1
Mechanic	2.1	8.6	6.3	7.4
Rickshaw van/pulling	5.9	11.6	11.1	11.3
Other transport	3.8	2.6	2.8	3.7
Construction based	10.0	4.0	0.8	0.3
Other non-agriculture-based	5.6	1.3		
<i>Total</i>	<i>100</i>	<i>100</i>	<i>100</i>	<i>100</i>

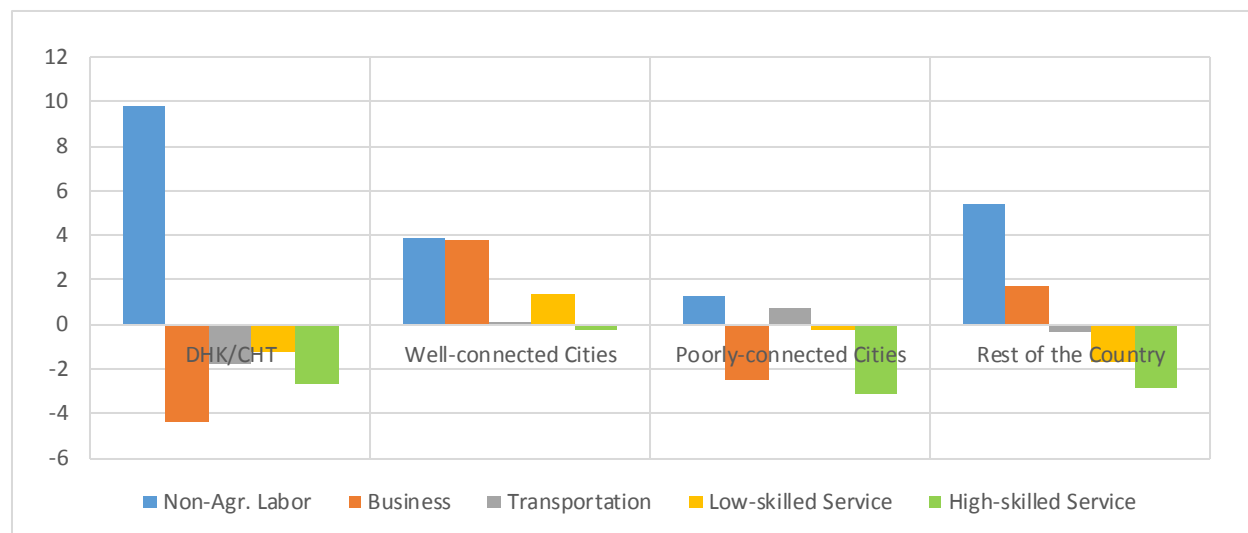
Source: MH panel survey data.

An important dimension of employment patterns is their spatial evolution. Figure 4.5 shows the spatial pattern of change in the shares of different types of RNF employment between 2000 and 2013. The spatial disaggregation is based on the districts where the households live: adjacent to the two major cities of Dhaka/Chittagong; adjacent to well-connected secondary cities; adjacent to poorly connected secondary cities; and the rest of the country.

The figure clearly shows the importance of connectivity and operating environment, which appear to be higher around the secondary cities and to some extent in more rural areas (probably reflecting the good performance of agriculture, generating employment through forward and backward linkages). The biggest change across the spatial categories occurred around Dhaka and Chittagong. Consistent with the general perception that these cities are getting congested, a significantly larger share of the workforce in these areas is engaged in non-agricultural wage labor, a largely unskilled category of employment. Shares of employment in all other categories, including business, low- and high-skilled services, as well as the transport sector (including both rickshaw pullers and other transport activities) have declined. The areas with the largest increase in business activities over

the 13-year period are those adjacent to well-connected secondary cities, which also show a slight improvement in low-skilled services.

**Figure 4.5: Change in shares of employment by location, 2000–13**



Source: Authors, using MH panel surveys.

The patterns observed in the panel data are consistent with those found in the World Bank (2004) report on the RNF sector in Bangladesh. Based on a 2003 survey of rural enterprises, the report shows that wholesale and retail trade have the largest share of RNF employment, with manufacturing (broadly defined) being the next largest.

Table 4.2, Table 4.3, and Figure 4.5 are based on the employment status of individual workers, but another useful perspective on RNF activities comes from examining the types of establishments providing employment in the RNF sector—a subject of particular interest to the rural manufacturing or industrial sector. The 2011 Survey of Cottage Industries by BBS provides data to profile the spectrum of rural establishments (BBS 2011). The largest share of cottage industry establishments, nearly 21 percent, is involved in processing or manufacturing food products.

**Table 4.4: Distribution of cottage establishments by industry type (based on 2-digit Bangladesh Standard Industrial Classification)**

SI No	Type of industry	Number	Percent
1.	Manufacturer of food products	171,344	20.6
2.	Manufacturing of textiles	141,035	17.0
3.	Manufacturing of furniture	103,637	12.5
4.	Manufacturing of wood and products of wood	76,780	9.2
5.	Other manufacturing	76,157	9.1
6.	Manufacturing of fabricated metal	75,967	9.1
7.	Manufacturing of weaving apparel	42,730	5.1
8.	Manufacturing of non-metallic product	27,038	3.2
9.	All others	115,591	14.0
	<b>Total</b>	<b>831,688</b>	<b>100.0</b>

Source: Cottage Industry Survey 2011, BBS.



## Evolution of Rural Non-Farm Enterprises

Khandker and Samad (2014) use two sources of data to better understand the nature and drivers of rural non-farm enterprises (RNFEs)—the HIES surveys of 2000, 2005, and 2010, and the unique WBI longitudinal panel surveys. As discussed in Chapter 1, the two surveys use different sampling designs, each with its strengths and weaknesses. The full HIES sample is nationally representative but successive rounds are repeated cross sections, not panel surveys. The WBI surveys contain repeated observations of the same households over a long (20-year) period, providing insight into how households have evolved over time. A particular feature of the WBI panel surveys is that they started out with a focus on the client base of micro-finance institutions, and as such the sample design has a particular focus on the poor and landless, the target group for the micro-finance industry. A comparison of the HIES and WBI panel for the closest years (2000 for HIES and 1998/99 for WBI) shows that the WBI sample is closely matched with the bottom 60 percent of the households in terms of per capita incomes. In other words, although the WBI surveys are not nationally representative, they provide an aperture for understanding the bottom 60 percent of the rural population, a group of particular interest for poverty reduction.

Khandker and Samad (2014) compare the broad composition of RNF income for the two data sources (Table 4.5). The comparison provides insight into the income profile of the lower income groups relative to the full population. The WBI sample shows a higher share of micro-enterprises, whereas HIES shows a higher share in wage and salaried incomes—a likely reflection of the WBI sample, with its focus on the micro-finance target group. For the closest comparable years, the other sources of incomes are broadly similar. An important message emerging from this comparison is that micro-enterprises are an important pathway out of poverty for the bottom 60 percent of households, most of whom are likely to be landless.

**Table 4.5: Shares of rural non-farm incomes (comparison of HIES and WBI panel survey)**

HIES	2000 (N=2,758)	2005 (N=2,917)	2010 (N=3,459)
Share of enterprise income (%)	21.3	18.1	21.8
Share of wage and salaried income (%)	27.8	30.7	36.1
Share of income from misc. sources <sup>†</sup> (%)	39.0	39.6	28.9
Share of remittance (%)	11.9	11.6	13.2
WBI panel survey	1991/92 (N=1,509)	1998/99 (N=1,758)	2010/11 (N=2,322)
Share of enterprise income (%)	38.2	36.1	30.4
Share of wage and salaried income (%)	44.5	25.2	24.1
Share of income from misc. sources <sup>†</sup> (%)	12.9	28.5	30.4
Share of remittance (%)	4.3	10.2	15.1

Source: HIES 2000, 2005, and 2010; WB-BIDS surveys 1991/92 and 1998/99; WB-InM survey 2010/11; Khandker and Samad 2014.

<sup>†</sup> Receipt of self-employed professional (lawyers, doctors, tutors, etc.), rental income from properties and assets, interests and profits from savings and investments, and receipts from safety net programs, charities, etc.

Khandker and Samad (2014) also compare the major types of activity for RNFEs across the two data sources (Table 4.6). The HIES data indicate that services dominate RNFEs, whereas the WBI data indicate that RNFEs operated by the poor are concentrated more in trading and transport.

**Table 4.6: Distribution of rural non-farm enterprises by activity type (HIES and WBI surveys)**

<b>HIES</b>	<b>2000</b>	<b>2005</b>	<b>2010</b>
	<b>(N=1,427)</b>	<b>(N=1,426)</b>	<b>(N=1,909)</b>
Manufacturing and processing	11.9	10.3	13.9
Transport	9.3	6.3	13.1
Trade	2.4	2.5	2.3
Service	65.3	75.8	61.5
Other miscellaneous activities	11.1	5.1	9.2
<b>WBI Panel Surveys</b>	<b>1991/92</b>	<b>1998/99</b>	<b>2010/11</b>
	<b>(N=775)</b>	<b>(N=1,031)</b>	<b>(N=1,089)</b>
Manufacturing and processing	19.7	12.0	7.9
Transport	14.2	30.0	32.7
Agricultural trading	19.0	14.0	16.7
Non-agricultural trading	38.9	39.6	38.2
Services	8.2	4.4	4.5

*Source:* HIES 2000, 2005, and 2010; WB-BIDS surveys 1991/92 and 1998/99; WB-InM survey 2010/11; Khandker and Samad 2014.

*Note:* Manufacturing and processing include manufacturing and processing in food and beverages, tobacco, textiles, wood and furniture, rubber/plastic, basic metal, and non-metal products. Transport includes operation and rental of various transport vehicles. Trade includes wholesale and retail trading of various farm and non-farm products such as livestock, poultry, vegetables, fruits, rice, furniture, utensils, shoes, clothing, operating stores, shops and so on. Service includes skill-based or specialized activities such as those of carpenters, masons, blacksmiths, electricians, barbers, tailors, real estate agents, social workers, counseling, banking, doctors, restaurant and hotel business, and so on, and the miscellaneous sector includes other small activities.

Probing further, Table 4.7 presents some of the key features of RNFEs between 2000 and 2010, based on the HIES data. Over that decade, a significantly higher share of RNFEs were registered enterprises (in other words, they had formalized their operations), and they also tended to become relatively more home-based. Interestingly, the age of the average enterprise rose, signaling a higher rate of survival. Other characteristics did not alter much, however. Most RNFEs remained small, male-dominated, and family-operated businesses. Most operated pretty much all year round.

Based on data from the WBI panel surveys, Table 4.8 looks at transitions in the activities of RNFEs operated by households between 1998/99 and 2010/11. Households showed considerable movement into and out of RNFEs of all types, but only one-quarter of households changed the type of RNFE they operated. About one-third to one-half of RNFEs went out of business over the 12-year period. About one-third of the RNFEs dedicated to manufacturing and trading in 1998/99 survived over time, and close to half of those in transport managed to stay in business. The highest mobility is seen in the services sector, where half of all RNFEs went out of business altogether, and another 26 percent entered trading or another of the remaining activities. The activities of some RNFEs (such as services) seem to be temporary, with a high proportion either quitting non-farm

activity altogether or moving to another non-farm activity, whereas others (transportation is one example) endured for the entire period.

**Table 4.7: Characteristics of rural non-farm enterprises**

Enterprise characteristic	2000 (N=1,427)	2005 (N=1,426)	2010 (N=1,909)
Years in business	7.2	9.2 (t=-1.33)	10.0 (t=-2.12)
Share of registered enterprises (%)	9.9	14.7 (t=-3.85)	18.2 (t=-2.61)
Share of home-based enterprises (%)	11.9	14.2 (t=-1.80)	16.7 (t=-1.94)
Months operate per year	10.3	10.7 (t=-3.79)	10.9 (t=-3.00)
Number of workers	1.6	1.7 (t=-0.75)	1.4 (t=2.52)
Share of hired labor in total workforce (%)	11.0	10.0 (t=0.88)	8.7 (t=1.69)
Owner's sex (percent male)	96.4	94.8	95.5
Owner's age (years)	44.5	46.1	46.7
Owner's education (years)	3.2	3.5	3.5

Source: HIES 2000, 2005, and 2010.

Note: Owner's characteristics are that of the head of the household that owns the enterprise. Figures in parentheses are t-statistics of the differences with the value from the previous year.

**Table 4.8: Transitions in activities of rural non-farm enterprises operated by households, 1998/99 to 2010/11**

1998/99 activity ↓	2010/11 activity →					
	No RNFE (%)	Manufacturing and processing (%)	Transport (%)	Agri-based trading (%)	Non-agricultural trading (%)	Service (%)
No RNFE activity (51.6%)	73.7	2.0	7.7	4.5	10.8	1.3
Manufacturing and processing (6.2%)	40.2	33.3	7.0	2.6	14.5	2.4
Transport (14.1%)	35.2	1.1	53.3	2.7	7.4	0.3
Agri-based trading (6.8%)	39.3	2.3	10.7	32.2	15.4	0.1
Non-agricultural trading (19.3%)	39.9	3.8	9.9	7.5	35.6	3.3
Service (2.0%)	49.1	4.4	8.6	8.8	25.7	3.4

Source: WB-BIDS surveys 1998/99; WB-InM survey 2010/11.

## *Drivers of Non-farm Growth*

### *Farm and rural non-farm linkages*

Agriculture's forward and backward linkages have long been recognized as dominant sources of non-farm jobs. A large body of literature is concerned with the basic linkages connecting agriculture with non-farm (and overall economic) growth; the main conclusions are summarized in Annex 4. Some of the jobs are "pull" jobs—created to supply inputs for agricultural production or for processing primary products. In contrast, "push" jobs are generally jobs that small farmers or the landless are forced into out of necessity. Different characteristics of farming in different contexts create "pull" and "push" scenarios.

In Bangladesh, estimates of the linkages of various RNF activities to agriculture vary but are in line with the broader development literature on the subject. The main conclusion is that agriculture remains a major driver of RNF growth. Hossain (2004) finds that more than 50 percent of rural households' activities are directly linked to agriculture. Following the insights of Mandal (2003), taking account of the backward and forward linkages, Sarker, Mandal, and Kleinke (2013) empirically estimate that every 100 person-days of farm employment in rice production generates an additional 58 person-days of employment in the non-farm economy through a multitude of support services, processing, and marketing activities.

Sectoral multipliers are a summary measure of these inter-sectoral linkages. Starting with Lewis (1954) and Johnston and Mellor (1961), a large number of studies across a range of countries and contexts have confirmed that agricultural multipliers are greater than 1. The general consensus is that the multipliers are between 1.5 and 2. For Bangladesh, a World Bank study in 2008 provided similar estimates of multiplier effects of various tradable goods in agriculture (World Bank 2008). The results show the effects of a 1-taka (BDT) exogenous increase in value added from the various tradable goods sectors. On average, an increase of BDT 1 in the output of tradable goods in Bangladesh leads to a further BDT 1.07 increase in value added from non-traded goods and services (Table 4.9). This gain occurs mainly because of consumer spending effects as incomes earned in various activities are spent in the domestic economy.

Multipliers are smallest in sectors with few production linkages (such as knitwear, for which most inputs are imported and most outputs are exported). The multiplier for the food industry is especially large because of major backward production linkages to the non-tradable crops sector (pulses, fruits, vegetables, and so forth).

Table 4.9 also shows gains in household income arising from increases in the output of various sectors and the accompanying multiplier effects. Not surprisingly, agricultural households (including agricultural laborers) reap most of the benefits of agriculturally led growth. They also benefit from industrial growth, though to a lesser degree, since they gain almost exclusively from the multiplier effects alone and not from the direct effects of increases in industrial output and

employment. The exception is the food industry. Although an increase in food industry output has only limited direct effects on agricultural household incomes, it has very large indirect effects on non-tradable agriculture, so that a BDT 1 increase in value added of the food industry results in a gain of BDT 0.94 in agricultural household incomes.

**Table 4.9: Multiplier effects of various economic sectors**

	Effects of a BDT 1 increase in value added of respective sectors					
	Value added multipliers	Change in valued added	Change in household income			
			All HHs	Agricultural HHs	Rural non-farm HHs	Urban HHs
Paddy	0.96	1.96	1.42	0.74	0.32	0.37
Grains	0.56	1.56	1.24	0.63	0.27	0.34
Livestock	0.96	1.96	1.55	0.91	0.35	0.28
Shrimp	0.82	1.82	1.09	0.60	0.24	0.25
Food industry	1.43	2.43	2.23	0.94	0.52	0.77
Readymade garments	0.85	1.85	1.07	0.33	0.27	0.47
Knitwear	0.44	1.44	0.38	0.12	0.09	0.17
Other industry	0.74	1.74	1.17	0.39	0.28	0.50
Utilities	0.55	1.55	0.66	0.18	0.15	0.33

Source: World Bank (2008).

The effect of agricultural growth (evident from the multipliers) on the non-farm sector is attained through diversification and structural transformation. Timmer (2005) calls it a “successful transition” from rural food security (primarily subsistence) to a higher level of rural productivity through diversification and commercialization. The rural economy in Bangladesh already shows signs of that transition. The challenge is to encourage this transition to move more rapidly than it has to date.<sup>55</sup>

More recent evidence on the continuing strong farm–non-farm linkages for Bangladesh comes from Khandker and Samad (2014) and Shilpi and Emran (2015) (as discussed in Chapter 1). Using HIES and WBI data, Khandker and Samad estimate that a 10 percent increase in farm income growth leads to additional growth in non-farm income of 6 percent. Some of these linkages are empirically verified by Shilpi and Emran (2015), who estimate a significant positive impact of agricultural productivity on the growth of informal manufacturing and skills services employment. Another insightful paper by Emran and Shilpi (2014) shows the significant impact of agricultural productivity on agricultural wages, the supply of off-farm labor, and per capita household expenditure. They find that a 1 percent increase in crop yields leads to a 1 percent increase in wage

<sup>55</sup> Many scholars (such as Timmer) stress that transformation is a desirable goal not only because it leads to higher incomes and employment but because it is essential for sustained growth in agriculture. According to Timmer, policy must focus on strengthening and not retarding this transformation. Some scholars have pointed out that heavy input subsidies for cereals (to attain self-sufficiency in food) in some economies may actually retard the transformation. Timmer (2005) finds that policies favoring input subsidies are slowing transformation in Bangladesh as well as India.

rates. All of these effects are strong and positive with respect to welfare and poverty reduction. Agriculture's role as an important driver of non-farm incomes remains empirically robust.

### *Changes in the characteristics of rural non-farm enterprises*

A defining feature of rural economic transformation is the rural population's transition from a dependence on agriculture to an increasing involvement in non-agricultural activities. The WBI data show extent to which RNFEs are moving away from agriculture (Table 4.10). Over the 12-year period, a surprising share of households moved out of RNFEs—a movement that is consistent with the employment trends discussed earlier. Among households remaining in RNFEs, the share of RNFEs with direct linkages to agriculture (for example, engaged in milling, processing, trading, agricultural equipment and repair services, and so forth) declined from 27 to 15 percent.

Households involved in RNFEs may not depend directly on the farm sector—they trade in non-agricultural goods, engage in transport and craftwork, make furniture, provide services, and so on—and strictly speaking may not depend on farm production per se. Yet the fortunes of the farm sector still affect these enterprises, insofar as farm incomes drive demand for the products and services of RNFEs (through linkage effects). In this sense, many households involved with RNFEs remain subject to the same volatility and seasonality that typify the farm sector.

**Table 4.10: Distribution of rural non-farm enterprises based on their linkages to the farm sector (%)**

Activities	1998/99	2010/11
RNFE activities linked to farm sector	26.5	14.8
RNFE activities not linked to farm sector	20.2	27.0
Households with no RNFE activities	53.2	58.2
N	2,558	3,264

Source: WB-BIDS surveys 1998/99, WB-InM survey 2010/11.

### *Sophistication of rural non-farm enterprises*

Another way to assess RNFEs is to look at how the complexity, sophistication, and scale of their activities have changed over time. For example, making molasses or brown sugar (*gur*) is a basic activity, whereas operating a bakery is a more advanced activity; making cane or bamboo products is a basic activity, whereas making furniture is an advanced activity; repairing a bicycle or rickshaw is a basic activity, whereas repairing automobiles is an advanced activity. Broadly characterizing the activities of RNFEs in this manner, Khandker and Samad (2014) look at the share of RNFEs engaged in basic and advanced activities in 1998/99 and 2010/11. Basic activities predominate (occupying 28.8 percent and 24.7 percent of the sample in 1998/99 and 2010/11, respectively) (Table 4.11). The extent of basic activities has dropped a bit over time, but the extent of advanced activities did not increase, remaining at about 17 or 18 percent.

The transition from basic to advanced non-farm activities over time is a key component of growth in the non-farm sector. Table 4.12 shows that only 15 percent of households involved in basic

RNFE activities in 1998/99 switched to more advanced activities by 2010/11, while about 38 percent left RNFE activities. Among those involved in advanced activities in 1998/99, only about 37 percent remained in 2010/11, while 22 percent had returned to basic activities. Among households that did not engage in any RNFE activities in 1998/99, only about 11 percent moved on to advanced activities by 2010/11, while 15 percent moved on to basic activities.

**Table 4.11: Progression in the sophistication of rural non-farm enterprises (%)**

Activities	1998/99	2010/11
Basic RNFE activities	28.8	24.7
Advanced RNFE activities	17.9	17.1
Households with no RNFE activities	53.3	58.2
N	2,558	3,264

Source: WB-BIDS surveys 1998/99, WB-InM survey 2010/11.

**Table 4.12: Transition from basic to advanced activities in rural non-farm enterprises, 1998/99–2010/11**

1998/99 activities ↓	2010/11 activities →		
	Basic RNFE activities	Advanced RNFE activities	Households with no RNFE activities
Basic RNFE activities	47.3	15.0	37.7
Advanced RNFE activities	22.4	36.8	40.8
Households with no RNFE activities	15.0	11.2	73.8

Source: WB-BIDS surveys 1998/99, WB-InM survey 2010/11.

The picture that emerges is one of a stagnant RNFE sector in which the progression from basic to more advanced activities has not been as great as might be desired. It may be that demand for more advanced activities is limited but will increasingly emerge with sustained growth in rural incomes. For example, a switch from rickshaw or bicycle repair to automobile repair cannot occur steadily without a growing number of automobiles in rural areas.

## *Returns to rural non-farm enterprises*

Another factor at play could be that the rates of return are not sufficient to induce households to switch from basic to more advanced RNFE activities, but that hypothesis seems unlikely; entrepreneurs who switched from basic to advanced RNFES earned significantly higher rates of return. Estimates from HIES data for 2010 show consistently high rates of return of about 50 percent across all RNFE categories (manufacturing and processing, transport, agricultural trading, non-agricultural trading, and services), with the highest rates reported for transport enterprises (68 percent), likely reflecting payoffs to the government's significant investment in roads.<sup>56</sup> In actuality, households that switched from basic to advanced activities or remained engaged in advanced activities over time enjoyed much higher returns than their counterparts engaged in basic

<sup>56</sup> Rates of return are estimated to have been even higher for 2000 and 2005, ranging from 60 percent to 76 percent in 2000 and from 54 percent to 76 percent in 2005, with the highest returns accruing to transport activities in both years.



activities, and the difference between returns to basic and advanced activities is statistically significant (Table 4.13).

These findings unequivocally show that moving from basic to more advanced activities is literally rewarding for rural entrepreneurs. What is not clear is why the transition to more sophisticated rural enterprises has stalled. The lack of growth in RNFEs (in fact, the decline in participation over time) is all the more puzzling because households that are not engaged in RNFEs have significantly lower incomes per capita (Table 4.14). Becoming involved in an RNFE, or remaining in RNFE activities, would appear to be a better choice as far as income is concerned.

**Table 4.13: Rates of return to rural non-farm enterprises by level of sophistication**

1998/99 activities↓	2010/11 activities →		
	Basic RNFE activities	Advanced RNFE activities	t-statistics of the difference
Basic RNFE activities	36.6	70.4	7.06
Advanced RNFE activities	60.6	83.4	4.31

Source: WB-BIDS surveys 1998/99, WB-InM survey 2010/11.

The results of the rate of return analysis reported here are confirmed through a statistical analysis by Khandker and Samad (2014), who estimate production and profit functions using HIES and WBI panel data. They find the marginal returns to capital to be positive and significant, as well as significant in magnitude (with an estimated elasticity of 0.35 for HIES and 0.26 for WBI). The WBI results (which, as noted, are more pertinent to lower-income households) suggest potential capital constraints, with RNFE output being more sensitive to non-labor inputs than to labor inputs. These results are consistent with the surplus labor and insufficient access to capital that are generally presumed to prevail among poorer (and mostly landless) households.

**Table 4.14: Household income based on the transition from and to rural non-farm enterprises (BDT per capita per month)**

1998/99 status↓	2010/11 status →		
	Households engaged in RNFE activities	Households not engaged in RNFE activities	t-statistics of the difference
Households engaged in RNFE activities	1,681.9	628.5	9.02
Households not engaged in RNFE activities	2,347.8	706.8	10.90

Source: WB-BIDS surveys 1998/99, WB-InM survey 2010/11.

## Urban proximity

Traditional patterns of RNFE development show that RNFEs are particularly apt to thrive in proximity to dynamic urban settings. Some scholars view this pattern as evidence of the RNF sector's key role as a bridge between commodity-based agriculture and livelihoods earned in the modern industrial and services sector in urban centers. Throughout Asia, the non-farm sector has



been the ladder from underemployment at farm tasks to regular wage employment in the local economy, and from there to jobs in the formal sector (Wiggins and Hazell 2008).

Although it is generally right to assume that with robust agricultural growth, RNFEs will typically enjoy rapid growth, it is not a certainty that all non-farm activities will flourish. Members of farm households initially undertake some non-farm activities as part-time occupations, which may eventually grow into separate, full-time commercial activities. Some non-farm activities such as pottery-making, basket-making, and household poultry production die out over time, displaced by cheaper, more regular, and, at times, better quality supplies from the commercialized and modern sectors. Case studies of pottery and household weaving clearly show that these cottage-based industries are declining, primarily because substitutes are available (Box 4.1).

**Box 4.1: Case studies of selected cottage industries in Bangladesh**

Pottery-making in Natore in northern Bangladesh is a truly traditional, family-based artisanal industry involving both male and female family members, but it is on the verge of disappearing. Pottery (earthenware, stoneware, and porcelain) is one of the oldest and most widespread of the decorative arts, in which functional objects (vessels, vases, plates, and bowls of different colors, for instance) are made from clay hardened with heat at a high temperature. The industry is declining for several reasons, such as falling demand, increasing clay costs, and the lack of capital and appropriate technical support for product diversification. Pottery makers are unable to compete with aluminum and other cheaper modern materials and are forced to seek alternative employment. Demand seems to have been sustained for a few pottery products, such as flower tubs and disposable food containers, but pottery makers often cannot muster the capital or acquire the know-how to meet the demand for those differentiated or specialized products.

Serious challenges have also emerged in the cottage-based handloom industry for making *lungis*. Known as sarongs in many countries, these traditional garments are worn around the waist by men in Bangladesh. Originally made on handlooms, lungis are now manufactured mostly in cottage industries employing power looms. Erratic power supply forces power-loom owners to rely on generators during about 70 percent of the production time, but the high cost of electricity produced with a generator (more than double the cost of electricity from the grid) makes the industry uncompetitive. Lack of working capital is another major issue. During periods of high demand there is a shortage of thread and the price rises. Buying thread in bulk and stocking it for peak demand periods requires access to large amounts of working capital, which most weavers find difficult to raise. Lungi weavers report paying up to 18 percent interest per annum for loans. Micro-finance is not a solution for most financing needs because the weekly or monthly repayment schedules do not fit the seasonal cash-flow needs of the lungi business.

Light engineering (the building of small machinery and equipment) is a successful and expanding cottage industry that is evolving to play a significant role in the rural economy. Frequently referred to as a “mother industry,” it supports other industries by providing capital machinery, spare parts, and maintenance support, and it offers many opportunities to add value, contribute to economic growth, and reduce poverty. The heart of the country's foundry industry is in Bogra, where more than 70 percent of the foundries are situated and supply around 80 percent of the agricultural equipment nationwide—especially centrifugal pumps for irrigation. These factories manufacture all kinds of spare parts for power tillers and agricultural machinery, in addition to a diverse assortment of other products—tubewells, lathes, sawmills, flour mills, slip and brake drums for motor vehicles, machinery for textile and jute mills, grinding machinery, and parts for ships. Rapid growth in demand from agricultural producers has been a key driver, demonstrating the crucial role of market demand in the start and growth of rural industry.

Source: Hussain 2015.

The demise of low-productivity, household-based manufacturing enterprises explains, in part, why employment in services and commerce frequently grows faster than employment in manufacturing. Changes in consumer spending likewise contribute to faster growth in services and commerce. Consumption data show that as incomes rise, rural households increase spending on services such as education, health, transport, and prepared food more rapidly than they increase spending on any locally manufactured goods.

As argued by most, and empirically established by some, another key driver of the RNF sector is the demand for products, which is facilitated by better access to urban centers. While investment in non-farm activities is often financed by the surplus generated by productivity increases in agriculture, the location of RNF activities is more likely determined by the market size, which in turn is a function of the degree to which the producer needs to be close to customers and the scale of production. Guided by these considerations, productive non-farm activities and services may locate in villages, small towns, or cities. Towns provide consumer demand and purchasing power for higher-value agricultural products (such as horticultural crops), thus encouraging diversification. They provide complementary services to farm producers, value-added services such as food processing, trading, exporting, technical know-how, ideas for new products, financing, and sometimes they create manufacturing jobs for surplus labor.

Using the distance to district headquarters from the *upzila* to measure proximity, Khandker and Samad (2014) examine how RNFE productivity changes with proximity to growth centers. An activity is considered to be close to a growth center if the *upzila* is within 5 kilometers of the district headquarters, and away from a growth center if the *upzila* is beyond 5 kilometers from the district headquarters. Table 4.15 shows how the productivity of RNFE activities varies by distance to growth centers. Overall, activities close to growth centers appear to be more productive than those located farther away, although the difference is statistically significant only in 1998/99. As per the 1998/99 data, RNFE activities close to growth centers have a 45.8 percent rate of return, while those away from growth centers have a 39.3 percent rate of return. This result is expected, as activities closer to growth centers are likely to have better access to inputs and better markets for their products than those located farther away.

**Table 4.15: Rates of return to rural non-farm enterprises based on proximity to growth centers (%)**

Year	RNFE activities close to urban areas	RNFE activities away from urban areas	t-statistics of the difference
1991/92 (N=775)	41.8	41.7	0.03
1998/99 (N=987)	45.8	39.3	1.91
2010/11 (N=1,081)	57.0	56.6	0.09

Source: WB-BIDS surveys 1998/99, WB-InM survey 2010/11.

Note: An activity is considered close to urban areas if the *upzila* is within 5 km of the district headquarter, and away otherwise.

Given that most studies show that the RNF sector benefits immensely from proximity to urban centers, broad-based urban growth, in which no rural producer is far from an urban center or hub, should be more conducive to growth of the RNF sector over a wider rural space than when urban growth is concentrated in only a few mega-cities. Dhaka, the capital and mega-city, is the most rapidly growing urban area in Bangladesh, followed by Chittagong (a port city). All other urban centers have grown much more slowly, with the result that growth of the RNF sector is concentrated around the two major cities and on the corridor that connects them. A deliberate policy to foster more broad-based urban growth by developing the road and rail network is not only desirable to relieve congestion in the major cities but to boost non-farm growth.

## ***Promoting Rural Non-farm Activities: Opportunities and Constraints***

By nature, RNF activities are largely private sector activities, yet the public sector can and does play an important role in promoting robust growth of the RNF sector. The roles that the public sector is playing well and those that require additional attention can be identified based on a clear understanding of the main drivers of RNF activities and the constraints operating in the RNF sector. Three sources of data at the household level are particularly useful for providing the granular detail required for an effective analysis of those drivers and constraints—the HIES, the WBI longitudinal panel, and the MH panel surveys (although these sources have some limitations, as discussed).

### ***Self-reported constraints***

Consistent with results from the analysis of the determinants of productivity and profits in RNFs, Khandker and Samad (2014) analyze information from HIES on self-reported constraints by households with RNFs.<sup>57</sup> Operators of rural enterprises report pervasive constraints (Table 4.16), although the percentage of operators experiencing constraints declined from 67 percent in 2000 to 50 percent in 2010. In all three HIES surveys, households reported a larger share of non-credit constraints than credit constraints, but credit remains the single biggest constraint reported. Progress on non-credit constraints has also been better; the percentage of households reporting non-credit constraints fell from 40 percent to 28 percent, while the decline in the share of households with credit constraints was relatively smaller. Among the various non-credit constraints reported in 2010, problems related to market access (demand), transport, and utilities (power and water) are the most common.

Khandker and Samad also report that in 2010, operators of enterprises in the services sector were most constrained (57 percent reported any type of constraint), followed by operators of enterprises engaged in miscellaneous activities (49 percent), manufacturing (44 percent), and trade and

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<sup>57</sup> Similar information on categories of constraints is not available from the WBI or MH panel surveys.

transport (some 30 percent each). Enterprises in the services sector also experienced the most credit constraints, followed by miscellaneous activities, manufacturing, trading, and transport.

**Table 4.16: Self-reported constraints faced by households that operate enterprises (% households with enterprises)**

Constraint	2000 (N=1,427)	2005 (N=1,426)	2010 (N=1,909)
No constraints	33.0	23.8	49.8
Inadequate capital or credit	27.1	25.5	22.1
Inadequate know-how	3.8	3.9	2.2
High operating cost	0.1	0.0	3.6
Unreliable/inadequate power/water supply	1.2	1.4	3.7
Problems with equipment/spare parts	1.7	0.6	0.4
Government regulations	2.5	4.0	1.1
Lack of raw materials	10.5	18.1	2.8
Inadequate demand for products	8.3	6.2	7.1
Transport problems	2.5	7.1	5.0
Other miscellaneous problems	9.3	9.4	2.2

Source: HIES 2000, 2005, 2010.

Note: Enterprises may face multiple constraints, but they were asked to report the most severe constraint they face d.

The WBI panel survey shows a significantly different picture. As noted, the WBI survey is targeted to low-income households, the target group for micro-finance. A negligible share of households (1 percent) participating in the 2010/11 WBI survey reported credit constraints,<sup>58</sup> a decline from about 8 percent in the 1998/99 survey. This difference could reflect two factors at play: (1) households may not require capital, as not all households need or want to borrow on credit, and (2) the needs of those who do want credit are met by available sources. The reported credit constraints are consistent with the households' reported sources of finance for start-up capital (Table 4.17).

HIES data show that the vast majority (4 out of every 5) of current RNFEs rely on their own sources of capital to start a business; the share of households relying on their own sources is lower in the WBI surveys. Both the HIES and WBI datasets show that the trend in borrowing from micro-credit institutions is rising, indicating their growing importance. The share is understandably higher in the WBI survey, as the sample is more focused on the micro-finance client base.

<sup>58</sup> The WBI data contain information only on credit constraints, not on any non-credit constraints.

**Table 4.17: Sources of start-up capital for rural non-farm enterprises**

<b>HIES data</b>			
<b>Share of different sources (%)</b>	<b>2000 (N=1,427)</b>	<b>2005 (N=1,426)</b>	<b>2010 (N=1,909)</b>
Own resource (asset, inheritance, savings, etc.)	78.3	78.7	79.9
Loans from micro-credit	3.3	5.8	8.2
Loans from commercial banks	0.8	0.6	1.0
Loans from informal moneylenders	2.4	0.7	1.1
Loans from relatives/friends	5.5	4.0	5.6
Others	9.7	10.2	4.2
<b>WBI panel data</b>			
<b>Share of different sources (%)</b>	<b>1991/91 (N=775)</b>	<b>1998/99 (N=1,031)</b>	<b>2010/11 (N=1,089)</b>
Own resource (asset, inheritance, savings, etc.)	64.0	50.6	55.7
Loans from micro-credit	8.5	21.6	26.1
Loans from commercial banks	1.3	0.3	0.4
Loans from informal moneylenders	13.6	8.6	5.0
Loans from relatives/friends	6.1	8.0	8.0
Others	6.5	10.9	4.8

Source: WB-BIDS surveys 1991/92 and 1998/99, and WB-InM survey, 2010/11.

## *Impact and determinants of credit and other constraints*

Further analysis by Khandker and Samad on the likely impact of credit and non-credit constraints sheds much light on their detrimental impact on profit margins (the detailed results are in Annex 4, Table A4.2 for the HIES sample and Table A4.3 for the WBI panel households). Constrained enterprises in the HIES sample earn profits that are about 9 percent lower than profits obtained by their unconstrained counterparts. For the WBI sample, credit constraints have a much larger impact—they reduce profits by 28 percent.

Enterprises that are less likely to be credit constrained tend to be formally registered, operated by more educated and wealthier households (with larger assets), larger (in terms of number of employees), and household-based (Annex 4, Table A4.4). Enterprises in villages with electricity are also less likely to be credit constrained, while enterprises in villages with more irrigated area and enterprises that have been in business for some time are more likely to be credit constrained—perhaps reflecting constraints to expansion or reflecting the level of competition (as older enterprises and those in more productive areas might face more competition).

Although enterprises operating in the transport and services sectors are less likely to be credit constrained, those in manufacturing are more likely to be constrained. Interestingly, the determinants of non-credit constraints for several correlates are the opposite in sign than for credit constraints—a larger asset base, large number of employees, and higher share of hired labor in the

workforce all raise the likelihood of non-credit constraints, while the years of operation tend to reduce non-credit constraints. The data seem to suggest that it may be much easier to initiate an enterprise than to expand it once it has become established.

These findings are consistent with the broader findings on the investment climate for private sector-led growth in Bangladesh discussed in depth in World Bank (2015a). Briefly, after the initial phase of reforms that have unleashed significant private-sector activity since the early 1990s, Bangladesh now requires a more complicated set of reforms for improving investment incentives and efficiency. The Doing Business indicators remain low (World Bank 2015b). The topmost concern of businesses is political instability (domestic disruptions, such as strikes or *hartals*), which hits agricultural value chains particularly hard given the perishable nature of most agricultural commodities. Unreliable electricity, insufficient access to finance, and corruption are the next three top constraints faced by businesses. Beyond these binding constraints, excessive regulations and institutional weaknesses (obsolete and complex rules, laws, and regulations), tax complexities, and poor contract enforcement are major hindrances to investment and to the operation of profitable businesses.

## ***Conclusions and Implications***

The RNF sector is a major source of productive employment and income in Bangladesh, providing some income to over three-quarters of rural households. While agriculture remains the main driver of rural growth, a majority of households rely on both sources of income for stability and growth, as the contribution of each source varies over time depending on the prevailing circumstances and performance of both sectors. Looking forward, the limited scope for expanding productive land, an increasingly educated and growing labor force, and increasing demand for non-farm goods and services in Bangladesh make it imperative to develop a stronger and more vibrant RNF sector.

To understand the RNF sector and what it does, a useful characterization of RNF activities is provided by Hossain (2004), based on the asset-intensity of employment: manual labor based, human capital based, and physical capital based. Evolving RNF patterns show an increasing concentration in labor, or manual-based employment, but declines in the share of business (physical capital-based) and skilled services (human capital-based) employment. Employment also has distinct spatial patterns. The mega-cities of Dhaka and Chittagong are seeing a significant rise in the share of RNF labor (or unskilled workers), but shares of all other categories of employment are falling, with the largest decline in business activity. Connectivity again plays a large role in the type of employment available around secondary cities. The spatial evolution of jobs shows that well-connected cities saw a rise in the share of business activities and some low-skilled services, while poorly connected cities saw a decline in business and high-skilled employment.

Forward and backward linkages of agriculture remain important in creating non-farm jobs and driving RNF growth. The quality of the jobs that are created is also important. So-called “pull” jobs are created through market linkages for supplying inputs or processing outputs, whereas “push” jobs are those into which small farmers or the landless are pushed for survival.

It is in this context that the development of RNFs and high-skilled services within the RNF sector is of particular interest. High-skilled services are heavily dependent on human capital and bring the roles of education and connectivity to the fore. RNFs are a more challenging option in some respects, but they are also a more promising option in terms of alternative livelihoods for the current generation, as well as future educated entrepreneurs. Analysis of RNFs shows that more of them are being formalized (registered), but the majority remain small, male-dominated, and home-based businesses. Firms are constantly opening and closing, and a substantial number exit the RNF sector altogether. In terms of economic transformation, RNFs have made some progress in reducing their dependence on agriculture (and its volatility). Panel data show that the households with enterprises show limited change in their sectoral (farm-based or non-farm-based) orientation.

Another way to assess progression of RNFs is to consider their complexity, sophistication, and scale of activities. The striking finding is that the progression is limited, with the majority of households engaged in RNE activities remaining involved in basic activities. In fact, although the extent of basic activities has dropped a bit over time, the gap has not been filled by an increase in advanced activities. Another possibility is that while the share of households engaged in RNFs may not be rising, existing enterprises may be growing and transforming over time. An analysis (using panel data) of RNFs that have remained in business over time shows that a very low share (15 percent) of the households involved in basic RNE activities in 1998/99 had switched to more advanced activities by 2010/11. The overall progression over time from basic activities toward more advanced activities within surviving RNFs was not so great as to indicate broad-based growth in rural economic activities.

The less rapid than expected emergence of RNFs and their relatively limited transition to more sophisticated operations is puzzling, considering their positive and significant association with higher incomes. Households engaged in RNFs have higher per capita returns, consistent with the positive and relatively higher impacts of both RNFs and RNF capital on household income. Importantly, rates of return on advanced RNFs are almost double those of basic RNFs, and households that exited RNFs did not enjoy higher incomes (per capita). The growth of RNFs, both horizontally as well as vertically, thus appears to be constrained by factors other than profitability.

One factor that has traditionally been considered important in RNF activities is proximity to urban centers, especially dynamic urban settings. An important finding in this regard is that overall, the rate of return for RNFs close to urban centers (major cities and secondary cities) is not statistically different from the rate of return for RNFs further away from urban centers (using district headquarters as the point of reference). Perhaps better connectivity makes it less advantageous to

be closer to urban centers. Another consideration is that most basic RNFEs produce traditional and low-quality products, which are being rapidly replaced by cheaper and better mass-produced products. While it is generally true that robust agricultural growth will promote rapid growth in the RNF sector, it is also important to recognize that not all non-farm activities may flourish. Some activities, such as pottery, basket-making, rice roller mills, or backyard poultry will increasingly be displaced by supplies from more modern industries, often from around urban centers.

Beyond considerations related to geographical location and connectivity (market size considerations), analysis of the major constraints faced by households points to two major constraints: lack of credit and poor infrastructure. The constraint reported most often by owners of RNFEs is limited access to credit, which is consistent with the fact that an overwhelming majority (80 percent) finance their operations out of their own resources. Own resources will clearly be a constraint on the scale and scope of RNFEs, as the internal savings and investment process will in most cases take a very long time. An important lesson on this front comes from the micro-finance industry, whose clients are much less dependent on their own resources, and who show significantly higher participation in RNFEs, and RNF activities more broadly, with a concentration in high-turnover activities like trading and transport. The analysis of the correlates of constraints faced by households operating RNFEs shows that, not surprisingly, the more educated, wealthier, and household-based enterprises are less constrained by poor access to credit. Importantly, registered RNFEs and those with access to electricity are also less likely to be credit constrained. Among sectors, manufacturing RNFEs face more credit constraints than RNFEs focusing on services and transport. Interestingly, the several correlates of being non-credit constrained are the opposite of the correlates of being credit constrained: larger enterprises (in terms of assets or employees) and those using more hired labor face more non-credit constraints, indicating the presence of issues related to the broader enabling environment.

The main implications emerging from the analysis are:

- There is a need to promote a better enabling environment, especially for emerging rural entrepreneurs, by facilitating better access to technology, information, capital, and infrastructure, and by removing the remaining business environment barriers, such as those influencing terms of trade, discriminatory taxes, and stifling regulations. In this connection, the recommendations of the 2004 World Bank report, “Promoting the Rural Non-Farm Sector in Bangladesh,” remain highly relevant: invest in appropriate technology to improve the competitiveness of horticulture and livestock products; put in an effective and trusted system of food quality and safety assurance; promote a modern marketing system for handling, processing, transporting, and storing perishable products; and remove the remaining tax and tariff anomalies.
- RNF activity is essentially private sector activity, but certain proactive engagements can serve important public goods functions, especially for prospective female and poor household entrepreneurs in areas in the initial stages of development. Examples include making information available on the demand for non-farm products and providing



assistance for skills training through mechanisms that allow prospective female entrepreneurs and weaker and less educated households to participate.

- A long-recognized constraint, also emphasized in the 2004 World Bank report and confirmed through more rigorous analysis, is access to finance. Improving access to credit and financial services for small and medium enterprises remains crucial for promoting more rapid and robust growth of RNFEs.
- Another major constraint, also widely recognized and a more generic development constraint, is the lack of a dependable power supply. This constraint needs little elaboration. Clearly insufficient access to power, with frequent disruption of supply, causes productivity to be lost, reduces the viability of enterprises, and is a major factor inhibiting new entrants in the RNF sector.
- Finally, a rapidly growing share of RNFEs focuses on trading, especially in agricultural produce. Such activities may be discouraged by the lack of marketing facilities or constraining market inefficiencies. Addressing the underlying issues will help expand the scale of such RNF activities. The next chapter addresses these and other major issues relating to agricultural value chains.

## References

- BBS (Bangladesh Bureau of Statistics). Various years. Reports on Household Income and Expenditure Survey (HIES) for 2000, 2005, and 2010. Dhaka.
- Various years. Reports on Labour Force Surveys (LFS) for 2005 and 2010. Dhaka.
- 2011. Cottage Industry Survey. Dhaka.
- Bhattacharya, D. 1996. "The Emerging Pattern of Rural Non-farm Sector in Bangladesh." *The Bangladesh Development Studies* 24.
- Chawanote, C., and C.B. Barrett. 2012. "Non-farm Occupational and Earnings Dynamics in Rural Thailand." Poster prepared for the Agricultural and Applied Economics Association (AAEA) and Northeastern Agricultural and Resource Economics Association (NAREEA) Joint Annual Meeting, Pittsburgh, Pennsylvania.
- Deichmann, U., F. Shilpi, and R. Vakis. 2009. "Urban Proximity, Agricultural Potential, and Rural Non-Farm Employment: Evidence from Bangladesh." *World Development* 37(3): 645–60.
- Deininger, K., and S. Jin. 2007. "Sri Lanka's Non-farm Economy: Removing Constraints to Pro-Poor Growth." *World Development* 35(12): 2056–78.
- Emran, S., and F. Shilpi. 2014. "Agricultural Productivity, Hired Labor, Wages, and Poverty: Evidence from Bangladesh." Policy Research Working Paper No. 7056, World Bank, Washington, DC.
- Foster, A., and M. Rosenzweig. 2004. "Agricultural Productivity Growth, Rural Diversity, and Economic Reforms: India, 1970–2000." *Economic Development and Cultural Change* 52(3): 509–42.
- Haggblade, S., P. Hazell, and T. Reardon. 2006. *Transforming the Rural Nonfarm Economy*. Baltimore: Johns Hopkins.
- 2010. "The Rural Non-Farm Economy: Prospects for Growth and Poverty Reduction." *World Development*. 38(10): 1429–41.
- Hossain, M. 2004. "Rural Non-Farm Economy: Evidence from Household Surveys." *Economic and Political Weekly* 39(36).

- Hussain, I. 2015. "Drivers of Economic Change in the Non-farm Sector" Background paper for "Dynamics of Rural Growth in Bangladesh." GFADR, World Bank, Washington, DC.
- IFPRI (International Food Policy Research Institute). 2013. Bangladesh Integrated Household Survey (BIHS), 2011–2012. Dataset. Washington, DC.
- Islam, K.M.N., S.C. Zohir, and M. Hossain. 2011. "SMEs Development in Bangladesh with Emphasis on Policy Constraints and Financing." In Volume 2 of *Sixth Five Year Plan of Bangladesh 2011–2015, Background Papers*, edited by M.K. Mujeri and S. Alam. Dhaka: Planning Commission.
- Johnson, D.G. 2000. "Population, Food, and Knowledge." *American Economic Review* 90(1): 1–14.
- Johnston, B.F., and J.W. Mellor. 1961. "The Role of Agriculture in Economic Development." *American Economic Review* 51: 566–93.
- Khandker, S., and H. Samad. 2014. "Non-Farm Drivers of Rural Growth: A Case Study of Bangladesh." Background paper for "Dynamics of Rural Growth in Bangladesh," GFADR, World Bank, Washington, DC.
- Lanjouw, P., and G. Feder. 2001. "Rural Non-Farm Activities and Rural Development: From Experience Towards Strategy." Rural Development Strategy Background Paper No. 4. World Bank, Washington, DC.
- Lanjouw, J.O., and P. Lanjouw. 2001. "The Rural Non-farm Sector: Issues and Evidence from Developing Countries." *Agricultural Economics* 46: 1–23.
- Lewis, A. 1954. "Economic Development with Unlimited Supplies of Labor." *Manchester School* 22: 139–91.
- Lin, J.Y., and Y. Yao. 1999. "Chinese Rural Industrialization in the Context of the East Asian Miracle." Working Paper No. E1999004. China Center for Economic Research, Beijing University, Beijing.
- Mahmud, W. 1996. "Employment Patterns and Income Formation in Rural Bangladesh: The Role of Rural Non-farm Sector." *The Bangladesh Development Studies* 24.
- Mandal, M.A.S. 2003. "Rural Non-Farm Activities: Diversity and Implications for Rural Labour Market in Bangladesh." In *Employment and Labour Market Dynamics*. Dhaka: Centre for Policy Dialogue.
- McCulloch, N.C., P. Timmer, and J. Weisbrod. 2007. "Pathways out of Poverty During an Economic Crisis: An Empirical Assessment of Rural Indonesia." Working Paper No. 115. Center for Global Development (CGD), Washington, DC.
- Mellor, J. 1976. *The New Economics of Growth: A Strategy for India and the Developing World*. Ithaca: Cornell University Press.
- Ranis, G., and F. Stewart. 1973. "Rural Non-Agricultural Activities in Development: Theory and Application." *Journal of Development Economics* 33(7): 1045–60.
- Sarker, R., M.A.S. Mandal, and M. Kleinke. 2013. "Measurement of Farm and Non-Farm Employment Linkages: Empirical Insights from Three Villages in Bangladesh." Paper presented at the Conference on International Research on Food Security, Natural Resource Management, and Rural Development, organized by the University of Hohenheim, Stuttgart.
- Sen, B. 1996. "Rural Non-farm Sector in Bangladesh: Stagnating and Residual, or Dynamic and Potential?" *The Bangladesh Development Studies*, 24(3/4): 143–80.
- Shilpi, F., and S. Emran. 2015. "Agricultural Productivity and Non-Farm Employment: Evidence from Bangladesh." Columbia University, New York. Processed.
- Timmer, P.C.. 2002. "Agriculture and Economic Growth." In Volume IIA of *Handbook of Agricultural Economics*, edited by B. Gardner and G. Rausser. Amsterdam: Elsevier. Pp. 1487–1546.
- . 2005. "Agriculture and Pro-poor Growth: An Asian Perspective." Working Paper No. 63. Centre for Global Development (CGD), Washington, DC.
- Wiggins, S., and P. Hazell. 2008. "Access to Rural Non-farm Employment and Enterprise Development." Background Paper for the IFAD Rural Poverty Report 2011. Overseas Development Institute, Brighton.
- World Bank. 2004. "Promoting the Rural Non-Farm Sector in Bangladesh." Report No. 29719-BD. Washington, DC.

- 2007. “Bangladesh: Strategy for Sustained Growth.” Bangladesh Development Series Paper No. 18. Dhaka.
- 2008. “High Value Agriculture in Bangladesh: An Assessment of Agro-Business Opportunities and Constraints.” Bangladesh Development Series Paper No. 21. Dhaka.
- 2015a. “Bangladesh: More and Better Jobs to Accelerate Shared Growth and End Extreme Poverty: A Systematic Country Diagnostic.” Washington, DC.
- 2015b. “Doing Business 2015.” Washington, DC.

## ***Annex 4: Farm–Non-farm Linkages and Micro-enterprise Performance***

The ability of farm–non-farm linkages to affect growth and poverty can depend heavily on initial conditions related to agriculture. Many studies have shown that non-farm income growth in rural areas, at least at the outset, depends on growth in agricultural productivity (Johnston and Mellor 1961; Ranis and Stuart 1973; Mellor 1976; Johnson 2000; Haggblade, Hazell, and Reardon 2006; Deichmann, Shilpi, and Vakis 2009).

In this context, the varying characteristics of the rural non-farm sector must also be considered (see Haggblade, Hazell, and Reardon 2006; Lanjouw and Feder 2001). Foster and Rosenzweig (2004), for example, make a distinction between non-farm goods that are traded and non-traded. Using rural household panel data from India spanning 1970–2000, they find that only non-tradable non-farm activities such as services are positively influenced by agricultural productivity growth. In contrast, tradable non-farm activities such as small manufacturing move into areas with lower wages, implying a negative relationship with agricultural productivity growth.

Using individual employment data from the 2000 HIES of Bangladesh, Deichmann, Shilpi, and Vakis (2009) examined the effects of rural farm–non-farm linkages by dividing non-farm activities into low-return wage work (paying equal to or less than the median agricultural wage of a village), high-return wage work, and self-employment. They found that proximity to urban centers matters greatly for high-return non-farm activities—high-return non-farm wage work and self-employment. Agricultural potential also matters, but through its interaction with access to urban centers. In fact, more isolated regions with greater agricultural potential are much less likely to engage in these high-return activities.<sup>59</sup> The results highlight the importance of connectivity for high-return employment.

Haggblade, Hazell, and Reardon (2010) discuss two scenarios where urban linkages and growth in the rural non-farm sector can affect agriculture. In dynamic agricultural regions, there can be a “pull” scenario (see the section on “Farm and rural non-farm linkages” in the main text of this chapter) in which new agricultural technologies increase output for certain commodities, and hence improve opportunities for trade of these goods. The non-farm sector in those regions can also provide inputs and services that new agricultural technology or processes may be dependent on, including better seed and fertilizer, capital equipment, and other services such as credit and marketing or distribution.

Improved infrastructure also plays an important role in creating a “pull” scenario. On the household side, improvements in productivity can free up time for non-farm activities, and as households’ incomes grow, their consumption of non-food items can also increase, further raising

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<sup>59</sup> They also find that low-return non-farm jobs are driven by local demand and are distributed much more evenly across geographical areas. Access to smaller rural towns (with a population of about 5,000), as opposed to access to urban centers, has little effect on non-farm activities except for non-tradable service works.

opportunities for households to meet the growing demand by entering the non-farm sector. As real wages increase, subsistence non-farm activities give way to higher-return activities in manufacturing and services. Poor households, therefore, benefit directly from real wage increases as well as improved higher-return opportunities from non-farm self-employment.

In contrast to the “pull” scenario, a “push” scenario can prevail in stagnant agricultural regions. Where the agricultural base is sluggish, the response of agriculture to innovations is not likely to be strong, and agriculture’s contribution to non-farm growth and broader economic development would be limited. Weak productivity gains in a sluggish agricultural base lead to lower growth in consumer demand, and hence in entrepreneurial and wage-earning opportunities. Sometime migration to urban areas is one way for the poor households to become engaged in non-farm activities and support agricultural incomes. When such opportunities do not exist, poor households may become trapped in low-return, local non-farm activities (such as making or trading small items) to supplement their income. The resulting interaction between agricultural productivity and different types of non-farm income growth, and their joint effects on poverty reduction, are therefore highly dependent on prevailing local conditions, including the agricultural potential of the area in question.

**Table A4.1: Household welfare by micro-enterprise adoption**

Welfare indicators	2000		2005		2010	
	HHs with enterprise as an additional activity (25.6 percent) (N=1,290)	HHs without enterprise as an additional activity (74.4 percent) (N=3,740)	HHs with enterprise as an additional activity (21.8 percent) (N=1,317)	HHs without enterprise as an additional activity (78.2 percent) (N=4,714)	HHs with enterprise as an additional activity (21.6 percent) (N=1,701)	HHs without enterprise as an additional activity (78.4 percent) (N=6,139)
Per capita income (BDT/month)	1,185.1 (t=5.98)	779.5	1,209.7 (t=10.50)	851.4	1,635.5 (t=5.42)	1,185.2
Per capita expenditure (BDT/month)	788.3 (t=5.97)	702.1	1,055.4 (t=6.92)	879.7	1,318.1 (t=5.53)	1,182.6
Moderate poverty headcount (%)	49.2 (t=-5.48)	58.0	33.5 (t=-6.01)	42.7	26.2 (t=-6.71)	34.8
Extreme poverty headcount (%)	33.5 (t=-6.73)	44.1	20.5 (t=-5.53)	28.1	15.0 (t=-5.38)	20.9

**Table A4.2: Impact of credit and non-credit constraints on micro-enterprise productivity, HIES data (N=4,762)**

Explanatory variables	Upzila FE		Upzila FE with IV	
	Log profit (BDT/year)	Profit margin	Log profit (BDT/year)	Profit margin
Year is 2005 (1=yes, 0=no)	5.593* (1.78)	0.726* (1.82)	-0.512 (-1.53)	-0.061 (-1.35)
Year is 2010 (1=yes, 0=no)	4.837 (1.59)	0.901** (2.34)	-0.652 (-1.04)	0.131 (1.30)
Enterprise is credit-constrained	0.017 (0.14)	-0.072** (-5.36)	0.226 (1.18)	-0.088** (-3.61)
Enterprise is non-credit-constrained	-0.011 (-0.08)	-0.044** (-3.15)	-0.043 (-0.22)	-0.087** (-3.85)
Activity is manufacturing	0.637** (2.66)	0.013 (0.41)	0.625** (2.41)	-0.001 (-0.03)
Activity is transport	0.824** (3.86)	0.233** (7.36)	0.956** (4.07)	0.234** (7.07)
Activity is trade	0.572 (1.56)	0.008 (0.17)	0.358 (1.00)	-0.015 (-0.30)
Activity is service sector	0.357* (1.74)	-0.063** (-2.40)	0.387* (1.71)	-0.069** (-2.48)
Log value of enterprise capital asset (BDT)	0.997** (19.13)	0.042** (7.89)	1.165** (20.07)	0.044** (8.98)
R <sup>2</sup>	0.402	0.280	0.343	0.253
Endogeneity test for endogenous regressors			$\chi^2(2)=2.108$ , p=0.349	$\chi^2(2)=7.298$ , p=0.026
Overidentification test for instruments (Hansen J statistics)			$\chi^2(8)=8.731$ , p=0.366	$\chi^2(8)=11.333$ , p=0.184
Underidentification test for instruments (KP statistics)			$\chi^2(9)=114.52$ , p=0.000	$\chi^2(9)=114.52$ , p=0.000
Weak identification for instruments (CD statistics)			F=172.99	F=172.99
Stock-Yogo weak identification test critical value for 5 percent bias			18.76	18.76

Source: HIES 2000, 2005, and 2010.

Note: \* and \*\* refer to statistical significance level of 10 percent and 5 percent, respectively. Figures in parentheses are t-statistics. Excluded enterprise category is miscellaneous activities. Regression also controls for enterprise characteristics such as enterprise age, months of operation per year, whether it is home-based, and household and community characteristics, and in addition, exogenous characteristics of the initial year and household occupation dummies based on major income source.

**Table A4.3: Impact of credit and non-credit constraints on micro-enterprise productivity, WBI panel data (N=1,758)**

Explanatory variables	HH FE		HH FE with IV	
	Log profit (BDT/year)	Profit margin	Log profit (BDT/year)	Profit margin
Year is 2010/11 (1=yes, 0=no)	-0.190 (-0.04)	-0.549 (-1.45)	-0.336 (-0.17)	-0.343* (-1.86)
Enterprise is credit-constrained	-0.729** (-2.44)	-0.027 (-0.58)	-0.829 (-0.94)	-0.280* (-1.66)
Activity is manufacturing	1.363** (3.06)	-0.168** (-3.07)	1.533** (3.51)	-0.150** (-2.77)
Activity is agricultural trading	1.505** (4.18)	-0.163** (-4.37)	1.416** (4.10)	-0.161** (-4.59)
Activity is non-agricultural trading	2.139** (6.42)	-0.086** (-2.90)	2.086** (6.30)	-0.082** (-2.77)
Activity is service sector	1.661** (2.73)	-0.059 (-1.21)	1.725** (2.75)	-0.046 (-0.97)
Log value of enterprise capital asset (BDT)	1.680** (23.94)	0.101** (20.41)	1.687** (25.64)	0.098** (21.74)
R <sup>2</sup>	0.608	0.644	0.593	0.602
Endogeneity test for endogenous regressors	-	-	$\chi^2(1)=0.130$ , p=0.718	$\chi^2(1)=4.393$ , p=0.036
Over identification test for instruments (Hansen J statistics)	-	-	$\chi^2(7)=11.178$ , p=0.083	$\chi^2(7)=5.308$ , p=0.505
Under identification test for instruments (KP statistics)	-	-	$\chi^2(7)=10.01$ , p=0.188	$\chi^2(7)=9.325$ , p=0.230
Weak identification for instruments (CD statistics)	-	-	F=6.560	F=6.505
Stock-Yogo weak identification test critical value for 5 percent bias	-	-	19.86	19.86

Source: WB-BIDS surveys 1991/92 and 1998/99, and WB-InM survey 2010/11.

Note: \* and \*\* refer to statistical significance level of 10 percent and 5 percent, respectively. Figures in parentheses are t-statistics. Excluded enterprise category is transport activity. Regression also controls for enterprise characteristics such as enterprise age, months of operation per year, whether it is home-based, and household and community characteristics, and in addition, exogenous characteristics of the initial year and household occupation dummies based on major income source. .



**Table A4.4: Determinants of credit and non-credit constraints faced by the enterprises**

**(FE logit) (N=4,762)**

Explanatory variables	Credit constraints	Non-credit constraints
Year is 2005 (1=yes, 0=no)	0.196 (0.88)	-0.084 (-0.29)
Year is 2010 (1=yes, 0=no)	0.522** (2.20)	0.036 (0.11)
Sex of the owner (1=male, 0=female)	-0.031 (-0.86)	-0.018 (-0.56)
Age of the owner (years)	-0.001 (-0.95)	-0.0002 (-0.29)
Education of the owner (years)	-0.004** (-2.27)	0.003 (1.56)
Log HH land (decimals)	0.001 (0.27)	-0.005 (-0.97)
Log HH non-land asset (BDT)	-0.022** (-2.74)	0.023** (2.57)
Years the enterprise has been in business	0.001** (2.12)	-0.003** (-3.25)
Enterprise is formally registered (1=yes, 0=no)	-0.046** (-2.41)	0.005 (0.20)
Enterprise is household-based (1=yes, 0=no)	-0.059** (-3.37)	0.026 (1.16)
Number of total employees	-0.004** (-2.22)	0.012** (3.12)
Share of hired labor in total workforce	-0.031 (-1.02)	0.109** (2.70)
Enterprise is in manufacturing sector (1=yes, 0=no)	0.070** (2.28)	-0.056 (-1.53)
Enterprise is in transport sector (1=yes, 0=no)	-0.115** (-3.97)	0.001 (0.04)
Enterprise is in trade sector (1=yes, 0=no)	-0.005 (-0.10)	-0.069 (-1.23)
Enterprise is in service sector (1=yes, 0=no)	0.115** (4.45)	-0.035 (-1.17)
Village has electricity (1=yes, 0=no)	-0.048* (-1.85)	0.027 (0.75)
Village has paved roads (1=yes, 0=no)	0.010 (0.41)	-0.015 (0.48)
Share of village land irrigated	0.079* (1.64)	0.030 (0.46)
Village has commercial banks (1=yes, 0=no)	-0.006 (-0.19)	0.022 (0.54)
Village has micro-credit organizations (1=yes, 0=no)	0.051 (1.08)	0.031 (0.49)
R <sup>2</sup>	0.093	0.104

Source: HIES 2000, 2005, and 2010.

Note: \* and \*\* refer to statistical significance level of 10 percent and 5 percent, respectively. Figures in parentheses are t-statistics. Excluded enterprise category is miscellaneous activities. Regression also controls for enterprise characteristics such as enterprise age, months of operation per year, whether it is home-based, and household and community characteristics, and in addition, exogenous characteristics of the initial year and household occupation dummies based on major income source.



## 5 Connecting Farmers to Markets: Trading in High-value Products

Urbanization, sustained income growth, and the decline in poverty are continuing to change consumption patterns and heighten demand for a more diverse range of agricultural products.<sup>60</sup> At the same time, as discussed in the previous chapter, producers across Bangladesh need to diversify to raise productivity and agricultural income in a sustainable way. For these demand and supply imperatives to converge—for farmers to gain appropriate incentives to diversify, and for the costs to consumers to fall—markets must be accessible and value chains must be efficient. Infrastructure investments and agricultural policy reforms in the past two decades have assisted the marketing of agricultural products by crowding in private investment in trade, transport, and other services. The rice subsector has benefited substantially from these changes; the sustained increase in per capita rice availability through domestic production helped Bangladesh emerge as the highest per capita consumer of rice in the world and Asia's highest per capita consumer of cereals (FAO 2013).

Now it is the turn of other agricultural subsectors to benefit. Domestic consumption of high-value non-cereal products, particularly horticultural produce (vegetables and fruits) and animal products (fish, poultry, egg, milk, and meat) is expected to grow at a much faster pace than consumption of cereals in the coming decades (Hossain and Deb 2011). Increased demand for fresh produce in the Middle East and other countries will be another source of growth through exports of these products. The growing domestic and external demand for high-value products offers a unique opportunity to raise farmers' incomes more rapidly. It also presents an opportunity to continue to increase and diversify rural non-farm employment and income growth through trading and eventually agro-processing and value addition.

The problem with this scenario, as generally perceived in Bangladesh, is that poorly developed market channels hinder the production of crops, especially high-value crops. A particular concern is the behavior of traders and other market intermediaries (which is widely perceived to be uncompetitive), along with distortions in transporting and marketing (especially rent-seeking and extortion along the value chains). The resulting marketing inefficiency and high costs hurt producers and consumers alike. Inefficiency constrains the chances of fully realizing Bangladesh's agricultural production potential based on comparative advantage.

Technical issues (such as the need for cold chains and storage) are cited alongside structural issues (such as alleged oligopolistic behavior among traders) as creating barriers to the development of more efficient supply chains. Few studies have looked at marketing issues in depth, however, or

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<sup>60</sup> The share of cereals in per capita calorie consumption declined from 84 percent in 1990 to 80 percent in 2010, and it is expected to decline further to 78 percent by 2020 (Amarasinghe et al. 2014). Consumers are turning more to vegetables, fruits, and other non-cereal products, which increased their share of per capita calorie consumption from 12.6 percent in 1990 to 15.8 percent in 2010. Per capita consumption of meat and other animal products is still low in Bangladesh (less than 5 percent of calorie consumption).

firmly established that widespread distortions are present in agricultural supply chains in Bangladesh. A cross-country study of rice and potato markets in Bangladesh, India, and China found that markets functioned better in Bangladesh than in the other countries. Another study found some evidence of market manipulation by traders in the recent onion crisis (Ahmed and Ahmad 2013), but for other major crops there is little evidence to document any major distortions.

A detailed analysis of value chains can identify the major marketing constraints. World Bank (2008a) examines constraints and opportunities for selected products of high-value agriculture, including fisheries, poultry, fruits and vegetables, high-value rice, and dairy, and delivers specific policy recommendations for each one. Focusing on production technology and export potential, and based on concerns raised by various stakeholders, the report concludes that better governance is needed to reduce the informal tolls levied against fresh produce as it moves from farm to market, but the report contains no empirical analysis to establish the extent and nature of distortions or their likely impact on marketing costs.

The broader policy and institutional issues highlighted by the 2008 report remain valid, so the analysis is not repeated here. Instead this report complements those findings and recommendations with an in-depth empirical analysis of domestic marketing channels, focusing on the constraints to developing an efficient marketing system for perishable products.

Accordingly, a series of Agricultural Value Chain Surveys conducted in 2014 collected detailed information from farmers and different types of traders operating at different layers and locations of markets along the value chains for four products. The value chains serve domestic markets, and the four products figure prominently in the traditional Bangali diet: vegetables, fish, poultry, and milk. Eggplant (*brinjal*) was chosen for the study on vegetable value chains because it is consumed widely in Bangladesh, and its value chain is similar to that of other widely consumed vegetables such as tomatoes, onions, and cauliflower.<sup>61</sup> Blue catfish (*pangash*) was chosen for the fish value chain study. Brinjal is widely consumed by rich and poor, whereas pangash has come to be known as the “poor man’s most reliable source of protein.” Mass production of chicken in modern poultry farms has made it affordable for most consumers. Milk consumption in Bangladesh, on the other hand, is relatively low but expected to grow rapidly. For a description of the surveys and their design, see Annex 5.

The surveys differ from other value chain studies in several important ways. Rather than just focusing on the estimation of margins, the surveys collected detailed information on all trading practices, including credit and other contractual arrangements, transportation, damages and losses, sources of information, enforcement of contracts, and security of property. More importantly, the surveys collected information on constraints faced by traders through an investment-climate type of opinion survey. A separate survey of all major markets assembled information on physical facilities at the market locations. The trader, market, and farmer surveys were also interlinked to learn how a constraint affecting a given layer might affect cost and conduct in all other layers.

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<sup>61</sup> An advantage was that eggplant was in season at the time of the survey fieldwork.

These detailed and interlinked surveys make it possible not only to estimate margins at different market layers but to analyze the determinants of those margins in terms of infrastructure, facilities, and other policy variables.

## *The Value Chains of High-value Products*

While some share of all of these products is sold directly to consumers, each product is marketed differently depending on its perishability and geographical coverage. The most common marketing channels for the four products are shown in Table 5.1.

The traditional marketing channel for highly perishable products such as milk has very few layers. Most milk marketed through the informal marketing channel—which accounts for 80 percent of milk consumption—is sold by farmers directly to consumers and sweet producers or to traders (mostly small wholesale/retail traders), who sell on to consumers and sweet producers. At the other extreme, brinjal—which is less perishable—goes through many layers of traders before reaching consumers in urban centers. The poultry and fish supply chains lie somewhere between these extremes. Milk also has a formal marketing channel; cooperatives collect milk from farmers and send it to processors through chilling centers, which sell it in turn to consumers and sweet producers, either directly or through retailers. Because of its high perishability, milk marketed through informal/traditional channels travels only short distances, whereas a less perishable product such as brinjal is sold in urban markets far from growing areas. A detailed description of the supply chains for each product covered under the study is given in Shilpi et al. (2015).

**Table 5.1: Marketing channels for brinjal, pangash, chicken, and milk**

Brinjal	Pangash	Chicken	Milk
Farmer → consumer	Farmer → consumer	Farmer → consumer	Farmer → consumer/sweet producer
Farmer → <i>bepari</i> (rural assembler) → <i>paikar</i> (wholesaler) → retailer → consumer	Farmer → local <i>aratdar</i> (consolidates from other traders) → local retailer → consumer	Farmer → local wholesaler → local retail → consumer	Informal: Farmer → <i>aratdar</i> → consumer/sweet producer
Farmer → <i>bepari</i> → <i>aratdar</i> → <i>paikar</i> /wholesale → retailer → consumer	Farmer → <i>bepari</i> → <i>aratdar</i> → <i>paikar</i> /wholesale → retailer → consumer	Farmer → local wholesaler → <i>bepari</i> → <i>aratdar</i> → wholesale/ <i>paikar</i> → retail → consumer	Formal: Farmer → cooperative → processor → retailer → consumer
		Farmer → local wholesaler → <i>bepari</i> → <i>aratdar</i> → retail → consumer	

Source: Shilpi et al. 2015.

## *Characteristics of traders*

Traders perform a variety of roles in the supply chain. All traders along the supply chain engage to some extent in grading, sorting, weighing, packaging, storing, and transporting produce. The

roles of different traders along the supply chain are not clearly demarcated—they may differ across market locations and products. For example, *aratdars* are the largest traders by volume; they typically consolidate supplies that come from farmers, often through other traders, and then distribute those supplies to consumers through still other traders. In many local markets, *aratdars* act like commission agents, never taking physical possession of the good, but in most markets, *aratdars* engage in sorting, grading, packaging, storing, and transporting of the products as well. In the poultry value chain, *aratdars* are more like dealers who supply chicks, feeds, and medicine to farmers, mostly on credit, and then make sales arrangements with buyers of fully grown chickens. These dealers charge no commission but get paid from the sales proceeds (in other words, the commission is built into the prices). The next traders in terms of size are *paikars* (wholesale traders), who operate downstream or upstream from *aratdars* and act as an intermediate step after farmers or before retailers. In the case of brinjal, pangash, and chicken, *beparis/farias* (rural assemblers) collect the product from the farmer; they are included with wholesalers in the data analysis. Some of the smaller wholesale traders also act as retailers, selling directly to consumers. The retail traders typically deal with many products, and the average size of each sale is usually much smaller than that of wholesale traders.

The majority of traders are young and relatively educated. While the average age of farmers is above 40 years in Bangladesh, two-thirds of the traders engaged in supplying high-value products are younger than 40. Some products that are expected to experience higher future growth, such as fish and poultry, are attracting much younger and more educated traders. Similarly, younger and more educated individuals are increasingly entering the upstream (*aratdar*/wholesale) trading services, which will play an important role in the consolidation of supply chains in coming years. This trend is actually present in farming practices for these products as well. For instance, farmers engaged in fish production have on average two more years of schooling than other farmers and are much younger on average (about 38 years) compared with producers of other commodities (44 years). Moreover, a substantial proportion of farmers engaged in fish and poultry production reported a secondary occupation in trading. The entry of younger and more educated farmers and traders in the production and distribution of these products is a positive sign of progress in the farming sector in Bangladesh.

### ***Characteristics of trading enterprises***

Total sales by *aratdars* over a three-month period were about 101 tons for brinjal, 34 tons for pangash, and 59 tons for chicken (Table 5.2). The average size of sales for wholesale traders is slightly more than half of the *aratdars*' sales. Compared with *aratdars* and wholesale traders, sales by retail traders are very small, on the order of 2 tons for all goods except chicken (5 tons). Traders in the milk supply chain deal with much smaller quantities compared with traders of other products.

Trading enterprises dealing with different products are different in some important dimensions (Table 5.3 and Table 5.4). For instance, most traders either own a shop or use a residence as a place of business for all products except milk. Milk marketed through the traditional channel is

either delivered to consumers directly by farmers or brought to the market at a fixed time of day (morning) by farmers and then bought, loaded into vans/buses, and delivered to consumers by traders. Because of these marketing arrangements, few traders—with the exception of large ones—need to have a fixed space or shop at the market. In terms of owning equipment, most trading enterprises are low-technology operations with phones, scales, and some processing equipment. The working capital requirements for trading enterprises are higher for chicken and milk compared to pangash and brinjal.

The enterprise size varies by type of trader as well. The median working capital required by aratdars is about 3 times that of wholesale traders and 12 times that of retail traders. Aratdars also tend to use computers more often (17 percent) and own motorized vehicles more often (19 percent) compared to other traders. More importantly, they use more formal banking services: 8 percent have an overdraft facility, compared with less than 1 percent of other traders.

**Table 5.2: Sales in last three months (sample median)**

Value chain	Aratdar	Large wholesale	Wholesale + retail	Retail	All
Brinjal (t)	101	56	3	2	16
Pangash (t)	34	27	9	2	9
Chicken (t)	59	33	18	5	10
Milk (000 liters)		9		2	3

Source: Shilpi et al. 2015.

**Table 5.3: Characteristics of trading enterprises in the four value chains**

	Brinjal	Pangash	Chicken	Milk
<b>Equipment (% traders)</b>				
Residence serves as selling/purchasing place	14.37%	17.73%	17.85%	3.03%
Owns shop/storage facility in a market	65.75%	86.32%	83.49%	15.13%
<b>Owner of ...</b>				
Mechanical scales	48%	68%	64%	45%
Processing equipment	13%	46%	53%	70%
Generator	2%	1%	4%	3%
Telephone	84%	90%	93%	80%
Computer	8%	11%	1%	3%
Non-motorized transportation	17%	9%	19%	26%
Motorized vehicles	7%	14%	16%	7%
Uses electricity in trading business	60%	63%	82%	16%
<b>Labor: Total number of workers over last year</b>				
Total (median)	5	5	5	5
<b>Capital: Average working capital of the enterprise (BDT) over the last 12 months</b>				
Median	30,000	50,000	100,000	100,000
<b>Capital: Proportion of traders receiving finance from (%):</b>				
Bank	5.25%	2.61%	9.72%	4.03%
Overdraft facility	2.07%	3.07%	2.59%	0.00%

Source: Shilpi et al. 2015.

**Table 5.4: Characteristics of trading enterprises, by type of trader**

	Aratdars	Wholesale	Retail	Wholesale + retail
<b>Equipment (% of traders)</b>				
Residence serves as selling/purchasing place	19.78%	10.69%	16.87%	19.31%
Owns shop/storage facility in a market	95.03%	50.66%	80.53%	87.93%
<b>Owner of ...</b>				
Mechanical scales	62.78%	44.72%	68.29%	64.29%
Processing equipment	23.33%	27.13%	54.36%	62.16%
Generator	1.11%	3.41%	2.18%	0.00%
Telephone	97.22%	90.94%	82.05%	90.18%
Computer	17.22%	6.25%	3.69%	2.70%
Non-motorized transportation	7.22%	21.59%	16.11%	7.21%
Motorized vehicles	18.89%	18.94%	3.36%	6.36%
Uses electricity in trading business	74.59%	46.90%	68.72%	82.76%
<b>Labor: Total number of workers over last year</b>				
Total (median)	6.00	5.00	5.00	5.00
<b>Capital: Average working capital of the enterprise (BDT) over the last 12 months</b>				
Median	300,000	100,000	25,000	60,000
<b>Capital: Proportion of traders receiving finance from (%):</b>				
Bank	7.73%	4.23%	5.89%	7.08%
Overdraft facility	8.29%	2.81%	0.17%	0.86%

Source: Shilpi et al. 2015.

## *Investment Climate for Agricultural Value Chains*

Traders along the value chain make a number of decisions, including day-to-day operational decisions as well as longer-term expansion decisions related to their enterprise, depending on their assessment of prevailing conditions and prospects. Detailed information collected as part of the surveys sheds light on traders' perceptions of the constraints limiting their operations. The respondents were asked to rate each of 17 different problems as a constraint to their business on a scale of 0–4, in which 0 indicated no problem and 4 indicated a severe problem.<sup>62</sup> Two ICA scores<sup>63</sup> are estimated on the basis of these responses. The ICA score for a major/severe problem for a given constraint is computed as the percentage of traders citing it as a severe or major obstacle. The score of minor/moderate is similarly computed as the percentage of traders citing a constraint as a minor or moderate problem.

The major/severe constraints identified by traders were poor road conditions and road blocks, limited access to and cost of financing, lack of shop/storage space, anti-competitive behaviors, unreliability of electricity, corruption, and crime and theft (Figure 5.1). More than half of the traders viewed poor road conditions and road blocks as major or severe problems, and another

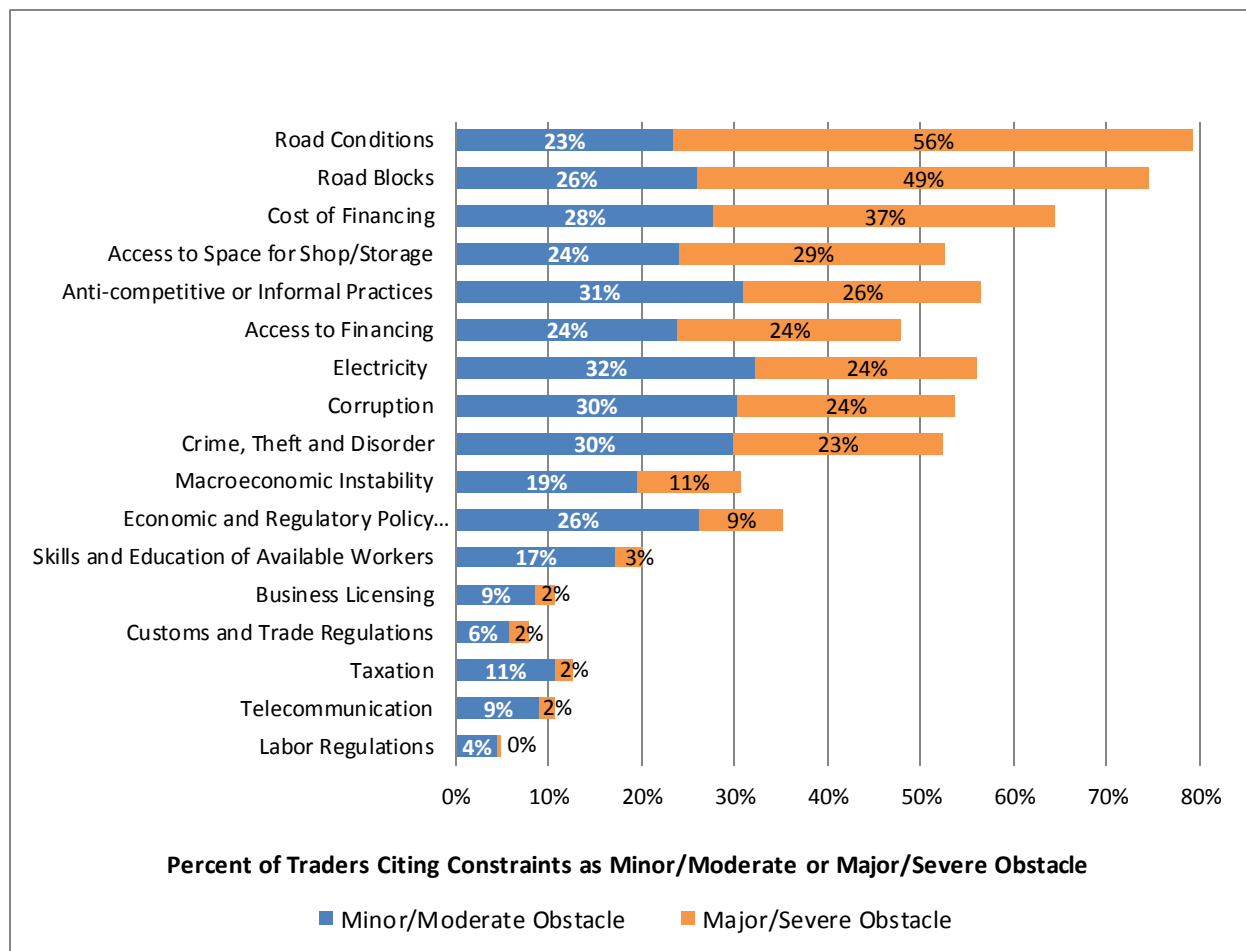
<sup>62</sup> Traders also had the option of responding with “does not apply” if a particular problem was not relevant to them.

<sup>63</sup> ICA is Investment Climate Assessment.



one-fourth rated them as minor/moderate problems. The cost of financing is rated as a major/severe constraint by 37 percent of traders, while another 24 percent cited problems accessing credit. More than one-fifth of respondents reported the lack of storage/shop space; anti-competitive behaviors; unreliability of electricity supply; corruption; and crime, theft, and disorder as major or severe problems. The traders' rankings of constraints are in fact similar to rankings provided by operators of medium and small rural enterprises in Investment Climate Surveys (World Bank 2008b).

**Figure 5.1: Traders' perceptions of obstacles to business operation**



Source: Shilpi et al. 2015.

Some variation occurs in the rankings of constraints by traders operating at different layers of the value chain and dealing with different types of products. For fish traders, the biggest concerns are road conditions (62 percent) and road blocks (54 percent). For milk traders, access to and cost of finance are the biggest constraint (42 percent and 24 percent). For 37 percent of poultry traders, the unreliable electricity supply was the main concern. Access to storage and shop space is a major issue for fish and vegetable traders. Among aratdars, road conditions and road blocks are the most important constraints (72 percent and 66 percent), followed by the cost of financing and lack of

storage space (35 percent each). Wholesale traders rank road conditions and blocks as the biggest constraints (63 percent and 59 percent), followed by the cost of financing (42 percent) and anti-competitive practices (28 percent). The most severe constraint for retail traders, on the other hand, is unreliability of electricity supply (35 percent), followed by road blocks and cost of financing.

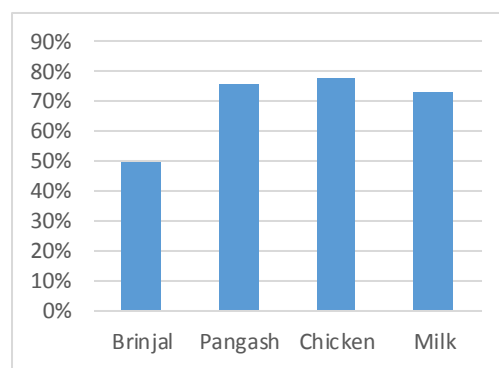
## ***Decomposing marketing costs and margins***

Traders' perceptions of constraints are subjective and may not always coincide with objective measures of constraints in trading. This section looks at some objective measures (traders' actual costs and margins) to assess the possible obstacles to trading activities.

### **Farmer's share in retail price**

The marketing margins implied by the share of the retail price that farmers receive as the farm-gate price vary by product, depending on the perishability and geographical reach of the marketing channel (Figure 5.2). The supply chain for brinjal involves many layers and is spread over a wider geographical area than supply chains of the other products surveyed. For this relatively less perishable product, the farm-gate price is about half of the retail price. For all other products, the farmer's share in the retail price ranges from 73 percent (for milk) to 78 percent (for chicken).

**Figure 5.2: Farmer's share in retail price in the four value chains**



Source: Shilpi et al. 2015.

### **Marketing costs and margins**

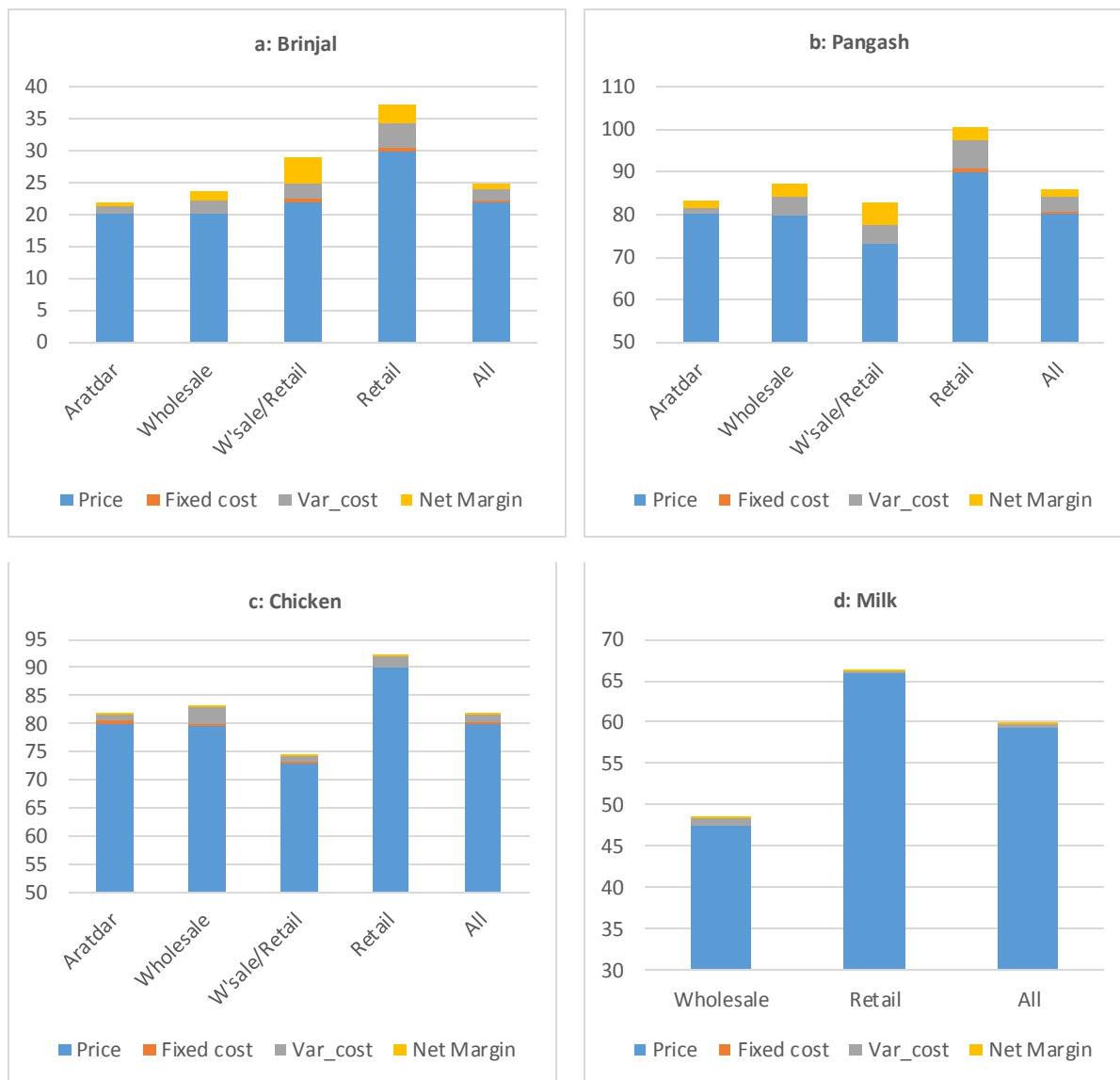
Trading margins for all four products are small, once the trader's fixed and variable costs are deducted from the gross margins (sale price – purchase price). In Figure 5.3, the height of the bar shows the sale price of the trader; the blue bar is the purchase price. Using the information collected in the surveys, the operating and variable costs of transactions are estimated.<sup>64</sup> The operating/fixed costs consisted of monthly costs of rental, wages, vehicle maintenance costs, licenses, fees, and other general costs (electricity, water, and others). Operating costs per kilogram (liter) were estimated, based on the volume of transactions in a month. Variable costs are estimated from tracking a transaction from its purchase to sale, tracing every step in between in terms of transport, handling, product loss, fees, taxes, storage, and any other costs. The variable costs are also expressed per kilogram (liter) based on the volume of transactions.

Figure 5.3 plots the median of variable and fixed costs. The net margins for chicken and milk are very thin—about 0.2–0.3 percent. The margins for brinjal and pangash are somewhat larger (3.5 percent for brinjal and 2.2 percent for pangash), yet both can be considered quite reasonable, given that both products travel longer distances and that fish are highly perishable. Among traders, only

<sup>64</sup> Detailed cost estimates are given in Shilpi et al. (2015).

retail traders of brinjal appear to have relatively higher margins, but the average quantity sold by retail traders is small (roughly around 22 kilograms per day).

**Figure 5.3: Marketing costs and margins in the four value chains**



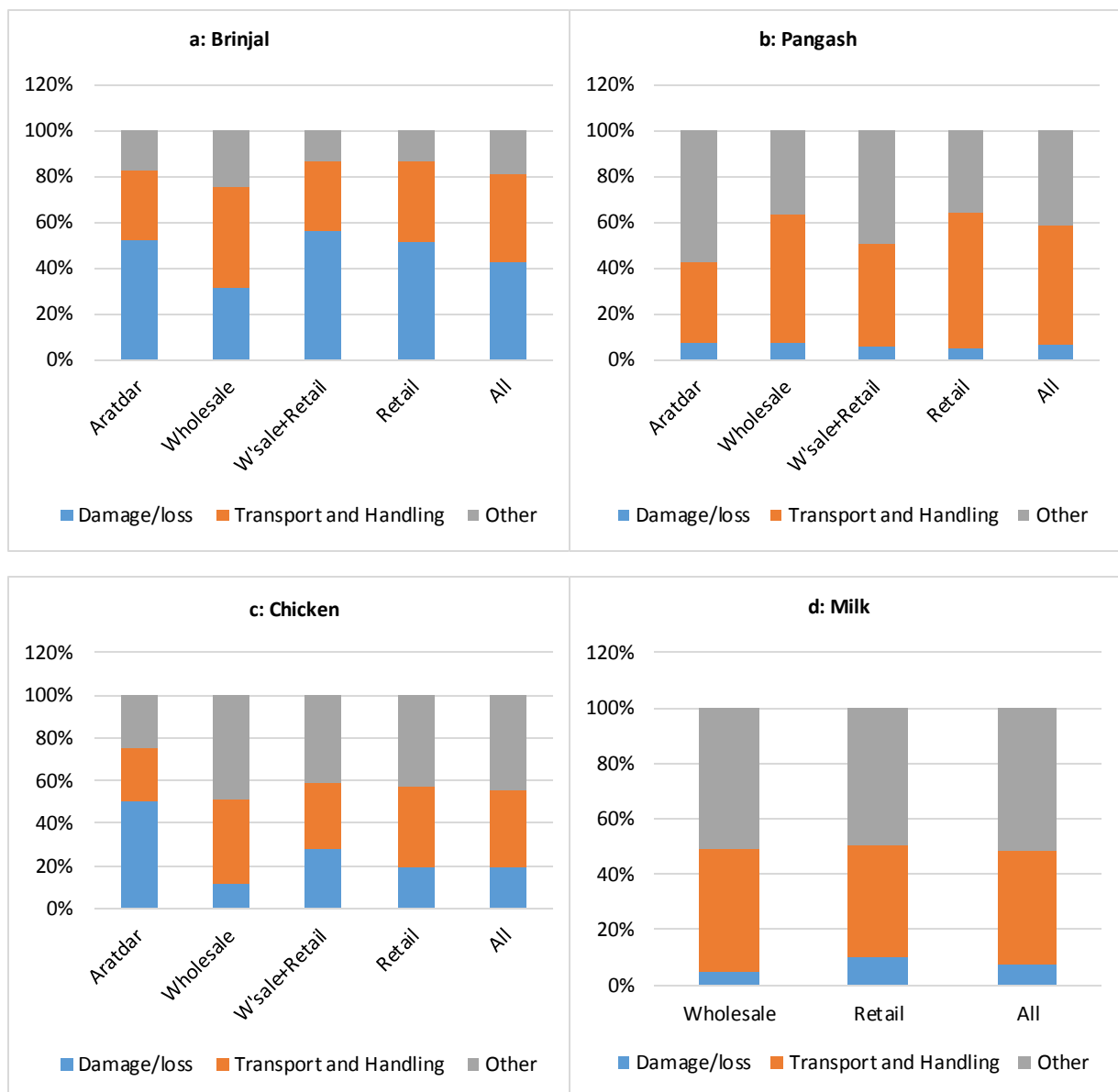
Source: Shilpi et al. 2015.

Note: W'sale/retail refers to traders engaged in both wholesale and retail business; All represents the average across all market participants. Market participants often transact with different agents along the value chain, and the purchase price and costs may vary accordingly. For example, retail traders may buy directly from farmers, wholesalers or traders

The variable costs of trading appear large relative to fixed costs for all products, with the exception of milk. For brinjal and pangash, variable costs are particularly higher at the retail and wholesale

levels. Based on detailed cost information from the value chain surveys, Figure 5.4 shows the composition of variable costs for traders in each value chain.

**Figure 5.4: Composition of traders' variable costs in the four value chains**



Source: Shilpi et al. 2015.

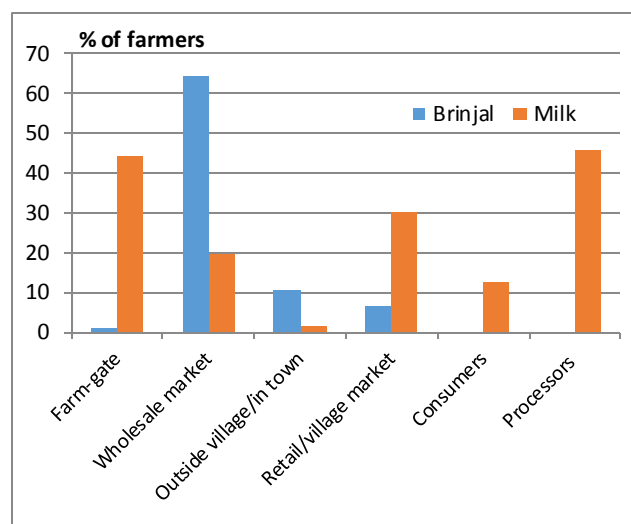
Transport costs are major sources of variable costs for all traders (Figure 5.4). For instance, transport and handling costs account for 45 percent of wholesale traders' variable costs and 35 percent of the variable costs for retail traders of brinjal. For all types of traders of brinjal, the costs of damage and loss are also very high (40 percent of variable costs). The loss due to product damage/loss is particularly high for aratdars and retail traders, accounting for more than half of

their variable costs. The high incidence of product loss/damage may explain partly why margins are relatively larger for retail traders, particularly in light of their smaller transaction volumes.

The main costs of fish trading appear to arise from transport and handling, as fish traders report very little product loss/damage. The large transport costs relative to product damage/loss is due to the ingenious way of transporting and marketing pangash in Bangladesh. Fish are usually packed in boxes and transported in refrigerated trucks in countries with more advanced supply chains, whereas in Bangladesh live fish are transported in drums filled with water. This transport arrangement dramatically reduces product loss even as it increases transport costs, yet it represents a cost-effective way of doing business in a tropical country lacking refrigerated trucks and facing enormous transport delays and blocks.

The gross margins for chicken and milk are very thin, and much of these margins can be explained by transport and handling costs. Though fresh milk is highly susceptible to spoilage, actual losses due to spoilage reported by the traders are small. Indeed, the costs of marketing milk (transport costs, spoilage, operating costs, and so on) are very small. They stand in stark contrast to brinjal, which is much less perishable but involves much larger marketing costs. The reason is that the traditional milk supply chain is short; markets are extremely localized, obviating the need for many intermediaries. The localization of milk trading is reflected in farmers' sales practices (Figure 5.5). Only a small percentage of farmers sell milk at wholesale markets (in contrast with brinjal, much of which is sold either in wholesale or retail markets). Most milk is sold at the farm-gate or to processors (80 percent); the rest is sold directly to consumers or at village or retail markets—which is why few milk traders even own or rent a shop at the market.

**Figure 5.5: Places where farmers sell brinjal and milk**



Source: Shilpi et al. 2015.

### Extent of product loss and damage

The higher extent of product loss/damage for brinjal and chicken compared to the other products studied is confirmed by trader and market-level data (Figure 5.4). The variable costs described previously were estimated using transaction information (one transaction per trader). Traders also reported the extent of damage and loss for their products over three months. These data indicate that nearly 30 percent of brinjal traders and 26 percent of chicken traders experienced product damage or loss over the three-month period, and their losses ranged from 5 percent (for brinjal) to

2 percent (for chicken). In contrast, only 17 percent of pangash traders and 5 percent of milk traders reported any damage or loss; their losses ranged from 2 percent (pangash) to 4 percent (milk). Most traders sold the damaged product at a much lower price, and some reported a loss of weight in their products due to transport delays and longer than intended storage periods. Much of the loss/damage is absorbed by the traders themselves (70 percent); in only a few cases were sellers of the product (farmers or traders) made to pay for the damage or loss (7 percent).

The market-level data indicate higher levels of damage and loss in urban markets compared with rural markets. For brinjal and pangash, losses in urban markets are twice as large as losses in rural markets, perhaps because these products reach rural markets before they are sent to urban markets (Table 5.5). The time delay, along with additional transport and handling, lead to higher losses in the urban markets. Only for chicken were losses higher in rural markets than in urban markets. For milk, losses again were insignificant.

**Table 5.5: Product loss in rural and urban markets**

	Product loss due to			
	Low quality	Transportation problem	Handling problem	Total
Rural				
Brinjal	3.35%	1.40%	1.73%	6.48%
Pangash	2.77%	1.93%	1.90%	6.59%
Chicken	1.85%	3.43%	2.33%	7.61%
Milk	0.00%	1.67%	0.00%	1.67%
Urban				
Brinjal	8.50%	1.83%	3.10%	13.42%
Pangash	0.81%	4.11%	5.84%	10.76%
Chicken	0.01%	2.47%	2.58%	5.07%
Milk	0.00%	0.00%	0.00%	0.00%

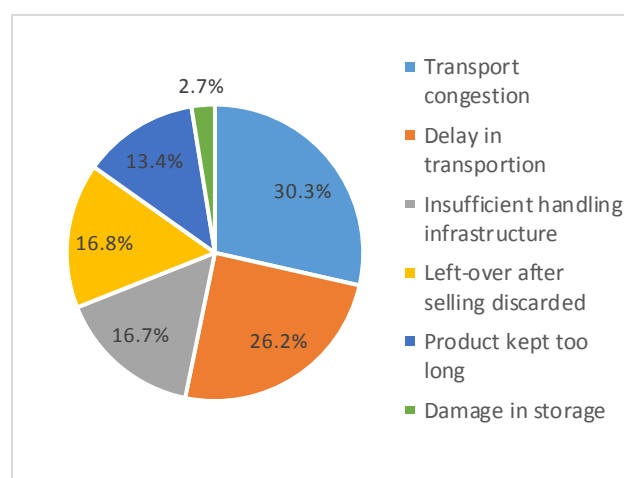
Source: Shilpi et al. 2015.

About 30 percent of traders reported transport congestion and another 26 percent reported transport delays as the main reasons for product loss/damage (Figure 5.6). Lack of handling infrastructure/facilities is also another important reason for product loss/damage.

### ***Market facilities and financing used by traders***

Nearly all of the markets in Bangladesh are managed either privately or by local municipalities, unlike India, for example, where state governments take an active role in managing regulated markets. The sections that follow look more closely at market facilities, including their accessibility,

**Figure 5.6: Reason for loss (% of traders)**



Source: Shilpi et al. 2015.

handling of products, storage facilities and costs, electricity and water, and crime and theft. The discussion also covers the finance, trade credit, and advances available to traders.

### **Transportation and market access**

As discussed, traders report a range of transportation problems, including delays, congestion, and costs; it is not surprising that road conditions and road blocks rank among the highest constraints to trading. The question that arises is whether these problems are indicative of problems related to the location and accessibility of markets.

In fact, market density in Bangladesh is relatively high, and nearly 90 percent of farmers have access either to wholesale, retail, or village markets. The majority of the farmers live within 5 kilometers of one of these markets. As a part of the sampling strategy for the value chain surveys, for each primary/village market, one village that was at least 10 kilometers away from that market location was selected. The survey data show that even those relatively more distant villages have other primary markets nearby. Indeed, farmers usually take their products to different markets depending on the day of the week when those markets convene.

In any case, not all farmers sell all products to markets. Farmers sell their brinjal at wholesale markets, whereas most chicken producers sell their product at the farm-gate (20 percent of poultry farmers engage in contract farming). Fish are sold both at the farm-gate and wholesale market (and 41 percent of farmers reported selling through agents). Milk is sold in retail markets or directly to consumers or processors; nearly half of dairy farmers sell milk to cooperatives or processors.

The market survey collected information from 41 of the largest wholesale/retail markets in the sample. Larger markets (wholesale and retail) appear to serve large geographical areas: markets/towns up to 2.18 hours of travel time for rural markets and 3.5 hours for urban markets. Rural markets sell products that originate less than an hour of travel time away, whereas urban markets sell products originating more than an hour away. Overall, markets are well connected to each other, and access to markets does not appear to be a major issue for farmers. The high density of markets, along with their inter-connections, imply that Bangladesh has a highly competitive and geographically integrated marketing system.

### **Market facilities and handling of products**

Poor handling is an important cause of product losses and damage along the supply chain. Information on the state of facilities was collected for the larger and more established markets in rural and urban areas. These markets can be considered well-provided; their facilities are comparable to those in regulated markets in India.

These established markets in Bangladesh fare well in terms of parking and the availability of other services for traders, such as banks, hotels, and post offices (Table 5.6).<sup>65</sup> Even so, they lack

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<sup>65</sup> The access to parking, banking, and other services in these markets in Bangladesh is comparable to that observed in regulated markets in India (World Bank 2008c).

processing mills, cold storage, and warehouse facilities. Only 12 percent of rural and 4 percent of urban markets reported having cold storage; 35 percent of rural markets and 22 percent of urban markets had warehouses. Tellingly, about 100 percent of cold storage capacity is used, and 88–98 percent of warehouse capacity. A considerable proportion of traders store their products at their shops.

Few markets provide equipment such as scales or packing machines; nor do traders appear to own anything beyond basic scales. Interestingly, rural markets appear to have better access to electricity than urban markets, although rural markets compare unfavorably with urban markets in terms of having a mill, bank, or packing machines. Overall, markets do provide some services but their provision of adequate storage facilities, electricity, and basic equipment is still lacking.

### Storage facilities and costs

According to the value chain survey, most traders use their shops or residences for storage. Only 3 percent reported having a private storage space other than their shop or home. With the exception of traders working in the milk supply chain, most traders in the other supply chains rent shops in the market (Table 5.3), and renting a shop is by far the largest operating cost for almost all traders. Storage costs are quite substantial. The cost of renting a shop is about BDT 32 per square foot in rural markets and BDT 45 per square foot in urban markets. Monthly rental for a shop (of average size) varies from BDT 5,300 in rural markets to BDT 7,850 in urban markets.

**Table 5.6: Market facilities**

Proportion of markets with:	Rural	Urban
Bus station	47%	91%
Train station	41%	17%
Hotels	24%	74%
Commercial bank	59%	83%
Post office	71%	87%
Police station	41%	83%
Mill	47%	87%
<b>Storage</b>		
Cold storage (%of markets)	12%	4%
Current capacity utilization rate	100%	100%
Warehouse	35%	22%
Current capacity utilization rate	88%	98%
Percentage of traders who store products in shops	41%	30%
<b>Parking facilities</b>		
Common parking area for all vehicles	56.10%	56.52%
Separate parking area for trucks	14.63%	17.39%
Separate parking area for carts	29.27%	34.78%
Separate parking area for tractors and trolleys	12.20%	17.39%
<b>Proportion of stalls/shops have:</b>		
Electricity	87%	78%
Access to water (piped water)	9%	39%
Access to water (well)	44%	63%
Access to water (other source)	7%	23%
Telephone (land line)	46%	45%
Mechanical scale	5%	3%
Electronic scale	13%	8%
Grading equipment	0%	0%
Packing machine	31%	42%

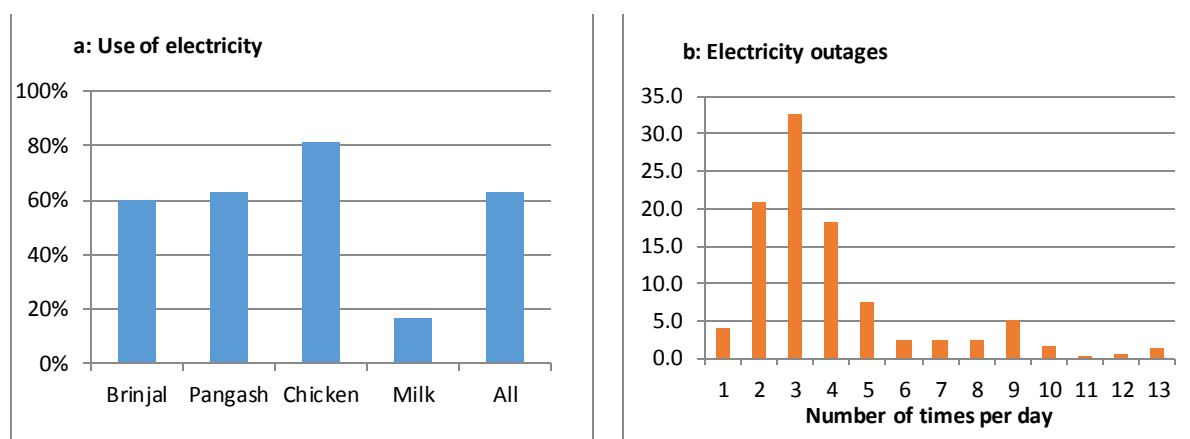
Source: Shilpi et al. 2015.



## Use of electricity and water

Daily electricity outages can seem as common as rice in the daily Bangladeshi diet. The majority of traders use electricity in their business operations, except for milk traders, who typically do not own or rent a shop (Figure 5.7, panel A). Traders ranked the unreliability of electricity as an important constraint on their business. About 80 percent of poultry traders use electricity in their business operation, and the unreliable electricity supply is their topmost concern (65 percent perceived it as a constraint, and 37 percent said it was a major/severe constraint). The median number of outages per day is about 3, as reported by traders (Figure 5.7, panel B), some of whom reported as many as 13 outages per day. The value chain survey confirms conclusions in the investment climate assessment for Bangladesh (World Bank 2008b): the unreliable electricity supply remains a major constraint, not only for urban firms but also for traders. Indeed, it may be a key reason for the lack of investment in cold storage at markets.

**Figure 5.7: Use of electricity in trading and electricity outages (% traders)**



Source: Shilpi et al. 2015.

However unreliable the electricity supply may be, connecting to the electricity supply is perhaps even more daunting, requiring considerable patience. According to the market survey data, on average it takes 87 days in rural markets and 102 days in urban markets to get a new electricity connection. Urban markets also fare worse than rural markets in securing a water connection: getting a new water connection takes only 3 days in rural markets but about 100 days in urban markets.

## Incidence of crime and theft

While it is difficult to measure the economic costs of crime and theft, the agricultural value chain surveys collected quantitative information on the incidence of theft that affects traders directly. About one-fifth of the traders experienced theft of trading goods, except for milk traders (Table 5.7). Theft appears to be more of a problem for fish traders, among whom about one-quarter faced theft over the last year. Traders took a number of measures (hiring guards, using locks) to

discourage theft. A small percentage faced theft by employees, and 5–8 percent avoided hiring a new employee because of concerns about theft.

**Table 5.7: Theft and crime**

	Brinjal	Pangash	Chicken	Milk
Percentage of traders faced theft	17.97%	24.76%	18.12%	7.89%
Employees involved in theft	2.07%	1.89%	3.53%	1.97%
<b>Measures against theft</b>				
Keep goods under lock and key	24.65%	40.33%	59.06%	40.79%
Hire a guard	48.39%	67.45%	59.29%	11.18%
Sleep on the premises	4.38%	0.94%	4.71%	1.32%
Avoid hiring for fear of theft	6.45%	8.73%	4.24%	7.89%
	Aratdar	Wholesale	Retail	Wholesale + retail
Percentage of traders faced theft	28.73%	19.89%	15.64%	19.83%
Employees involved in theft	3.87%	2.63%	1.66%	3.45%
<b>Measures against theft</b>				
Keep goods under lock and key	38.12%	40.53%	41.93%	44.83%
Hire a guard	74.03%	33.77%	61.23%	70.69%
Sleep on the premises	2.76%	6.38%	0.83%	0.00%
Avoid hiring for fear of theft	8.84%	5.63%	7.49%	2.59%

Source: Shilpi et al. 2015.

## Access to finance

Traders operating in markets for high-value products require a substantial amount of working capital. Aratdars report requiring about BDT 400,000 in working capital annually, whereas the median annual working capital requirement was BDT 100,000 for wholesale traders and BDT 25,000 for retail traders (Table 5.8). Much of the need for working capital is met by traders from their own funds: 83 percent for aratdars and 85 percent each for wholesale and retail traders. The proportion of traders expressing a need for credit was higher than the proportion of traders who had actually borrowed. For instance, among aratdars, 54 percent wanted to borrow against 47 percent who had actually used credit during the past 12 months. On average, traders approach 12–16 people for credit.

While more traders expressed a need for borrowing, very few actually borrow from formal banks—7.7 percent of aratdars, 4.2 percent of wholesale traders, and 6 percent of retail traders. The ownership of overdraft facilities is also rare among retail and smaller wholesale/retail traders. A considerable proportion of traders (ranging from 43 percent to 30 percent) belong to savings association/chit funds, but the amounts received are relatively small.

**Table 5.8: Access to capital and finance**

	Aratdar	Wholesale	Retail	Wholesale + retail
Average working capital in the past 12 months (median)	400,000	100,000	25,000	60,000
Percentage of own funds in current working capital	83	85	85	89
Needed credit in the past 12 months	53.59%	45.03%	39.10%	35.34%
Have used credit in the past 12 months	46.96%	37.90%	35.94%	30.17%
Number of persons approachable for funding	16	12	13	13
Belong to a savings association	43.09%	31.33%	29.62%	28.45%
Average amount drawn from the savings association	16,696	9,180	5,308	4,818
Borrowed from bank	7.73%	4.23%	5.89%	7.08%
Have an overdraft or cash credit facility	8.29%	2.81%	0.17%	0.86%

Source: Shilpi et al. 2015.

The limited access to formal financing and use of bank loans and overdraft facilities could result from unwillingness on the part of traders to engage with the formal banking sector or their inability to secure a loan from these sources. In the rural investment climate survey (World Bank 2008b), small and medium enterprises in the non-metropolitan areas expressed frustration with the lengthy and complicated paperwork and long waiting period associated with obtaining formal loans. While some of the smaller and micro enterprises had access to loans administered by micro-finance institutions or NGOs, those loans seem to be unavailable to traders. For instance, none of the traders in the agricultural value chain surveys reported NGOs or micro-finance as sources of credit. The large amount of working capital needed to finance trading, along with traders' perception that poor access to finance and the costs of finance are among the top constraints to business operations, certainly appear to indicate the presence of credit constraints.

### Trade credit and advances

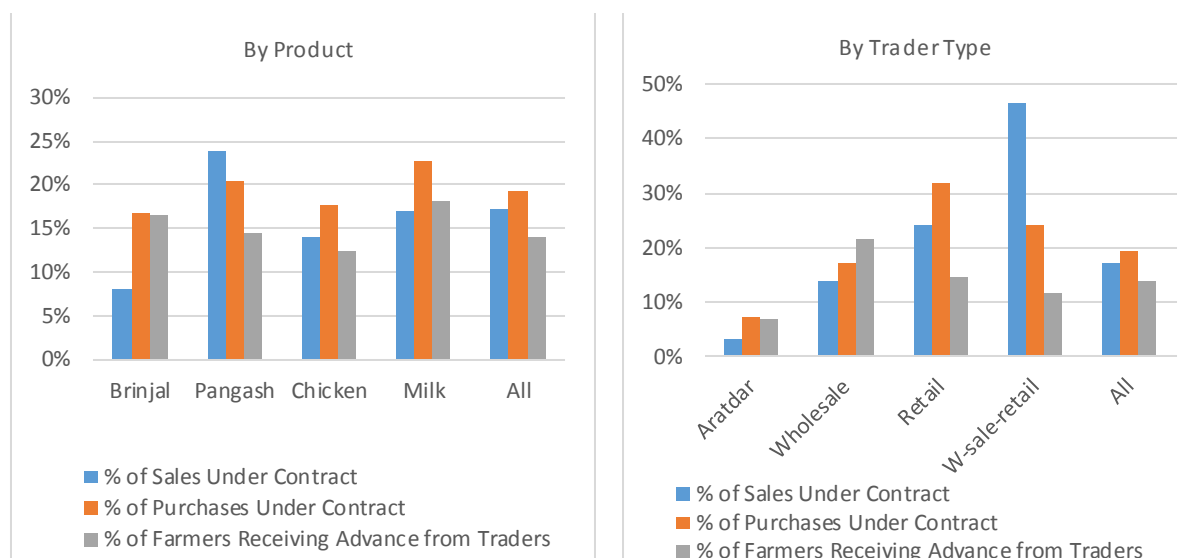
The incidence of trader credits and advance payments varies by product in the four value chains studied for this report. The use of contract purchasing and sales is more prevalent among traders operating in the fish and milk markets (Figure 5.8, panel A). Nearly one-quarter of sales made by pangash traders and one-fifth of their purchases of pangash involve contracts. The practice of paying advances to farmers is, on the other hand, more common among brinjal and milk traders.

Nearly all sales and purchases at the aratdar level involve payments at the time of delivery—in other words, they are cash sales (Figure 5.8, panel B). The use of trade credit increases among downstream traders, however. About one-third of retail traders purchase under contract, and about one-quarter sell under contract. Providing advances to farmers is more prevalent among wholesale traders: 21 percent report providing advance payments.

While aratdars and to some extent wholesalers have better access to bank credit, other traders rely more on contract purchases and sales (Figure 5.8). Traders' reliance on trust and reputation for conducting business, particularly when that business is based on contracts, is also evident from the purchase and sales pattern. Most traders rely on regular suppliers (62 percent) and customers (56

percent). The reliance on regular suppliers and customers is much lower at the aratdar level (44 percent and 46 percent, respectively). This reliance on regular customers and suppliers, along with the use of contracts and advance payments, allows wholesale and retail traders who have relatively limited access to formal credit to overcome finance constraints.

**Figure 5.8: Use of contracts in trading**



Source: Shilpi et al. 2015.

## ***Market Behavior: Competition and Efficiency in Trading***

As noted, a common perception is that traders' anti-competitive behavior creates distortions in agricultural marketing, especially the marketing of high-value crops. Interestingly, traders operating in supply chains for high-value products seem to share this perception: they rated anti-competitive behavior and informal trading practices as a constraint on their business. It is important, however, to distinguish between traders' concerns about informal trading practices such as "hit-and-run" entry and price cuts, and the anti-competitive behavior that concerns the popular media and policy makers. For policy makers and development practitioners, anti-competitive behavior often implies monopolistic and oligopolistic behavior. To assess whether traders in the surveyed markets behave in a manner contrary to what is expected in a competitive marketplace, several features of competitive markets are examined here. The market surveys indicate that at both the wholesale and retail levels of the marketing chain, numerous traders operate in any given location. For instance, on average more than 40 traders deal with brinjal and pangash in urban markets, and more than 7 traders of the same product operate in rural markets. By the same token, farmers have the choice of selling in multiple markets, giving them the option of taking their produce to alternative markets.

## Market entry requirements

Traders may be considered to gain market power if entry into a market is difficult. The market survey collected information on the requirements for any trader contemplating starting an operation in a market location (Table 5.9). While most markets require traders to have some experience, there is no formal requirement related to education. Most traders need to have proof of identity, licenses to operate in the market, and some guarantees. It costs about BDT 800 to obtain a license valid for a year in rural markets and BDT 1,000 in urban markets. The time needed to get a license (5–7 days) is not too burdensome. Most of these entry requirements are much less stringent than those observed, for example, in India. The major entry requirement in Bangladesh is a security deposit (BDT 30,000 in rural markets and BDT 70,000 in urban markets). Nearly all shops in a market are rented for a term of three years, and rental deposits are BDT 27,000 in rural markets and BDT 58,000 in urban markets. While the security deposits for renting and operating in a market are quite large, they are relatively small when compared with traders' average working capital requirements. Note that these requirements for entry pertain to large, well-established markets. The financial burden of entering rural primary markets is significantly less, particularly for small and itinerant traders.

**Table 5.9: Requirements for getting a shop in a market**

	Rural	Urban
Experience as a trader	24%	30%
Number of years of experience	10	3.6
Years of education	No	No
Number of years of education	n.a.	n.a.
Security deposit money	24%	61%
Minimum deposit (BDT)	3,1250	7,0125
Sales tax registration	6%	30%
License	65%	61%
Proof of identity	82%	74%
Proof of residence	35%	35%
Creditworthiness/solvency	47%	30%
Guarantees	59%	52%
Number of guarantees	1.4	2.5
Any affidavit	47%	65%

Source: Shilpi et al. 2015.

## Information and price dispersion

An important test of a value chain's competitiveness and geographical integration is whether information about prices is transmitted smoothly up and down the value chain. Price information is critical for the operation of an efficient value chain, as it enables traders to take advantage of arbitrage opportunities. Such arbitrage activities in turn ensure price convergence across areas.

Traders in the survey followed many markets to gather price information. On average traders follow 4.5 input markets, 3 supply markets, and 2.2 sales markets regularly. They consult 4–5 people in their main market and 2–3 people in other markets for price information. They reported relying on their own observations in setting prices, although they said they also incorporated feedback from regular customers and other traders. For farmers, the main source of information is other farmers. Chicken and pangash farmers also rely considerably on traders and input suppliers for price information.

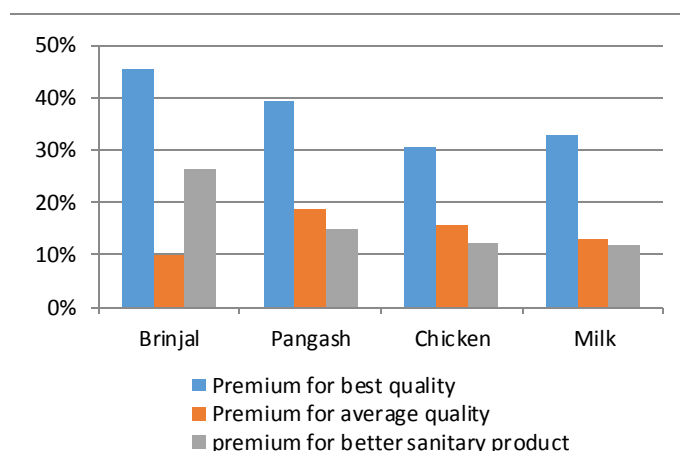
To test whether price information is transmitted to the farmers efficiently, the sale price reported (independently) by the surveyed farmers and the purchase price of traders (aratdars and wholesalers) are compared. Despite the farmer and trader surveys being undertaken separately and with some time lag (due to logistics), there is remarkable consistency in the prices reported by these two market actors: sale prices reported by farmers are nearly identical to the purchase prices reported by aratdars and wholesale traders, particularly for brinjal. The difference between what farmers and traders reported is about 7 percent for pangash and 9 percent for milk. Only for chicken is the difference significant. The consistency in the reported price is quite remarkable also because large traders such as aratdars and wholesalers are in most cases located farther from farmers, especially for products like brinjal and chicken, and a significant portion of farmers sampled for these two products came from districts (such as Rangpur) that are far from main urban markets. These findings suggest that information flows from traders to farmers are quite efficient and that the probability of traders having local market power due to farmers' lack of information appears to be quite low in Bangladesh.

### ***Product quality and price premium***

While traders use some innovative ways of transporting products to preserve quality (live fish in water-filled drums), few reported having equipment to pack or process products. The relatively low use of technology in trading could result either from some constraints in the availability of infrastructure or services or from a lack of awareness among traders about potential returns to investments in technology. The agricultural value chain survey asked detailed questions about traders' awareness of products' quality attributes as well as the price premium received for better quality products.

Traders do pay considerable attention to the variety and quality of products that they procure. The survey data indicate that nearly all traders (more than 95 percent) pay attention to quality differences and offer prices accordingly. The price premium for a better quality product is considerable: best quality brinjal fetches nearly 46 percent higher prices than poor quality product, and even average quality enjoys a 10 percent price premium (Figure 5.9). The premium for best quality is 39 percent for pangash, 33 percent for milk, and 30 percent for chicken. The survey data also confirm that farmers are aware of quality and receive higher prices for better quality products.

**Figure 5.9: Quality premiums by product**



Source: Shilpi et al. 2015.

Traders pay and receive higher prices for products that comply with better health and sanitary requirements. The premium for compliance with health and sanitary standards is 12–26 percent. Despite the presence of considerable premiums for better quality, however, few traders reported incurring costs to ensure better sanitary standards (8 percent of brinjal, 12 percent of pangash, 11 percent of chicken, and 3 percent of milk traders).

The return from better quality products appears to be much higher than the return from products that comply with health and sanitary standards. Ensuring better quality requires better farming and harvesting practices, better traffic conditions to cut transport delays and losses, better transport equipment (such as refrigerated trucks), adequate cold storage facilities, and a reliable electricity supply. Without better traffic and transport conditions and a reliable electricity supply, it is unlikely to be worthwhile for traders to invest in packing, processing, and transport equipment or for farmers to invest in better farming, harvesting, and processing to enhance and preserve product quality along the supply chain.

## ***Conclusions and Implications***

Sustained income growth and rapid urbanization have already translated into higher growth in demand for high-value vegetables, fruits, and animal products such as meat, milk, fish, and eggs in Bangladesh. The expected steep growth in demand for these products domestically and from export markets offers a unique opportunity to raise farmers' and traders' incomes as well as to generate employment in non-farm activities. To take advantage of this opportunity, the supply chains for these products have to be geared up to connect farmers to consumers in an efficient way.

Agricultural markets in Bangladesh have been generally favorable to growth. Surveys of traders and farmers confirm that markets function very well overall. Marketing margins are quite small and reasonable, with transport costs being the major source of traders' variable costs. Importantly, the marketing margins for the most perishable commodities (fish, milk, and chicken) are the lowest. Brinjal costs are higher, largely because of the larger geographical spread of the supply chain. Finally, the surveys of farmers and traders found very little evidence of uncompetitive behavior, including the much-discussed cartelization of markets, in which a few powerful traders collude to fleece farmers.

A second important finding that contradicts a widely held view is that physical post-harvest losses are much lower (under 5 percent) than the figure of 30–40 percent that is routinely quoted. To put the performance of Bangladesh's agricultural markets in perspective, it is useful to compare it with market performance in other countries. Comparable data on the commodities surveyed is limited, but for rice, a recent comparative study of Bangladesh, China, and India shows that the share of the farm-gate price of rice in final retail prices is higher in Bangladesh than in either China or India.

The agricultural value chain surveys conducted for vegetables (brinjal), fish (pangash), chicken, and milk (focusing on the traditional dairy supply chain) find encouraging signs in the production and marketing of these high-value products and provide some valuable insights:

- More educated and younger people are entering into farming and trading of high-value products, especially fish and poultry. The retention of human capital in the agricultural value chains studied here is a promising sign that the transformation and modernization needed for meeting increased domestic and export demand will be realized.
- Another important strength of agricultural value chains is that farmers appear to have good market access. Farmers typically live within a short distance of at least one primary market and in many instances multiple markets. The close proximity of markets is reflected in farmers' nearly universal propensity to sell in the market instead of at the farm-gate.
- The agricultural value chain is well integrated with respect to different layers (farmers to traders to consumers) and to geographical coverage. As a result, information about prices flows smoothly and efficiently from traders to consumers. Smooth information flows ensure better prices for farmers and better geographical integration of markets.
- Traders face no serious barriers to entry, not only in primary markets where it is not always necessary to rent a shop but also in the more established markets. The biggest barriers in entering a well-established market are the cost of the security deposit and renting a shop, and perhaps getting an electricity connection. The amount of money needed for a security deposit is not as large as traders' working capital requirement, however. Other than finance, there is no serious barrier to entry, even in large wholesale/retail markets in urban areas.
- As a result, net margins are small for almost all traders, and markets appear to be quite competitive.

Overall, the liberalized marketing environment in Bangladesh appears to serve producers and consumers quite well. This does not mean that there is no room for improvement. The agricultural value chain surveys indicate that several important weaknesses continue to limit performance in the value chains. The main weaknesses of agricultural marketing of high-value products, revealed by objective measures (data on traders' costs and trading practices) and subjective measures (traders' opinions), are:

- **Transport costs.** Traders rate road congestion and transport delays as the most important problems in marketing. Transport costs constitute a large share of trading costs, and transport delays are identified as a major reason for product damage and loss. To counter the lack of refrigerated trucks, fish traders transport live fish in drums filled with water, which unfortunately contributes significantly to trading costs. In addition to raising costs, these difficulties related to transportation cause supply chains (for milk, for example) to be geographically shorter. While Bangladesh has an extensive road network, there is an urgent need to manage traffic conditions and improve trucking fleets to reduce transport delays and their associated costs.



- **Limited access to and cost of finance.** Most traders rated cost of finance as a major/severe problem in operating their business. Trading requires a large investment in terms of working capital, 85 percent of which remains self-financed. Financing by banks remains relatively rare and accessible to only the largest traders (aratdars and wholesalers). Few traders have overdraft facilities. Better access to financial services (such as electronic payment and overdraft facilities) is needed, not only to reduce trading costs but also to ensure that more individuals can enter into trading services.
- **Unreliable electricity supply.** The unreliable power supply tops most of the investment climate assessments in Bangladesh. For traders, the unreliable power supply means that there is less of an incentive to invest in processing and packing equipment. More importantly, the survey indicated an acute and pervasive shortage of cold storage facilities in Bangladesh. Most likely, investments in cold storage are another victim of the unreliable electricity supply.
- **Investment in market facilities.** Marketplaces in Bangladesh provide some facilities—parking, banks, bus stations, and post offices—but they are deficient in the provision of cold storage, mills, warehouses for storage, and equipment such as scales and packing machines. As consumers become more conscious of the quality of the products that they buy, markets will have to conform to higher health and sanitation requirements. The expected expansion in trade of high-value products means that additional investment in market facilities will become essential in the near future.

## References

- Ahmed, A.U and K. Ahmad. 2013. “Sudden Onion Price Surge in Bangladesh: A situation Analysis for Policy.” Bangladesh Policy Research and Strategy Support Program, IFPRI, Dhaka.
- Amarasinghe, U.A., B.R. Sharma, L. Muthuwatta, and Z.H. Khan. 2014 “Water for Food: Outlook to 2030.” Research Report No. 158. International Water Management Institute (IWMI), Colombo.
- FAO (Food and Agriculture Organization of the United Nations). 2013. Food balance sheets .FAOSTAT database at <http://faostat.fao.org>
- Hossain, M., and U. Deb. 2011. “Crop Agriculture and Agrarian Reforms in Bangladesh: Present Status and Future Options.” In Volume 2 of *Sixth Five Year Plan of Bangladesh 2011–2015, Background Papers*, edited by M.K. Mujeri and S. Alam. Dhaka: Planning Commission.
- Shilpi, F., M.N. Hoque, J. Yao, and H. Uddin. 2015. “Connecting Farmers to Consumers: Trading in High Value Products in Bangladesh.” Background paper for “Dynamics of Rural Growth in Bangladesh,” GFADR, World Bank, Washington, DC.
- World Bank. 2008a. “High Value Agriculture in Bangladesh: An Assessment of Agro-Business Opportunities and Constraints.” Bangladesh Development Series Paper No. 21. Dhaka.
- . 2008b. “Harnessing Competitiveness for Stronger Inclusive Growth: Bangladesh Second Investment Climate Assessment.” Bangladesh Development Series Paper No. 25. Dhaka.
- . 2008c. “India: Taking Agriculture to the Market.” Report No. 35953. Washington, DC.

## ***Annex 5: Design of the Agricultural Value Chain Surveys***

The value chain surveys focused on four products—brinjal, pangash, chicken, and milk—and consisted of separate surveys of traders, markets, and farmers, with an emphasis on trading arrangements for serving domestic markets. The surveys differ from existing value chain studies in several important ways. Rather than just focusing on the estimation of margins, the surveys looked at trading practices, traders' perceptions of constraints, and physical market facilities. The trader, market, and farmer surveys were interlinked to permit the analysis of how a constraint at one layer of the market affected cost and conduct at all other layers. The detailed and interlinked surveys make it possible not only to estimate margins at different layers of the markets but to analyze the determinants of these margins in terms of infrastructure, facilities, and other policy variables.

World Bank (2008a) provides detailed value-chain analyses for several high-value agriculture sectors, including fisheries, poultry, fruits and vegetables, high-value rice, and dairy, and identifies specific policy recommendations for each. That report concentrates on production technology and export potentials, whereas this report investigates the domestic marketing channels, focusing on constraints to the development of an efficient marketing system for perishable products. The four products studied here all figure prominently in the traditional Bangali diet. Brinjal was chosen for the vegetable value chain study because its value chain is similar to those of other widely consumed vegetables (such as tomatoes), and it was in season when the survey was conducted. Among different types of fish, pangash (blue catfish) was selected because it is also widely consumed, especially by the poor.

The survey of trading practices gathered information on credit and other contract arrangements, transportation, damages and losses, sources of information, enforcement of contracts, and security of property. An opinion survey similar to investment climate surveys was used in seeking information from traders on their most important constraints. A separate survey of all major markets gathered information on the specific physical facilities provided at each market. As noted, the trader, market, and farmer surveys were interlinked to allow analysis of how a constraint at a given layer can affect cost and conduct at all other layers.

The surveys collected information from 1,448 traders (at all layers of the market for each product) from 41 large and a number of smaller markets and 557 farmers for all commodities. The sample of traders is representative at the trader level (wholesale vs. retail vs. other traders) and at the product level. The farmer survey is representative only at the product level. In addition to information on facilities, the market survey collected information on market management, connectivity, and a number of other variables. The sample was drawn in two stages. For each product, the main growing areas were first identified. The sample of main markets was drawn from information on supply points collected through interviews with traders in the main consumption center (Dhaka). For each product, at least two districts were chosen, using two criteria: (1) each is

a significant supplier of the product and (2) one district is near the main consumption center (Dhaka) and the other farther away. The survey thus covered seven districts—Narsingdi, Mymensingh, Gazipur, Manikganj, Bogra, Rangpur (one of the poorest and more lagging districts in the country), and Sirajganj. The main growing districts selected for brinjal were Rangpur (6.26 percent of production), Bogra (4.44 percent), and Dhaka (3.6 percent). For chicken, the main growing districts in the sample were Mymensingh (4.12 percent) and Bogra (3.24 percent). For milk, the main areas were Sirajganj (2.23 percent) and Manikganj. For pangash, the main supply areas were Mymensingh (10 percent) and Bogra. Narsingdi and Gazipur, two districts near Dhaka City, are significant suppliers of vegetables, poultry, and milk.

The sample of traders (1,448) was selected randomly from each market from a list of 183 markets. Forty-one of the markets were major wholesale/retail markets and the rest were relatively smaller and of differing sizes, including some rather small primary/village markets that convene once or twice a week. For each of the primary markets surveyed (74), two villages were selected—one near and one far—to draw a random sample of farmers from 148 villages. The market facilities questionnaire was administered in the 41 large wholesale/retail markets.

All of the selected villages are from outside Dhaka City. During the fieldwork, it was discovered that though a village may be far (more than 10 kilometers) from the selected primary market, it may be nearer to another primary market due to the high density of primary markets in Bangladesh. Often primary markets convene only once per week. A farmer may go to several markets in a week. In that way, a number of markets get supplies from a single village on different days of the week. Of the selected villages, 22 were selected to study the brinjal value chain, and 113 farmers from those villages were surveyed randomly; for the chicken value chain, 33 villages were selected and 147 chicken growers surveyed; for the fish value chain, 60 villages and 132 fish farmers; and for the milk value chain, 33 villages and 170 milk producers. No more than 20 respondents were selected from a village, with two exceptions (27 chicken growers from a village in Bogra and 33 milk producers from a village in Sirajganj). As stated, in some cases it was not possible to select 10 farmers for a given product from each village listed. When this was the case, enumerators interviewed additional farmers from other villages.

Similar to the sample of farmers, no more than 10 traders were selected from a market location, with three exceptions (in Dhaka and Rangpur) where trader density was much higher and traders in the same market location traded a number of the selected products. While markets, traders, villages, and farmers were selected for each of the specific products, it is possible for them to produce or trade more than one of those products. Because of this possibility, there was a chance of some double-counting in the final breakdown of the sample with respect to markets, traders, villages, and farmers. The data analysis indicated no such double counting for traders, farmers, and villages. But as already noted, many different types of traders operated in the same market location.

Tables A5.1–A5.4 provide the detailed sample for the four selected products. Several points should be noted. First, aratdars are not always present in all market locations, particularly for brinjal, chicken, and milk. For brinjal and chicken, aratdars are hardly present in the primary markets and they are more prevalent in the secondary (wholesale) markets. For chicken, aratdars are more like dealers who supply chicks, feeds, and medicine to farmers, mostly on credit, and then make sales arrangements with buyers of fully grown chickens. These dealers do not charge any commission but instead get paid from the sales proceeds (the commission is built into the price). Second, there are also beparis in the primary markets (for brinjal) who are classified as wholesalers in the data analysis (for brinjal, for example). Third, the milk market differs from markets for other products in the sense that part of the milk supply goes through the formal marketing channel to processors. Though Sirajganj is a major milk shed area, few traders there engage in the milk trade there as most farmers sell their milk to cooperatives or to agents of large milk processors such as Milk Vita and Aarong.

**Table A5.1: Distribution of brinjal (eggplant) sample**

	Narsingdi	Dhaka	Rangpur	Gazipur	Total
Farmer	54	0	59	0	113
Aratdar	7	24	16	2	49
Paikar/wholesale	63	45	71	23	202
Retail	46	57	40	3	146
Retail + wholesale	6	23	1	0	30
<b>Total</b>	<b>176</b>	<b>149</b>	<b>187</b>	<b>28</b>	<b>540</b>

Source: Shilpi et al. 2015.

**Table A5.2: Distribution of pangash (fish) sample**

	Mymensingh	Dhaka	Rangpur	Bogra	Total
Farmer	71	0	0	61	61
Aratdar	30	29	21	26	76
Paikar/wholesale	37	28	13	48	89
Retail	33	102	15	28	145
Retail + wholesale	7	2	1	12	15
<b>Total</b>	<b>178</b>	<b>161</b>	<b>50</b>	<b>175</b>	<b>386</b>

Source: Shilpi et al. 2015.

**Table A5.3: Distribution of chicken sample**

	Gazipur	Dhaka	Rangpur	Bogra	Total
Farmer	59	0	24	64	147
Aratdar/dealer	9	24	0	1	34
Paikar/wholesale	45	35	19	55	154
Retail	32	74	23	48	177
Retail + wholesale	23	36	4	0	63
<b>Total</b>	<b>168</b>	<b>169</b>	<b>70</b>	<b>168</b>	<b>575</b>

Source: Shilpi et al. 2015.

**Table A5.4: Distribution of milk sample**

	Manikganj	Dhaka	Sirajganj	Total
Farmer	56	36	78	170
Paikar/wholesale	21	26	5	51
Retail	63	36	0	99
Retail + wholesale	2	4	0	6
<b>Total</b>	<b>142</b>	<b>102</b>	<b>83</b>	<b>327</b>

Source: Shilpi et al. 2015.



## 6 Prospects for Food and Nutrition Security

### *Achieving Food and Nutrition Security*

Agriculture has played a key role in the development of Bangladesh's economy—improving food security, reducing poverty, and bringing prosperity to areas that have been depressed for a long time. It is still the mainstay for the rural economy, contributing directly and indirectly through significant indirect linkages with the now-ubiquitous non-farm economy to generate jobs and incomes.

Over the years, the dominant focus of agricultural policy and strategy has been to increase food grain production, principally rice production—to achieve food security. This focus has been successful; Bangladesh is virtually self-sufficient in producing its main staple, rice.<sup>66</sup> Food security, which continues to translate to rice security, still remains the central objective of the government's agricultural strategies. To that end, the focus of policies and public interventions is to maintain the incentives for domestic rice production to expand, specifically through output price support, price stabilization, and fertilizer subsidies. At the same time, government policy is also designed to protect poor consumers through subsidized sales of rice (through the early 1990s) and through important and extensive safety nets involving food for work and food transfers.

Looking ahead, an important questions for development strategy and policy concerns the prospects for food and nutrition security should the focus shift towards accelerating income growth. Land is a key factor in agricultural production but is extremely limited in Bangladesh, with little potential for further increases in cropping intensity through irrigation expansion. More than half of rural households are landless, and demographic pressures will likely keep farm sizes low, implying that an increasing number of workers will participate in non-farm work. At the same time, at the aggregate level food security (in terms of rice) has by and large been achieved. Land productivity has room to improve, given the remaining yield gaps. Demand is rapidly growing for agricultural products other than rice—other crops, livestock, and fisheries—which are a potential source of growth for small landowners. Diversification is important for the many reasons discussed throughout this report, and for improving nutritional outcomes (which remains a challenge and is discussed here). Given these different arguments, the future role of agriculture is understandably a source of debate.

To consider the probable future role and direction of change for agriculture, it is important to understand the probable future demand and supply of key food commodities. Hossain and Deb (2011) estimate that by 2021 per capita demand for rice will fall by 1.9 percent in rural areas and 7 percent in urban areas (Table 6.1). At the same time, per capita demand for fruit is estimated to rise by 63 percent and 103 percent in rural and urban areas, respectively; for fish by 58.3 percent

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<sup>66</sup> Average imports of rice in recent years have been equivalent to less than 2 percent of domestic production.

and 61.3 percent; and for meat and eggs by 74 percent and 102 percent, assuming that national income grows at 8 percent per year in 2011–16 and 10 percent per year in 2016–21.

**Table 6.1: Projections of per capita consumption (g/person/day) for selected foods**

	2011		2021	
	Rural	Urban	Rural	Urban
Rice	530	430	520	400
Wheat	15	30	20	35
Pulses	15	22	19	27
Oils	17	25	20	30
Potato	70	80	80	96
Other vegetables	170	180	200	208
Spices	60	75	70	90
Fruits	40	54	50	73
Sugar	10	15	13	20
Fish	48	62	60	80
Meat and eggs	23	42	32	61
Milk	40	50	50	73

Source: Hossain and Deb 2011.

To meet these rapidly growing demands, the supply of foods other than rice will need to grow significantly faster than in the past (Table 6.2). For example, to meet projected meat and egg demand, supply must grow at an average rate of more than 8 percent per year, yet over the past two decades, the livestock subsector has not grown more rapidly than 5 percent per year. Clearly there is a need to diversify out of rice production in the crops subsector; rice occupies nearly 78 percent of gross cropped area.

**Table 6.2: Projections in demand and expansion in supply needed for selected foods**

	Projected demand (million t)			Expansion in supply needed (%/yr)	
	2011	2016	2021	2011–16	2016–21
Rice	27.4	28.71	29	1	0.2
Wheat	1.02	1.41	1.85	6.5	4.5
Pulses	0.92	1.23	1.56	5.8	4.5
Oils	1.04	1.32	1.72	4.5	4.5
Potato	3.95	4.88	6	4	3.8
Other vegetables	9.38	11.67	13.64	4	3.5
Spices	3.48	4.37	5.85	4.5	4
Fruits	2.23	3.27	4.6	6	6
Sugar	0.62	0.87	1.22	6	6
Fish	2.81	3.8	5.04	6.3	6
Meat and eggs	1.52	2.33	3.28	8.3	6.5
Milk	2.32	3.46	4.86	8.3	6.5

Source: Hossain and Deb 2011.

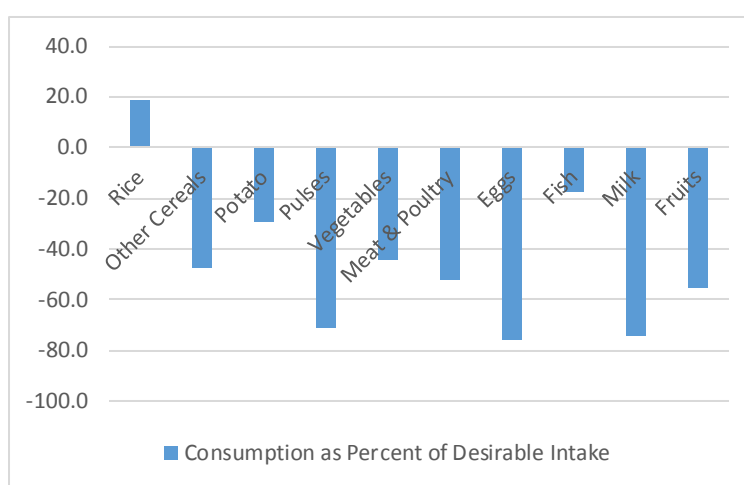
Bangladesh has made considerable progress in basic nutrition. Average calorie intake is now at 2,318 kilocalories per capita per day relative to the estimated national requirements, based on



physical activity and desired body weights, of 2,200 kilocalories per capita per day (Zakir Hussain, Talukder, and Ahmed 2015).<sup>67</sup> Similarly, protein intake—at 66 grams per capita per day in 2010—is now estimated to surpass the recommended level of 58 grams per capita per day (Talukder et al. 2015).

From a nutritional perspective, however, current consumption patterns are far from optimal, with too little dietary diversity. Figure 6.1 illustrates the divergence between current consumption and nutritionally desirable consumption (Zakir Hussain, Talukder, and Ahmed 2015). Rice consumption is already higher than desirable (on average), while other foods are underconsumed.

**Figure 6.1: Actual and desirable consumption of selected foods**



Source: Zakir Hussain, Talukder, and Ahmed 2015.

Given the current consumption pattern and projected demand-supply balance, it is safe to assume that food security going into the future looks reasonably stable. Uncertainty will of course remain, not least because of climate change, for which the best strategy is to close the current yield gaps.<sup>68</sup> A high priority for agricultural research is to focus on developing food crop varieties that tolerate or resist stresses—drought, saline soils, and flooding, to name a few. The Bangladesh Agricultural Research Institute has already made progress in this respect. Intensifying these efforts, complemented by other investments to strengthen agriculture’s resilience to climate change, are crucial to secure long-term food security.

The most immediate policy priority, however, is to achieve better nutritional outcomes, as malnutrition rates remaining unacceptably high (Zakir Hussain, Talukder, and Ahmed 2015). Intuitively, what happens *to* agriculture matters for sustaining the progress on food security and what happens *in* agriculture matters for promoting nutritional security. The next two sections seek

<sup>67</sup> Different researchers put the desirable calorie intake at different levels. Talukder et al. (2015) report desirable calorie intake to be 2,430 kilocalories per capita per day, which places current calorie levels slightly below desired levels.

<sup>68</sup> As Yu et al. (2010) concluded when assessing the impact of climate change on agriculture.

to throw some light on these two key development challenges, which continue to be to priorities for policy makers.

## *Agriculture and Nutrition*

Bangladesh has made good progress on human development indicators, but malnutrition remains high and has serious human development impacts. Those impacts include very high economic costs in terms of lost productivity, economic activity, and health. The evidence is also clear that malnutrition is a multi-sectoral problem—in other words, nutritional outcomes are influenced by numerous factors, one of which is agriculture. At first sight, the link between agriculture and nutrition seems obvious: agriculture supplies nutrients because it supplies food, and insufficient calories result in basic undernutrition. But even in sections of the population that have enough food in terms of calories, the scourge of malnutrition (often referred to as “hidden hunger”) persists, implying that malnutrition is not just a problem of being too poor to buy food.

A major concern is the lack of diversity in the average individual’s and especially the poor person’s daily diet. Rice historically has dominated the Bangladeshi diet, at all income levels, and continues to do so. More diverse foods are being consumed, but not in sufficient quantities, as shown in Figure 6.1. Even though the links between agriculture and nutrition seem intuitively and conceptually compelling, they have been difficult to demonstrate empirically because suitable data are lacking. Until now, no known dataset provided the three key pieces of information needed for such an analysis—data on households’ agricultural production patterns, consumption patterns, and nutritional outcomes (assessed through appropriate anthropometric measures). This shortcoming was overcome recently with a new dataset, the BIHS of 2011/12 by IFPRI (IFPRI 2013). These data are analyzed for this report to investigate the determinants of malnutrition in a nationwide sample of over 5,000 households.

The sample statistics reveal that agricultural patterns, consumption patterns, nutritional intake in terms of calories and proteins, parental health indicators (body mass index), and child malnutrition indicators (stunting, wasting, and underweight z-scores calculated according to the formulas of the World Health Organization) are similar to national averages based on multiple appropriate sources (Table 6.3). Detailed shares of food expenditure by major food group and income quintile are given in Annex 6, Table A6.2.

Cereals dominate household food expenditures at 41 percent, with the next highest share of expenditures being on vegetables and fruits (16 percent) and fish (12 percent). Pulses and meats (including poultry) are about 8 percent each. The expenditure pattern seems reasonably diversified, but the relative price differentials are substantial, and when these shares are converted into physical terms (major nutrients, in calories and proteins), the dominance and overconsumption of rice are evident (Figure 6.2). Importantly, while the share of cereals (primarily rice) falls in terms of expenditures as incomes rise, the shares of calories and protein sourced from rice continue to rise!

Expenditure shares of other commodities show some predictable patterns but also some unpredictable ones. Animal products and fish rise with incomes, but the shares of other food groups remain about the same, including (somewhat surprisingly) vegetables. Part of the reason is that the average diet, even at lower income levels, has a reasonably high level of consumption of vegetables, which may reflect widespread homestead/kitchen gardening (even among the functionally landless who have some homestead land).

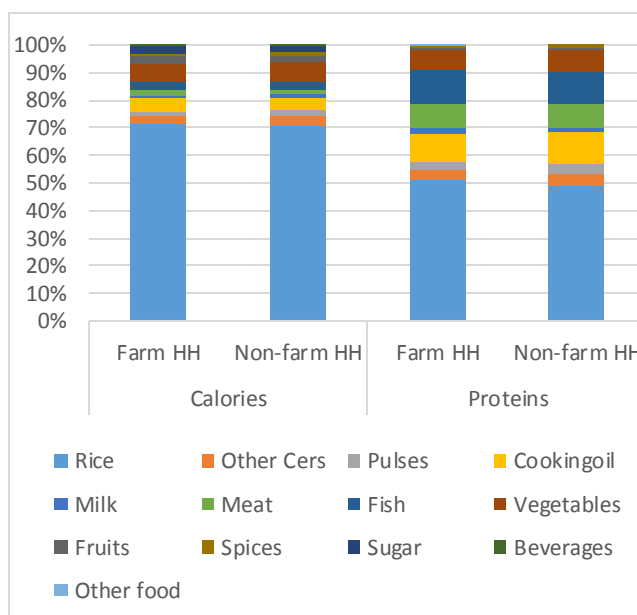
Before turning to the determinants of nutritional outcomes, it is important to highlight the impact of policies on consumption choices. Estimates from a consumer demand system for the major commodity groups listed in Annex 6, Table A6.1, show the predictable declining income elasticity for cereals, and also cooking oil and spices, but proteins, vegetables, and fruits are found to be highly income elastic, a different trend from the descriptive analysis of expenditure shares. Clearly other factors are important, highlighting potential drawbacks of descriptive analysis. More relevant for policy are the household consumption responses to prices (see Table A6.2 in Annex 6). All foods show expected own and cross-price responsiveness, but the results clearly show a much higher negative impact of high prices on demand for protein, vegetables, and fruits. Given that the cross-price elasticities are

**Table 6.3: Sample statistics, BIHS, 2011–12**

Variables	Sample average
Total sample (households)	5,503
Rural households (%)	50.3%
Farm area (decimals)	162.1
Rice area share	76.8%
Vegetable area share	3.6%
Fruit area share	0.5%
Cash crop area share	7.4%
Farm area diversity (Simpson Index)	0.11
Calorie diversity (Simpson Index)	0.45
Mean total assets (BDT)	56,533
Unimproved toilets (households with children under 5)	72.3%
Improved toilets (households with children under 5)	27.8%
Hand washing (households with children under 5)	51.4%
Calorie intake (weekly Kcal/household)	16,728
Protein intake (weekly g/household)	512
Average BMI (household head, 98% households reporting)	20.21
Average BMI (spouse, 94% households reporting)	19.25
Wasting (under-5, 43% households with children under 5)	12.3%
Stunting (under-5, 43% households with children under 5)	47.1%
Underweight (under-5, 43% households with children under 5)	33.6%

Source: BIHS 2011-12.

**Figure 6.2: Share of foods in calorie and protein intake**



Source: BIHS 2011-12.

relatively small, it seems households' major response may be to cut back on those foods and partly substitute other foods for them, mainly cereals and spices. The nutritional impact of price policies that alter relative prices, especially in favor of cereals, is thus potentially significant.

The impact of economic policies on prices is also demonstrated in the demand for calories and proteins. Controlling for demographic (negative) and income (positive) impacts, higher cereal prices significantly reduce calorie intake of the poorest two quintiles, while pulse, cooking oil, and spice prices increase calorie consumption across the board, showing strong substitution effects. Higher vegetable prices also force the poorest two quintiles into calorie consumption. In terms of the price effects on proteins, the results confirm the converse of the calorie impacts: higher cereal prices promote protein consumption, as do higher vegetable prices, for all groups except the top quintile. Higher protein prices negatively impact only the bottom two quintiles. The results strongly suggest that price movements have particularly strong impacts on the poor.

The more direct agriculture-nutrition pathway is demonstrated through three interlinked relationships. One is the relationship between agricultural production diversity (used to capture the impact of what is done in agriculture, beyond the obvious income effects though higher productivity) and dietary diversity (measured as the Simpson index of calorie consumption from different sources of food). The second is the subsequent impact of dietary diversity on nutritional outcomes, for which the parental (household head and spouse) body mass index (BMI) is used as a proxy. And finally, to close the link to child malnutrition, the third relationship is the impact of parental BMI (along with the direct impact of dietary diversity) on the nutritional indicators for children under five years of age.

As discussed earlier, nutritional outcomes are likely to be an outcome of multiple factors, and a priori it is not clear how important or relevant each of these may be. To address this concern, in addition to the usual demographic variables, the estimations control for the following potentially important factors in explaining nutritional outcomes to provide a more robust confirmation of the agriculture-nutrition linkages:

- Household income (using total expenditures per capita as a proxy for permanent income as is standard in consumption and poverty analyses) and wealth—to control for the income effect.
- In addition to total income, shares of farm income are included to capture any specific impact that agricultural incomes per se may have as distinct from income from other sources or from cropping patterns (captured by the diversification index).
- Rice and other food prices (as indices) are included to capture a broad range of economic factors, including importantly the (direct and indirect) impact of policies.
- Distances to markets and public facilities are included to capture infrastructure and public service access.
- Type of toilet—a key variable included to control for sanitation and hygiene, an important potential determinant of malnutrition.

- A water, sanitation and hygiene (WASH) indicator, for households reporting knowledge of the importance of washing hands after using toilets, after cleaning a child who has defecated, and before eating food or feeding a child

The main results for the three relationships are shown in Annex 6, Tables A6.3 and A6.4. The relationship between dietary diversity and BMI and their determinants is investigated for both household heads and spouses for all households in the dataset.<sup>69</sup> The main points emerging from the dietary diversity and BMI analysis are:

- Farm production diversity, captured as an index of the area allocated to different crops, shows a significant non-linear relationship with dietary diversity. It shows that at very low levels, farm diversification reduces dietary diversity, but beyond a threshold, diversification has a strong positive influence on dietary diversity. This result is important, because it establishes the role of diversification beyond the “income and wealth effects” captured by the relevant variables. The relationship is robust for both head of household and spouse of head of household and across all specifications tried.
- This result needs to be interpreted carefully, however. As constructed, the production diversity index does not indicate the type of crops grown. Almost one-third of the sample is completely specialized in a single crop (that is, there is no diversification, with the index taking the value of zero), but the important detail to note is that this single cropped area is not all under rice. A breakdown of the sample by decile of the diversification index shows that the lowest decile (no diversification) group has the lowest average share of area under rice. A breakdown by decile of farm area also shows that the lowest decile households have the higher share of area under other crops (primarily vegetables, spices, potatoes, and a generic category of “cash crops”).
- A related robustness check to verify this conclusion statistically is to test for the impact of the area allocated to rice on dietary diversity. All results (not shown here) show a significant negative impact of rice area on dietary diversity, confirming that diversification out of rice is a priority for nutritional outcomes.
- Total assets, consumption expenditures per capita (a proxy for income), and also food expenditures per capita all have strong positive impacts on dietary diversity, as may be expected. Importantly, farming households show lower dietary diversity—not surprising, as many produce their own food, and the high concentration of area under rice has a strong influence on diets. Consistent with the income effects are the significant positive impacts of both domestic and international remittances.
- Other key policy variables are prices. High rice prices promote dietary diversity, while high prices for other foods reduce it. Again this result is not a surprise, but it reinforces the point that agricultural price policy has a widespread impact on nutritional outcomes.

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<sup>69</sup> The results reported here are without using district fixed effects, as their inclusion clouds the influence of some variables, but the main variables of interest give very similar results. To allow for potential endogeneity in dietary diversity with BMI, the two relationships are estimated simultaneously using the three-stage least squares procedure.

- The education level of women, at the secondary level, has a positive impact, as does a secondary-level education of the household head (although at a weaker level of significance).
- An important variable is own fish farming. The indicator shows a significant positive impact, indicating the potential importance of fish culture on dietary and nutritional outcomes.
- Turning now to the impact of dietary diversity on adult BMI, the results show a sharp difference between the impact for household head and spouses. Household heads or males show a strong and significant positive impact of dietary diversity, but they seem to be getting sufficient calories, as the indicator for calorie sufficiency is not significant. The results are the opposite for women. Dietary diversity is insignificant, but the indicator for calorie sufficiency is highly significant, implying that insufficient calorie intake is the primary problem facing women in determining their BMI. It is possible that once calorie requirements are met, dietary diversity may become significant, but that is only a conjecture at this point.
- Among the other determinants of adult nutritional outcomes, that is BMI, assets and total expenditure per capita (income) have a positive and significant influence.
- Among the non-agricultural determinants, improved toilet use is strongly and positively related to higher BMI, a highly significant result highlighting the importance of sanitation.
- Education levels matter for both heads and spouses. But interestingly as men get older they have lower BMIs, while women tend to have higher BMIs as they get older.
- Women's empowerment also has interesting results. Women working outside the home have a negative impact on heads' BMI but a positive impact on spouses' BMI.

In addition to confirming the relationships between agriculture, dietary diversity, and adult nutritional status, an important advantage of the BIHS is the information on the three key indicators of child (under-5) malnutrition. The main points from the estimates in Annex 6, Table A6.4 are:

- Both adults' BMI has a strong, significant, and consistently negative impact on child malnutrition. For both parents, higher BMIs significantly reduce the probability of the child being stunted, wasted, or being underweight. Direct area or agricultural production diversification has no influence, indicating that the main channel through which agriculture links to a child's malnutrition is through the parents' health status.
- The results also confirm the multi-sectoral nature of the malnutrition problem: WASH has a significant negative impact on stunting, but not on wasting and underweight. Improved toilets reduce stunting and underweight status.
- The impact of total household expenditure per capita (incomes) is significant and negative, confirming that income effects too matter. International remittances matter for wasting and underweight but are not significant for stunting.
- Mother's education matters (at different levels) for the different outcome indicators.

Overall the results show strong links between agricultural diversification and nutritional outcomes, a dimension that has often not featured enough in agricultural policy decision making.

## *Strategies for Food Security and Shared Prosperity: A Scenario Analysis*

Food and nutrition security remain high priorities in the development strategy of Bangladesh, but so do poverty reduction and shared prosperity. It is important to assess the complementarities and trade-offs implied by alternative development strategies with respect to these policy goals. Similar aggregate growth can be achieved through development strategies that focus on specific sectors, and within sectors on specific subsectors, each with differing implications for food and nutrition security. To understand the relative merits of the different possible strategies, a scenario analysis is undertaken using a dynamic computable general equilibrium (CGE) model for the Bangladesh economy. The CGE model uses the latest available Social Accounting Matrix (SAM) for 2007, updated to 2015. This approach allows for an examination of how real GDP per capita growth rates and various measures of food consumption and demand change over time under a range of possible future scenarios. A brief description of the CGE model is given in Annex 6, and the full description of the model and detailed results are in Ahmed, Gautam, and Raihan (2015).

The first scenario establishes the baseline with the TFP for each sector growing at an average annual rate of 2 percent until 2030.<sup>70</sup> In addition, counterfactual scenarios simulate TFP growth rate increases in individual sectors, representing strategies and policy interventions focused on specific (selected) sectors. At the broad sector level, the scenarios correspond to increases in TFP for agriculture, manufacturing, and services, along with a balanced scenario in which all sectors receive the same treatment. Within agriculture, strategic tradeoffs are considered by focusing on specific subsectors: rice, non-rice crops and forestry, livestock and poultry, and fisheries. In each of these scenarios, the TFP is accelerated by 3 percent to reflect the impact of a set of policies and interventions specifically focused on individual subsectors.

The eight counterfactual scenarios maintain the baseline TFP growth rates in all sectors. They differ in the following respects:

- i. **Rice-only acceleration:** Accelerate TFP growth rate of paddy and milling by 3 percent.
- ii. **Non-rice crops and forestry only acceleration:** Accelerate TFP growth rate of all crops and forestry, other than paddy and milling, by 3 percent.
- iii. **Livestock and poultry only acceleration:** Accelerate TFP growth rate of livestock and poultry by 3 percent.
- iv. **Fisheries-only acceleration:** Accelerate TFP growth rate of fisheries by 3 percent.
- v. **Agricultural acceleration:** Accelerate TFP growth rate of all agricultural subsectors by 3 percent.

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<sup>70</sup> Labor supply is assumed to grow at the same rate as the working-age population, and the skill composition of the labor supply remains constant. The growth of the working-age population is based on projections from the *United Nations World Population Projections 2012 Revision* (United Nations 2013). The constant skill composition assumption for the labor supply is a conservative assumption, given that the benefits of improved educational attainment over the next six years will not be seen clearly in the labor supply composition in the time horizon under consideration.

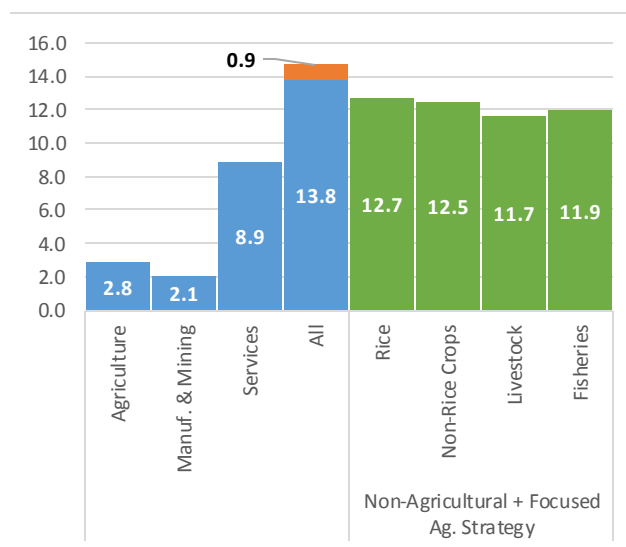
- vi. **Manufacturing acceleration:** Accelerate TFP growth rate of the manufacturing sectors by 3 percent.
- vii. **Services acceleration:** Accelerate TFP growth rate of the services sectors by 3 percent.
- viii. **Balanced acceleration:** Accelerate the TFP growth rate of all sectors by 3 percent.

In addition to those eight scenarios, four variants of the balanced acceleration scenario consider accelerating the non-agricultural sectors but only selectively focus on each of the four agricultural subsectors (similar to scenarios i to iv). The impact of alternative strategies in terms of the incremental GDP generated under each sector strategy scenario is summarized in Figure 6.3. The height of the bars represents the percentage difference in the aggregate GDP projected for 2030 for each scenario relative to the baseline outcomes.

In terms of aggregate growth, as intuition would suggest, the balanced growth strategy gives Bangladesh the fastest average annual per capita real GDP growth rate in the 2015–30 period, as shown by the highest incremental gains relative to any single sector strategy. Given the size of the sectors (the share of agriculture in GDP in the SAM is 23 percent, manufacturing is 13 percent, and services is 63 percent), the absolute gains in total GDP from a TFP shock of similar magnitude will always produce higher growth from the “larger” sectors. Clearly, agriculture alone is not a viable strategy to promote rapid aggregate growth. An equally important message from the simulation results in Figure 6.3 is that a balanced strategy is significantly superior to any single sector strategy, irrespective of the size of any sector (in the case of Bangladesh, the largest sector is services). Importantly, there is a synergy premium of almost 1 percent using a balanced strategy, more than a simple sum of the “parts” (that is, individual sector strategies) would indicate.

The same synergistic effect is observed when considering individual agricultural subsector scenarios. Figure 6.3 shows the simulation outcomes for scenarios with non-agricultural sectors all growing at an accelerated pace, but within agriculture the strategy is selectively applied to individual subsectors (rice, non-rice crops and forestry, livestock and poultry, and fisheries). All narrowly focused subsector strategies perform poorly relative to a balanced agricultural sector strategy. Again, the scale effect is visible, with the rice scenario having the highest aggregate impact on growth, reflecting the dominance of rice in Bangladeshi agriculture. Importantly, the non-rice crops and forestry scenario shows almost the same impact, clearly indicating that diversification out of rice is not likely to

**Figure 6.3: Incremental GDP gains from alternative scenarios in 2030 relative to the baseline (%)**



Source: Simulation results.

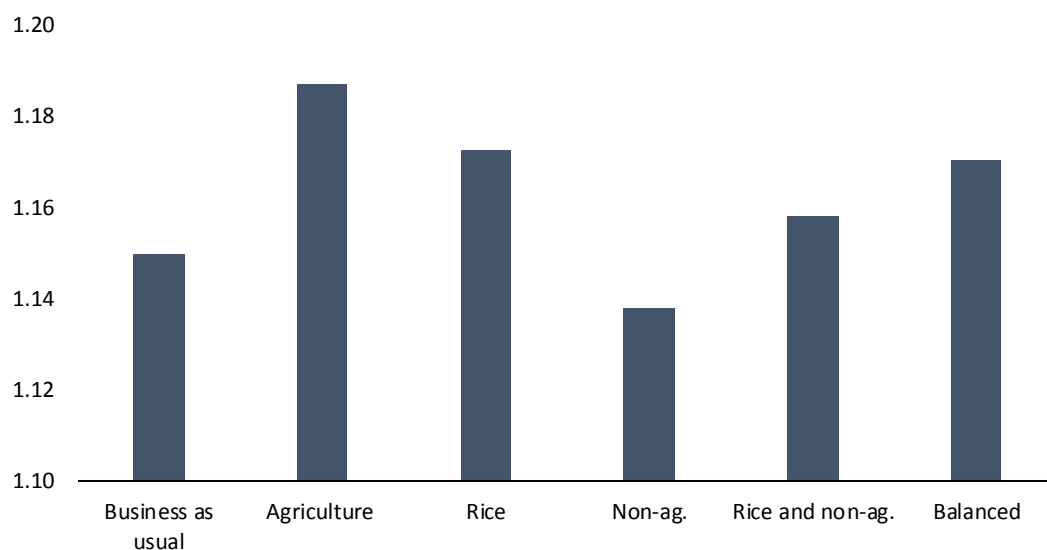


compromise growth as may be feared. Additionally it could improve the much-desired nutritional outcomes with an increase in more nutritious non-rice crops.

The simulation results provide important insights also into the pro-poor nature of alternative growth strategies, as well as into the likely implications of alternative strategies for food security and nutrition. Agricultural growth has the highest elasticity of both total and food consumption by households relative to growth originating in the non-agricultural part of the economy (Figure 6.4 and Figure 6.5). Within agriculture, productivity growth in rice has the largest impacts on total household consumption, given the dominant share of rice in the food basket (in terms of calories as well as expenditures).

These patterns are explained by two factors. First, agricultural strategies lead to lower food prices with positive impacts on welfare economy-wide. Increased supplies (with falling demand in the case of rice, given the negative income elasticity of rice) result in food prices falling, which especially benefits the poor. Second, improved productivity also helps to release factors (particularly labor) from agriculture, with positive ripple effects throughout the economy via factor markets. Within agriculture, higher rice productivity also pushes factors into other agricultural commodities, leading to relatively smaller price declines even for non-rice crops.

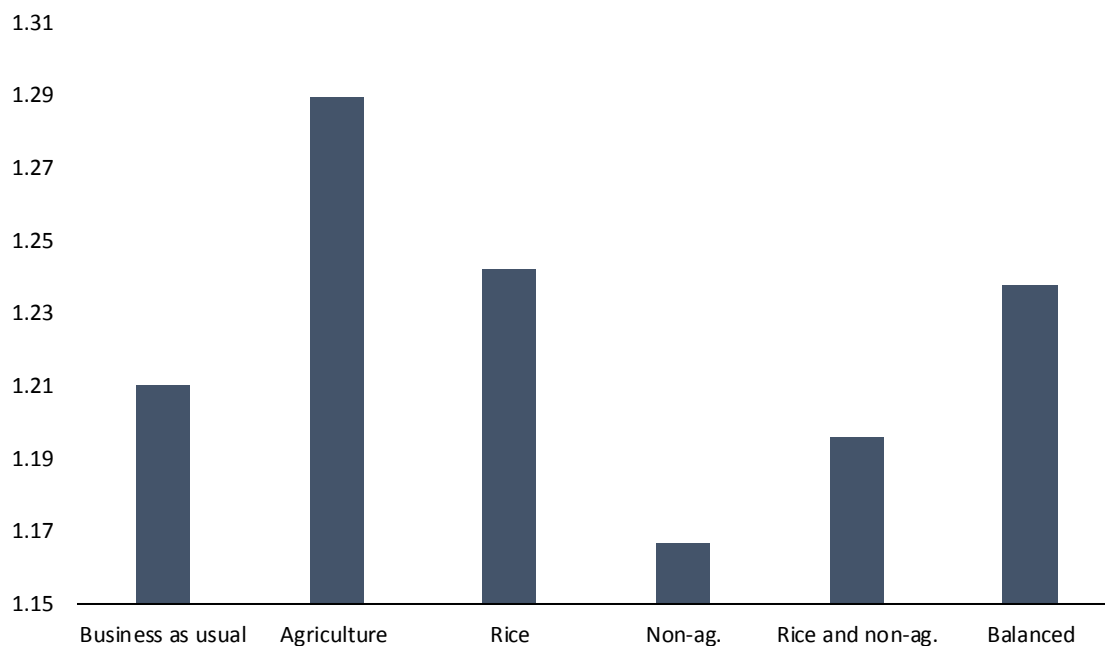
**Figure 6.4: Real GDP elasticity of household total consumption growth under different scenarios, 2015–30 (% point)**



Source: Simulation results.

Note: For a given scenario, the elasticity is determined by dividing the average annual consumption growth rate by the average annual real GDP growth rate. The non-rice crops and forestry, livestock and poultry, and fisheries acceleration scenarios have similar elasticities of 1.15–1.16.

**Figure 6.5: Real GDP elasticity of household food consumption growth under different scenarios, 2015–30 (%point)**



Source: Simulation results.

Note: For a given scenario, the elasticity is determined by dividing the average annual consumption growth rate by the average annual real GDP growth rate. The non-rice crops and forestry, livestock and poultry, and fisheries acceleration scenarios have similar elasticities of 1.22–1.23.

From a food and nutritional security perspective, the simulations have important implications for development strategy. Agriculture-focused strategies lead to faster consumption growth than non-agriculture strategies (see Table 6.4). Importantly, within agriculture, continuing to focus primarily on rice does not help as much with dietary diversity (in the form of demand and consumption of non-rice foods) as policies and strategies to promote diversification out of rice. The significant incremental impact on consumption patterns—with significant implications for nutritional outcomes—from a diversified agriculture and balanced overall growth strategy is more clearly brought out in Figure 6.6.

Importantly, food security traditionally defined in terms of rice consumption is not compromised by adopting a more diversified agriculture and balanced strategy (compared to the rice-only with non-agricultural growth strategy). At the same time, the consumption of more diverse, nutrient-rich foods shows a massive increase. The gains are significantly higher than even with an agriculture-only strategy, indicating that non-agricultural growth, along with agricultural growth, needs to be a priority for promoting nutritional outcomes. These trends reflect the trends in prices for various foods, leading to important shifts in the demand for non-rice and more nutrient-rich foods (see Annex 6, Table A6.1 and Table A6.2). The outcomes from the non-agricultural sector acceleration and non-agricultural sector acceleration along with continuing rice productivity improvements result in predictable impacts, highlighting the importance of continuing to focus on agriculture, with a shift toward non-rice food sectors.

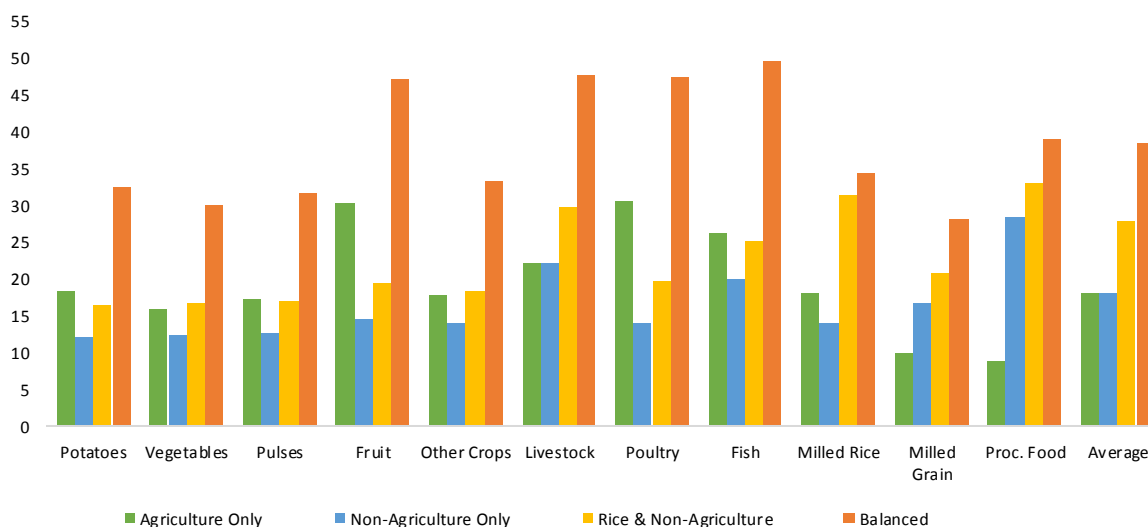
**Table 6.4: Simulated average annual growth in household food consumption, 2015–30 (%)**

	Baseline	Agric.	Rice	Non-rice crops	Live-stock	Fisheries	Non-ag.	Rice and non-ag.	Balanced
Potatoes	4.8	5.5	5.0	5.3	4.9	4.9	5.3	5.4	5.9
Vegetables	4.7	5.3	4.9	5.1	4.8	4.7	5.1	5.3	5.7
Pulses	4.8	5.4	4.9	5.2	4.8	4.8	5.2	5.4	5.8
Fruit	5.9	6.7	6.0	6.6	5.9	5.9	6.3	6.4	7.2
Other crops	5.1	5.6	5.2	5.5	5.1	5.1	5.5	5.7	6.1
Livestock	5.9	6.5	6.1	6.0	6.2	5.9	6.5	6.7	7.2
Poultry	5.9	6.8	6.0	6.1	6.4	5.9	6.3	6.5	7.2
Fish	6.0	6.7	6.1	6.0	6.0	6.5	6.6	6.7	7.3
Milled rice	5.0	5.6	5.5	5.0	5.0	5.0	5.5	6.0	6.1
Milled grain	4.7	5.0	4.8	4.8	4.7	4.7	5.2	5.4	5.6
Proc. food	5.4	5.7	5.5	5.5	5.4	5.4	6.3	6.4	6.6
<i>Average</i>	<i>5.3</i>	<i>5.9</i>	<i>5.6</i>	<i>5.4</i>	<i>5.4</i>	<i>5.4</i>	<i>5.9</i>	<i>6.1</i>	<i>6.4</i>

Source: Simulation results.

Note: The average is the weighted average.

**Figure 6.6: Incremental changes in consumption of various foods relative to baseline under alternative growth scenarios (%)**



Source: Simulation results.

## Conclusions and Implications

Prospects for agricultural growth are closely linked to prospects for food security and nutrition. A legitimate question to ask at this juncture of Bangladesh's agricultural transformation is what might happen to food and nutrition security if the focus of development policy and strategy shifts more toward diversification, with an emphasis on income growth.

Fortunately the trade-off appears to be less of an issue now than in the past, when self-sufficiency in rice was the overarching imperative. Projections indicate that the future supply of rice relative to demand is unlikely to be a major concern, and that the supply of other food groups needs to grow significantly faster than in the past. Importantly, the scope for improving yields is substantial given current yield gaps, especially for aman and aus rice. With a continued focus on agricultural research to push the production frontier forward and to build agriculture's resilience to climate and biophysical stress, there is significant potential to release land for much-needed crop diversification.

A more immediate policy priority is to achieve better nutritional outcomes. Malnutrition rates remain high and have serious human development and economic impacts. As noted, intuitively it can be argued that what happens *to* agriculture is important to sustaining food security, and what happens *in* agriculture matters for improving nutritional outcomes. Clearly, nutritional security is a complex, multi-sectoral challenge, with many contributory factors, among which agriculture is prominent. At the same time, however, a better understanding must be developed of the pathways through which agriculture influences nutritional outcomes.

A major concern in Bangladesh is the lack of sufficient dietary diversity in the average person's (and especially the poor person's) daily consumption, which is often traced back to agricultural diversification—that is, the availability of a diverse range of affordable food. These concerns are validated by demonstrating three links along the agriculture-nutrition causal chain (pathway). One is the relationship between diversity in agricultural production and diversity in diets (measured as the Simpson index of calorie consumption from different sources of foods). Given the high percentage of rural households that farm and consume a significant share of their own production, the hypothesis is that production patterns matter for consumption patterns. The second link is the subsequent impact of dietary diversity on household nutritional outcomes. For adults, the key outcome assessed is the impact of dietary diversity on parental BMI (with the household head presumed to be the father and spouse presumed to be the mother for most households). For children, the major nutritional outcomes are the standard anthropometric indicators for under-5 stunting, wasting, and being underweight. So to close the link between agriculture and child malnutrition, the third link considered is the impact of parental BMI (along with the direct impact of dietary diversity) on the child nutritional outcome indicators.

The analysis confirms the presumed positive impacts of income (and wealth) on dietary diversity. Beyond this “income effect,” the multi-sectoral nature of the nutrition problem is highlighted by the impact of sanitation (particularly the prevalence of improved toilets) on nutritional outcomes of both adults and children under 5 (for stunting and underweight but not for wasting). Women's education and empowerment (captured as women in the household working outside of the home) also significantly improve women's nutritional status.

In addition to these factors, agriculture is found to play an important role in improved nutritional outcomes. The first link in this causal chain is through consumption diversity. This influence works

through three channels. First, the overall policy framework is critical, as it affects the relative prices of different foods. As predicted by standard micro-economic theory, higher rice prices increase dietary diversity and higher non-rice prices reduce it. Second, higher agricultural (production) diversification has a strong positive effect on consumption diversity. Third, own fish production has a positive impact on consumption diversity (although the same cannot be said for livestock production).

The second link in the chain is between agriculture and adult nutrition (using BMI as a proxy), but in this case the impact differs for men and women (household head and spouse, respectively). Men's BMI is affected significantly positively through dietary diversity (household calorie consumption per capita is not significant). Female BMI, however, is responsive to the index of calorie intake but not to dietary diversity, suggesting that for women, overcoming basic calorie deficiency (or hunger) seems to be a more immediate problem. Once it is addressed, perhaps dietary diversity would become as important a factor as for men.

Finally, the results on children's nutritional outcomes establish that the main channel through which agriculture affects under-5 malnutrition is through the parental BMI. Both parents' BMIs have strong impacts in reducing wasting, stunting, and underweight. The direct impact of production diversity is not found to be significant. Household dietary diversity directly affects only children's underweight problem, but the statistical impact is found to be weakly significant. Higher incomes reduce the probability of all three problems, as expected. Sanitation is also found to be important for stunting and underweight but not for wasting.

The scenario analysis using a general equilibrium model confirms that a diversified agricultural strategy is more beneficial for improving nutritional outcomes. It shows that among single sector strategies, an exclusive non-agricultural focus would generate higher aggregate growth, which is to be expected given the relative size of agriculture in the overall economy. However, the analysis also shows that a balanced strategy is far superior to any individual sector strategy, with the added bonus of a synergistic premium (that is, growth in excess of the sum of individual sector strategies) equivalent to almost 7 percent additional GDP growth.

In terms of the pro-poor nature of alternative strategies, the results show agricultural growth to have the highest elasticity of both total and food consumption by households relative to growth originating in the non-agricultural parts of the economy. A balanced strategy (one that simultaneously pursues agricultural and non-agricultural growth) would result in elasticities that are similar to those of the agriculture-focused approaches, while yielding substantially higher GDP growth. The balanced strategy also provides higher elasticities of total and food consumption than any non-agriculture-focused strategy alone. Within agriculture, productivity growth in rice has the largest impact on total household consumption by lowering rice prices, given the dominant share of rice in the food basket (in terms of calories as well as expenditures). For sustaining food security and economy-wide real welfare gains (through lower food prices), rice productivity therefore remains important. For promoting dietary diversity (the consumption of non-rice foods) and by

association nutritional outcomes, a balanced strategy with an agriculture strategy that pursues both rice and the nutrient-dense non-rice crops, livestock, and fisheries does significantly better.

The main implications of the analysis are as follows:

- Promoting agricultural diversification will have a strong influence on nutritional outcomes and needs to be at the center of the agricultural development strategy going forward. The situation with respect to food security, specifically in terms of rice, is reasonably comfortable and can be maintained through improved productivity of aman and aus rice. Increased aman production, in which Bangladesh has a comparative advantage, will help release land from boro rice for more nutrient-rich crops, especially horticulture. Removing policy and institutional distortions that affect relative prices of food commodities and constrain farmers' decisions on diversification are a high priority for better nutritional outcomes, along with improved sanitation.
- Bangladesh has a good track record on progress in women's empowerment. The striking result that women's BMI is affected more by increased calories per capita instead of dietary diversity suggests the presence of a more basic undernutrition challenge for women (owing to insufficient calorie intake) and calls for a redoubling of efforts to overcome the remaining problems of women's hunger, health, and empowerment.
- The simulation results clearly show that food security traditionally defined in terms of rice consumption is not compromised by adopting a more diversified agriculture and balanced strategy (compared to an exclusive focus on rice, with or without a simultaneous focus on a non-agricultural growth strategy).
- Finally, the general equilibrium scenario analysis clearly demonstrates the superiority of a balanced strategy for more pro-poor growth, food security, and better nutritional outcomes. In other words, for faster poverty reduction and shared prosperity, pursuing a broad-based agricultural growth strategy needs to be a priority along with promoting non-agricultural growth.

## References

- Ahmed, S.A., M. Gautam and S. Raihan. 2015. "Strategies for Food Security and Shared Prosperity." Background paper for "Dynamics of Rural Growth in Bangladesh," Agriculture Global Practice, World Bank, Washington, DC.
- BBS (Bangladesh Bureau of Statistics). Various years. Reports on Household Income and Expenditure Survey (HIES) for 2000, 2005, and 2010. Dhaka.
- Decaluwé, B., A. Lemelin, H. Maisonnave, and V. Robichaud. 2010. The PEP Standard Computable General Equilibrium Model Single-Country, Recursive Dynamic Version: PEP-1-t. Partnership for Economic Policy (PEP) Research Network.
- Hossain, M., and U. Deb. 2011. "Crop Agriculture and Agrarian Reforms in Bangladesh: Present Status and Future Options." In Volume 2 of *Sixth Five Year Plan of Bangladesh 2011–2015, Background Papers*, edited by M.K. Mujeri and S. Alam. Dhaka: Planning Commission.

- IFPRI (International Food Policy Research Institute). 2013. Bangladesh Integrated Household Survey (BIHS), 2011 – 2012. Dataset. Washington, DC.
- Talukder, R.K., F. Alam, M. Islam, and A.R. Anik. 2015. “Seventh Five Year Plan Preparation Background Paper on Food Security and Nutrition.” Planning Commission, Dhaka.
- United Nations. 2013. *World Population Prospects: The 2012 Revision*. <http://www3.unog.ch/web/hlcm/inventory/dataset/world-population-prospects-2012-revision>.
- Yu, W., M. Alam, A. Hassan, A.S. Khan, A. Ruanne, C. Rosenzweig, D. Major and J. Thurlow. 2010. *Climate Change Risks and Food Security in Bangladeshi*. London: Earthscan.
- Zakir Hussain, A.M., M.Q.K. Talukder, and A. Ahmed. 2015. “Nutrition Background Paper for the Preparation of the Seventh Five Year Plan.” Planning Commission, Dhaka.

## Annex 6: Detailed Results on Agriculture-Nutrition Linkages and the Scenario Analysis Model

### Selected results

Table A6.1: Share of food expenditure by food group and income quintile (BIHS 2011-12)

Food expenditure category	Aggregate	First	Second	Third	Fourth	Fifth
Cereals	40.7	45.6	42.6	42.3	39.1	34.1
Pulses and cooking oil	8.3	8.5	8.3	8.3	8.3	8.2
Vegetables and fruits	16.4	16.5	15.7	16.1	16.4	17.2
Milk and meat	7.8	4.7	6.9	7.4	8.5	11.7
Fish	12.1	10.7	12.1	11.3	12.6	13.7
Spice and beverage	5.0	5.5	5.1	4.9	4.9	4.6
Sugar and other	9.7	8.5	9.4	9.7	10.2	10.6

Table A6.2: Compensated price elasticity of food demand (BIHS 2001–12)

Commodity group	Cereals	Cooking oil	Protein	Vegetables and fruits	Spices	Beverages, sugar, others
Cereals	-0.557	0.942	0.204	0.152	0.038	0.202
Cooking oil	0.410	-0.655	0.214	0.155	-0.111	0.092
Protein	0.401	-0.066	-0.803	0.152	0.060	0.100
Vegetables and fruits	0.403	-0.163	0.208	-0.814	0.025	0.118
Spices	0.406	0.111	0.219	0.156	-0.239	0.043
Beverages, sugar, others	0.432	-0.659	0.216	0.174	-0.129	-1.009

Note: Elasticities estimated from an Almost Ideal Demand System Specification.



**Table A6.3: Determinants of dietary diversity and body mass index (BMI) in Bangladesh (BIHS, 2011–12)**

Regressors	Dietary diversity	Household head BMI	Dietary diversity	Spouse BMI
Agricultural diversification	-0.281*** (-3.43)		-0.290*** (-3.51)	
Agricultural diversification squared	0.529*** (4.15)		0.539*** (4.21)	
Dietary diversity (log)		1.577*** (4.06)		-0.159 (-0.37)
Total calories/capita (log)		-0.065 (-0.39)		0.475** (2.29)
Household assets (log)	0.026*** (7.00)	0.319*** (8.35)	0.029*** (7.66)	0.363*** (7.94)
Domestic remittances/capita (log)	0.001*** (3.73)		0.001*** (3.19)	
Foreign remittances/capita (log)	0.002*** (4.05)		0.001*** (2.53)	
Rice price (log)	0.018*** (2.64)		0.014** (2.15)	
Other food price (log)	-0.305*** (-22.86)		-0.311*** (-23.14)	
Food expenditures/capita	0.130*** (8.62)		0.036*** (14.24)	
Total expenditures/capita	0.222*** (22.41)	0.148** (2.03)	0.191*** (17.97)	0.441*** (2.76)
Farming household (binary)	-0.045*** (-3.31)		-0.034*** (-2.49)	
Distance to market (log)	-0.001 (-1.44)		-0.001 (-1.25)	
Distance to public health facilities (log)		-0.007 (-1.44)		-0.009 (-1.25)
Prevalence of community toilets (village share)		8.20 (1.06)		-10.988* (-1.67)
Prevalence of improved toilets (village share)		7.853*** (4.12)		0.732** (2.05)
Household size (log)	0.167*** (5.16)	0.354*** (2.68)	0.517*** (11.70)	0.414** (2.49)
Marital status (married=1)	0.052*** (3.44)	0.327** (2.12)	0.052*** (3.25)	0.526*** (2.70)
Religion (Muslim=1, binary)	-0.071*** (-5.53)	0.333*** (2.50)	-0.065*** (-5.14)	0.003 (0.02)
Language (Bengali=1, binary)	0.232*** (2.69)	-1.402 (-1.56)	0.186*** (2.27)	-0.513 (-0.51)
Ethnicity (Bengali=1, binary)	-0.066 (-0.81)	0.792 (0.93)	-0.043 (-0.55)	1.091 (1.12)
Literacy of HH head (binary)	0.038*** (3.45)	0.420*** (3.63)	0.038*** (3.38)	-0.236 (-1.53)
Age of HH head (years, log)	0.019 (1.30)	-0.365*** (-2.56)	0.016 (1.04)	1.139*** (6.51)
HH head education: Primary (binary)	0.003 (0.25)	0.205* (1.81)	0.070 (0.63)	-0.241* (-1.78)

HH head education: Secondary (binary)	0.009*	-0.029	0.007	0.166**
	(1.67)	(-0.50)	(1.11)	(2.43)
HH head education: Tertiary (binary)	0.021	0.125	0.021	-0.393*
	(1.48)	(1.28)	(1.42)	(-2.27)
Spouse education: Primary (binary)	0.019	-0.757***	0.007	2.581***
	(1.20)	(-4.78)	(0.41)	(12.57)
Spouse education: Secondary (binary)	0.063***	-0.278***	0.050***	3.168***
	(3.74)	(-1.69)	(2.76)	(14.75)
Spouse education: Tertiary (binary)	-0.009	-0.952***	-0.029	2.267***
	(-0.55)	(-6.00)	(1.09)	(10.89)
Women work outside of home (binary)	0.004	-0.286***	-0.005	0.366***
	(0.51)	(-3.46)	(-0.06)	(3.76)
Share of non-farm income in HH income	-0.020		0.108	
	(-0.57)		(1.31)	
Own non-milk animals (binary)	-0.0004		0.001	
	(-0.04)		(0.06)	
Own fish pond (binary)	0.033***		0.026**	
	(3.05)		(2.41)	
Own milking animal (binary)	0.0001		0.002	
	(0.01)		(0.20)	
Age 6-10 (binary)	0.003		0.004	
	(0.29)		(0.44)	
Age 0-5 (binary)	0.052***		0.059***	
	(5.27)		(5.94)	
Home garden: Spices (binary)	-0.017		-0.014	
	(-1.48)		(-1.21)	
Home garden: Vegetables (binary)	-0.001		-0.002	
	(-0.08)		(-0.23)	
Home garden: Fruits (binary)	-0.014		-0.010	
	(-1.30)		(-0.89)	
Time of interview: 1	-2.983	19.441***	-3.556***	-0.473
	(-1.22)	(8.35)	(-23.87)	(-1.00)
Time of interview: 2	-3.022	19.402***	-3.588***	-0.707*
	(-1.45)	(8.29)	(14.17)	(-1.60)
Time of interview: 3	-3.001	18.394***	-2.558***	-0.776*
	(-1.44)	(7.27)	(-12.33)	(-1.76)
Time of interview: 4	-3.034	19.473***	-3.023***	-0.810*
	(-2.224)	(6.17)	(-14.45)	(-1.83)
Constant	-12.556***	-6.982***	-15.227***	0.081
	(-4.55)	(-8.55)	(-9.44)	(0.98)
R <sup>2</sup>	0.36	0.12	0.38	0.14
Observations	5364	5364	5181	5181

Notes: Estimates are based on three-stage least squares methodology to account for potential endogeneity of dietary diversity index in the BMI equations. Estimates reported are without using district fixed effects. Results for key variables of interest do not change with the inclusion of district fixed effects, with the exception of remittances and the binary indicator for farming households, which both become insignificant.

**Table A6.4: Determinants of nutritional outcomes in Bangladesh with and without fixed effects (BIHS 2011–12)**

Regressors	Wasting (fixed effects)	Wasting (no fixed effects)	Stunting (fixed effects)	Stunting (no fixed effects)	Underweight (fixed effects)	Underweight (no fixed effects)
Dietary diversity (logs)	0.132 (0.98)	0.137 (1.15)	0.098 (0.98)	0.038 (0.42)	0.174* (1.69)	0.153* (1.63)
BMI of mother	-0.025** (-2.00)	-0.023** (-1.96)	-0.024*** (-2.68)	-0.024*** (-2.78)	-0.027*** (-2.86)	-0.027*** (-3.03)
BMI of father	-0.061*** (-4.01)	-0.057*** (-3.96)	-0.029*** (-2.72)	-0.030*** (-2.98)	-0.042*** (-3.69)	-0.045*** (-4.16)
WASH (binary)	0.047 (0.49)	0.063 (0.70)	-0.287*** (-4.04)	-0.246*** (-3.56)	-0.068 (-0.92)	-0.052 (-0.72)
Community toilets (village share)	-0.174 (-0.27)	0.637 (1.39)	0.581 (1.14)	0.089 (0.24)	-0.555 (-1.01)	-0.593 (-1.48)
Improved toilets (village share)	-0.265 (-1.11)	-0.125 (-0.73)	-0.389** (-2.26)	-0.091 (-0.71)	-0.409** (-2.27)	-0.192 (-1.43)
Distance to public health facility (log)	-0.014 (-1.57)	-0.017** (-2.03)	0.004 (0.50)	0.005 (0.70)	-0.008 (-1.06)	-0.010 (-1.36)
Distance to market (log)	0.0004 (0.08)	0.002 (0.34)	-0.001 (-0.21)	-0.001 (-0.28)	0.001 (0.36)	0.002 (0.69)
Age of HH head (years, log)	-0.2590 (-1.55)	-0.240 (-1.58)	-0.044 (-0.36)	-0.060 (-0.52)	-0.103 (-0.81)	-0.090 (-0.75)
Household size (log)	0.965** (1.96)	0.487 (1.07)	0.319 (0.88)	0.508 (1.50)	0.643* (1.67)	0.565 (1.59)
Age of children under 5 (months)	0.001 (0.31)	0.001 (0.36)	0.001 (0.58)	0.001 (0.64)	0.006*** (2.66)	0.006*** (2.66)
Rice price (log)	-0.050 (-0.75)	-0.069 (-1.10)	0.017 (0.37)	0.027 (0.63)	-0.008 (-0.16)	-0.011 (-0.25)
Other food price (log)	-1.22e-06 (-0.02)	-0.000 (-0.60)	-0.000 (-1.53)	-0.0001 (-1.18)	-0.000 (-0.62)	-0.000 (-0.60)
Household assets (log)	0.039 (1.02)	0.036 (1.05)	-0.019 (-0.68)	-0.040 (-1.51)	-0.032 (-1.07)	-0.047* (-1.69)
Total expend./capita (log)	-0.245** (-1.97)	-0.187* (-1.63)	-0.310*** (-3.48)	-0.232*** (-2.77)	-0.321*** (-3.36)	-0.268*** (-2.99)
Food expend./capita (log)	0.489 (1.44)	0.210 (1.02)	0.148 (0.60)	0.197 (0.84)	0.360 (1.36)	0.277 (1.10)
Health expend./capita (log)	0.019 (0.97)	0.004 (0.22)	0.003 (0.20)	0.011 (0.76)	0.014 (0.84)	0.015 (1.03)
Ag. diversification	0.167 (0.73)	0.210 (1.02)	0.263 (1.48)	0.156 (0.96)	0.007 (0.04)	-0.065 (-0.38)
Marital status (Married=1)	-0.328* (-1.73)	-0.297* (-1.69)	0.153 (1.02)	0.112 (0.77)	-0.002 (-0.01)	-0.023 (-0.15)
Religion (Muslim=1)	-0.311** (-2.36)	-0.199* (-1.74)	-0.030 (-0.28)	-0.088 (-0.95)	0.020 (0.19)	-0.073 (-0.77)
Language (Bengali=1)	-1.196 (-1.41)	-0.987 (-1.12)	0.533 (0.59)	0.0478 (0.54)	0.625 (0.72)	0.649 (0.75)
Ethnicity (Bengali=1)	-0.094 (-0.12)	0.119 (0.14)	1.081 (1.39)	1.052 (1.40)	-0.102 (-0.14)	-0.007 (-0.01)
Literacy of father (binary)	-0.148 (-1.47)	-0.139 (-1.44)	0.018 (0.24)	0.007 (0.10)	-0.196*** (-2.48)	-0.186** (-2.43)

Literacy of mother (binary)	-0.364*** (-3.72)	-0.288*** (-3.11)	0.058 (0.71)	0.068 (0.85)	0.053 (0.69)	0.057 (0.77)
Father's education: primary (binary)	-0.110 (-1.07)	-0.112 (-1.15)	0.067 (0.90)	0.067 (0.94)	0.025 (0.31)	0.021 (0.28)
Father's education: Secondary (binary)	-0.094 (-1.58)	-0.044 (-0.79)	-0.036 (-0.84)	-0.047 (-1.15)	0.004 (0.10)	0.016 (0.37)
Father's education: Tertiary (binary)	-0.301 (-0.86)	-0.169 (-0.52)	0.021 (0.09)	0.082 (0.36)	-0.504* (-1.69)	-0.409 (-1.40)
Mother's education: Primary (binary)	-0.011 (-0.10)	-0.035 (-0.34)	0.059 (0.71)	0.068 (0.85)	0.025 (0.29)	0.010 (0.13)
Mother's education: Secondary (binary)	0.285 (0.95)	0.322 (1.16)	-0.613** (-2.22)	-0.619** (-2.35)	-0.423 (-1.39)	-0.463 (-1.54)
Mother's education: Tertiary (binary)	-0.117 (-0.22)	-0.155 (-0.31)	-0.289 (-0.78)	-0.393 (-1.09)	-0.520 (-1.03)	-0.599 (-1.20)
Mother works outside home (binary)	-0.056 (-0.66)	-0.119* (-1.63)	-0.054 (-0.85)	-0.068 (-1.23)	-0.044 (-0.67)	-0.603 (-1.04)
Mother works in urban sector (binary)	0.040 (0.07)	0.152 (0.26)	0.044 (0.10)	0.056 (-0.13)	0.218 (0.49)	0.170 (0.39)
Father works in urban sector (binary)	-0.275 (-1.43)	-0.169 (-1.28)	0.216** (2.16)	0.153* (1.63)	0.130 (1.21)	0.119 (1.22)
Domestic remit./capita (log)	0.0001 (0.04)	0.001 (0.22)	-0.002 (-0.57)	-0.002 (-0.63)	-0.004 (-1.22)	-0.004 (-1.19)
International remit./capita (log)	-0.020*** (-3.30)	-0.020*** (-3.40)	0.005 (1.35)	0.005 (1.35)	-0.007* (-1.66)	-0.008** (-1.97)
Time of interview: 1	-0.337 (-0.79)	-0.254 (-0.94)	0.613* (1.64)	0.767*** (2.70)	0.499 (1.35)	0.376 (1.40)
Time of interview: 2	-0.655 (-1.62)	0.614** (-2.47)	0.721** (2.05)	0.898*** (3.36)	0.383 (1.10)	0.315 (1.26)
Time of interview: 3	-0.663* (-1.67)	-0.664*** (-2.67)	0.681** (1.96)	0.870*** (3.26)	0.260 (0.76)	0.255 (1.02)
Time of interview: 4	-0.578 (-1.55)	-0.571* (-2.28)	0.733** (2.20)	0.805*** (3.00)	0.365 (1.12)	0.312 (1.24)
Constant	3.146* (1.80)	3.942*** (2.56)	1.790 (1.21)	0.497 (0.37)	2.718* (1.85)	2.385* (1.83)
Log Likelihood	-783	-822	-1502	-1555	-1383	-1420
Observations	2362	2362	2362	2362	2362	2362

## ***The Bangladesh Dynamic Computable General Equilibrium Model and Additional Results***

The Bangladesh dynamic CGE (BGDDyn CGE) model is built using the Partnership for Economic Policies (PEP) standard recursive dynamic CGE model (Decaluwé et al. 2010). Because a majority of CGE models are static in nature and cannot account for growth effects, they are inadequate for long-run analysis of economic policies or shocks to the economy. By excluding accumulation effects, they do not allow the study of the transition path of an economy, where short-run policy impacts are likely to be different from those of the long run. A sequential dynamic CGE model is used to overcome this limitation. The model links a series of static CGE models between periods by updating exogenous and endogenous variables. Capital stock is endogenously updated with a capital accumulation equation, whereas population (and total labor supply) is updated exogenously between periods.

A detailed description of the BGDDyn model, with the static and dynamic modules of the model and model equations, can be found in Ahmed, Gautam, and Raihan (2015). Briefly, the static model presents the behavior of the economic agents in the economy, whereas the dynamic model shows the transition path of the economy due to any external shock. The BGDDyn CGE model uses the latest available Social Accounting Matrix (SAM) of Bangladesh (for the year 2007). The SAM has 4 types of accounts: (1) production activity and commodity accounts for 32 sectors; (2) 4 factors of production with 2 types of labor and 2 types of capital; (3) current account transactions between 4 main institutional agents: household-members and unincorporated capital, corporation, government, and the rest of the world; and (4) a consolidated capital account to capture the flows of savings and investment. The activities, commodities, factors, and institutions in the SAM are given in Table A6.5. For simulation results, see Tables A6.6–A6.7.

**Table A6.5: Description of the Bangladesh 2007 Social Accounting Matrix**

Set	Description of elements
Commodities (32)	
Agriculture (12)	Paddy Cultivation, Wheat Cultivation, Other Grain Cultivation, Potato Cultivation, Vegetable Cultivation, Pulses Cultivation, Fruit Cultivation, Other Crop Cultivation, Livestock Rearing, Poultry Rearing, Fishing, Forestry
Industry (10)	Rice Milling, Grain Milling, Food Process, Manufactured Goods-Rural, Manufactured Goods-Urban, Petroleum, Construction-Rural, Construction-Urban, Electricity and Water Generation, Mining and Gas
Services (10)	Trade-Rural, Trade-Urban, Transport-Rural, Transport-Urban, Housing Service, Health Service, Education Service, Public Administration and Defense, Services -Rural, Services-Urban
Factors of Production (4)	
Labour (2)	Labour Unskilled, and Labour Skilled
Capital (2)	Capital and Land
Current Institutions (11)	
Households (7)	Rural: landless, marginal farm, small farm, large farm, non-farm day labor, non-farm others Urban: Households with low educated heads, and households with high educated heads
Others (3)	Government, Corporation and Rest of the World
Capital Institution (1)	

**Table A6.6: Simulated change in local prices of food in agricultural scenarios, 2015–30 (annual change, %)**

	Business as usual	Agricultural acceleration	Rice-only acceleration	Non-rice crops and forestry acceleration	Livestock and poultry acceleration	Fisheries acceleration
Potato	-0.22	-0.63	-0.13	-0.78	-0.20	-0.18
Vegetables	-0.19	-0.54	-0.10	-0.68	-0.17	-0.15
Pulses	-0.27	-0.66	-0.18	-0.79	-0.26	-0.23
Fruit	-0.30	-0.78	-0.21	-0.93	-0.28	-0.26
Other crop	0.32	0.00	0.41	-0.15	0.35	0.35
Livestock	-0.21	-0.44	-0.19	-0.18	-0.53	-0.17
Poultry	-0.24	-0.71	-0.17	-0.35	-0.70	-0.21
Fishing	-0.35	-0.68	-0.26	-0.29	-0.33	-0.85
Milled rice	-0.16	-0.50	-0.63	-0.10	-0.14	-0.13
Milled grain	0.28	0.30	0.38	0.14	0.30	0.31
Processed food	0.07	0.22	0.16	0.08	0.08	0.08
Average	-0.10	-0.40	-0.09	-0.37	-0.12	-0.10

Source: Simulation results.

Note: The average is the unweighted average of the growth rates in the price.

**Table A6.7: Simulated change in local prices of food in non-agricultural scenario, 2015–30 (annual change, %)**

	Business as usual	Non-agricultural acceleration	Rice and non-agricultural acceleration	Balanced acceleration
Potato	-0.22	0.09	0.17	-0.34
Vegetables	-0.19	0.58	0.1	-0.28
Pulses	-0.27	0.55	0.03	-0.40
Fruit	-0.30	0.09	-0.08	-0.36
Other crop	0.32	0.08	0.82	0.43
Livestock	-0.21	0.01	-0.06	-0.27
Poultry	-0.24	0.11	0.2	-0.29
Fishing	-0.35	0.75	-0.21	-0.44
Milled rice	-0.16	0.17	0.54	-0.25
Milled grain	0.28	-0.10	0.05	0.36
Processed food	0.07	-0.24	0.1	0.09
Average	-0.10	0.10	1.1	-0.13

Source: Simulation results.

Note: The average is the unweighted average of the growth rates in the price.

## 7 Priority Areas for Action

This study has approached the challenge of promoting growth, particularly rural growth, through an examination of the nature, dimensions, and drivers of rural poverty. The analysis has documented recent changes in the rural economy, identified key drivers of emerging trends, and assessed the implications of those changes for future growth, poverty reduction, food security, and nutrition. This concluding chapter briefly lists the areas of highest priority for policy and strategy to strengthen and sustain an environment that enables more rapid growth and poverty reduction.

- 1) ***A balanced development strategy.*** A development strategy that stresses both farm and non-farm growth and at the same time pursues a diversified strategy within agriculture itself (favoring no agricultural subsector over others), is superior to alternative sector-specific strategies in all dimensions of development: pursuing growth, furthering the gains in poverty reduction, reducing economic vulnerability, maintaining food security, and promoting better outcomes in nutrition.
- 2) ***More rapid diversification in agriculture—with carefully balanced attention to rice.*** Within agriculture, diversification into high-value agriculture (non-crop agriculture and crops other than rice) is a priority, but it is important to neither neglect nor overemphasize the rice sector. Consolidating the prospects for rice is important and is eminently feasible, through an approach that emphasizes exploiting the remaining yield gaps, investing in traditional and non-traditional technologies (planting hybrids and responsibly realizing the potential of biotechnology), and leveraging the private sector to move the current technology frontiers. This approach will safeguard past achievements while injecting new momentum into productivity growth, and it will be critical in building resilience to potential climate change impacts. Strategic priorities include improving aman rice yields and freeing up the more suitable boro areas for a diverse range of high-value and more sustainable crops, and giving greater attention to various aspects of developing the high-value crop, livestock, poultry, and fisheries subsectors.
- 3) ***Further improving the policy framework and rebalancing public expenditure priorities.*** At the macro level, policy distortions protecting the non-farm economy remain and create an implicit anti-agriculture domestic bias. The main issues are analyzed in the Diagnostic Trade Integration Study by the World Bank, which also identifies key actions to address them. Among sectoral policies, a careful review is warranted to assist farmers in pursuing economically and ecologically optimal use of inputs. Evidence indicates that significant wastages (with large environmental and health costs) are associated with the overuse of chemical fertilizers, which may be due to insufficient technical knowledge or inappropriate incentives. Rationalizing public expenditures to emphasize investments in research (with increased attention to non-rice crops, livestock, and fisheries), extension services, markets, and infrastructure will help to enhance incomes, value-chain efficiencies, and competitiveness.

Finally, removing the remaining regulatory and institutional constraints to private sector participation in the seed sector will have a large potential payoff.

- 4) ***An enabling environment for robust rural non-farm growth and more efficient value chains.*** For rural non-farm growth, especially the growth of business enterprises, the empirical analysis reaffirms the essential role of the enabling environment. Access to finance, power, and roads are critical elements of this environment, along with better access to technology and information, and the removal of business environment barriers, such as those influencing terms of trade, discriminatory taxes, and stifling regulations. Value-chain analyses highlight the importance of focusing on food safety standards and modern market infrastructure, given the large share of rural non-farm enterprises that pursue activities related to agriculture (such as trading and processing). The value-chain analyses also clearly show that agricultural markets are functioning quite efficiently, with low marketing margins (driven mostly by transport costs), dispelling the general myths on the distortions and inefficiencies associated with the liberalized market environment. The clear priority is to avoid distracting debates and focus on improving market infrastructure and facilitating more efficient value chains.
- 5) ***Invest in connectivity.*** The widespread impact of connectivity is well demonstrated. Looking to the future, continued investments in infrastructure are a high priority. Rural roads have been a key part of the past success in raising productivity, promoting the limited diversification that has taken place, and creating better employment opportunities. Closely related to connectivity is the need to focus on secondary cities that remain poorly connected, because they are potential drivers of economic activity and better quality jobs. The evidence shows that while the mega-cities have attracted more employment, they have overwhelmingly attracted informal jobs with higher vulnerability. Well-connected cities have had positive growth in business jobs, while poorly connected cities have languished, with no structural change in the types of jobs created.



## AGRICULTURE GLOBAL PRACTICE



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