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Food Security and Nutrition in Bangladesh: Evidence-Based Strategies for Advancement

Akhter U. Ahmed, M. Mehrab Bakhtiar, and Moogdho M. Mahzab

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Table of Contents

TABLES

FIGURES

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ACRONYMS

5DE	Five Domains of Empowerment
AEZ	Agroecological zone
AFS	Agrifood system
AMDR	Acceptable Macronutrient Distribution Range
ANGeL	Agriculture, Nutrition, and Gender Linkages
AWDDW	Allowances for the Widowed, Deserted and Destitute Women
BADC	Bangladesh Agricultural Development Corporation
BARC	Bangladesh Agricultural Research Council
BARI	Bangladesh Agricultural Research Institute
BBS	Bangladesh Bureau of Statistics
BCC	Behavior change communication
BCIC	Bangladesh Chemical Industries Corporation
BDHS	Bangladesh Demographic and Health Survey
BDRS	Bangladesh Disaster Related Statistics
BDT	Bangladeshi Taka
BIHS	Bangladesh Integrated Household Survey
BINA	Bangladesh Institute of Nuclear Agriculture
BKB	Bangladesh Krishi Bank
BMI	Body mass index
BNNC	Bangladesh National Nutrition Council
BRDB	Bangladesh Rural Development Board
BRRI	Bangladesh Rice Research Institute
BSCIC	Bangladesh Small and Cottage Industries Corporation
BWMRI	Bangladesh Wheat and Maize Research Institute
CIP	Country Investment Plan
CPI	Consumer Price Index
DAE	Department of Agricultural Extension
DAM	Department of Agricultural Marketing
DAP	Diammonium phosphate
DTW	Deep tubewell
EGPP	Employment Generation Programme for the Poorest
EP	Essential Priorities
FAO	Food and Agriculture Organization of the United Nations

FFE	Food for Education
FFP	Food Friendly Program
FFW	Food for Work
FPMA	Food Price Monitoring and Analysis
FPMC	Food Planning and Monitoring Committee
FPMU	Food Planning and Monitoring Unit
GDP	Gross domestic product
GHG	Greenhouse gas
GoB	Government of Bangladesh
GPI	Gender Parity Index
GR	Gratuitous Relief
HHI	Herfindahl-Hirschman Index
HIES	Household Income and Expenditure Survey
HYV	High-yielding variety
IFPRI	International Food Policy Research Institute
IMLMA	Improved Maternity and Lactating Mother Allowance
IPHN	Institute of Public Health Nutrition
IPV	Intimate partner violence
LBW	Low birth weight
LFS	Labor Force Survey
LIFT	Livelihoods and Food Security Trust Fund
LLP	Low-lift pump
MAD	Minimum Acceptable Diet
MATS	Bangladesh Millers' and Traders' Survey
MCB	Mother and Child Benefit
MDD-W	Minimum Dietary Diversity for Women
MFI	Microfinance institution
MICS	Multiple Indicator Cluster Survey
MOP	Muriate of Potash
MoWCA	Ministry of Women and Children Affairs
MSME	Micro, Small, and Medium Enterprises
MSP	Machinery service provider
MT	Metric ton
MV	Modern variety
NAMP	National Agricultural Mechanization Policy
NARS	National Agricultural Research System

NCA	Net Cropping Area
NCB	National Committee on Biosafety
NEET	Not in Education, Employment, or Training
NFNSP	National Food and Nutrition Security Policy
NGO	Non-governmental organization
NMS	New marketing system
NNS	National Nutrition Services
NPAN	National Plan of Action for Nutrition
NSSS	National Social Security Strategy
OMS	Open Market Sales
PCA	Principal Component Analysis
PEC	Post Enumeration Check
PESP	Primary Education Stipend Program
PFDS	Public Food Distribution System
PMT	Proxy means testing
RAB	Rapid Action Battalion
RAKUB	Rajshahi Krishi Unnayan Bank
RCT	Randomized controlled trial
REA	Revised Extension Approach
SAM	Social Accounting Matrix
SD	Standard deviation
SDG	Sustainable Development Goal
SDI	Simpson's Diversity Index
SEAP	South and East Asia and Pacific
SF	School Feeding
SRO	Statutory Regulatory Order
SSN	Social safety net
SSP	Single Super Phosphate
STW	Shallow tubewell
SUN	Scaling Up Nutrition
TR	Test Relief
TLS	Truthfully labelled seed
TMRI	Transfer Modality Research Initiative
TSP	Triple Super Phosphate
T&V	Training and Visit
USAID	United States Agency for International Development

VGD	Vulnerable Group Development
VGF	Vulnerable Group Feeding
VWB	Vulnerable Women Benefit
WASH	Water, sanitation, and hygiene
WEAI	Women's Empowerment in Agriculture Index
WFM	Work for Money
WFP	World Food Programme
WHO	World Health Organization

EXECUTIVE SUMMARY

The International Food Policy Research Institute (IFPRI) prepared this report to provide a comprehensive assessment of food security in Bangladesh, with a focus on the core dimensions of availability, access, and utilization. Key findings from this food security assessment report are as follows:

Food Availability

Food availability refers to the sufficient production and supply of food to meet population needs. IFPRI assessed the status of food availability through a variety of relevant factors, such as population, rural land ownership, food production and input use, access to finance and agricultural extension services, and food imports.

Bangladesh's rising population is straining its agricultural resources

The country has made commendable progress in enhancing agricultural production to support its growing population. However, Bangladesh's large population—169.83 million people, with 1,151 people per square kilometer, as of the latest census in 2022—puts immense pressure on agricultural resources, making it challenging to keep pace with the country's growing food needs.

Agricultural growth is increasing at a slower pace than overall economic growth

Over the past decade, agricultural growth has been modest (3–4 percent) compared to stronger growth in national gross domestic product (GDP) (6–8 percent). The crop and horticulture subsector grew by 3.2 percent in 2022/23, more than its growth of 2.6 percent in 2021/22 and 2.3 percent in 2020/21, rates which were likely lower due to the global COVID-19 pandemic and its impact on agricultural activities.

Agricultural growth can be a driver of poverty reduction

IFPRI has estimated that growth in the agricultural sector is 3.1 times more effective in reducing poverty than equivalent growth in nonagricultural sectors of the economy. A comprehensive approach that promotes yield-increasing technological change and a shift to higher-value agricultural production is essential for enhanced agricultural growth and, consequently, faster poverty reduction in Bangladesh.

Disparities in land ownership persist

Land is crucial for agricultural production, yet 56 percent of rural households are landless. The incidence of landlessness ranges from 47 percent in Khulna Division to 68 percent in Chattogram.

A large proportion of farmers do not own any land

In 2018/19, 40 percent of all farm households were "pure" tenants, meaning that they did not own the land they cultivated. About 36 percent of farmers cultivated only their own land. The proportion of mixed-tenant farmers—those who cultivate both their own land and rented land (as sharecroppers and/or leaseholders)—was 23 percent in 2018/19. Chattogram and Sylhet Divisions have the highest percentage of pure tenant farmers.

Most of Bangladesh's agricultural land is used for rice production

Rice alone accounted for nearly three-quarters (73.1 percent) of the country's gross cropped area in 2022/23. Among all divisions, Mymensingh (87.7 percent) and Sylhet (86.4 percent) had the highest shares of rice in gross cropped area.

Rice production has experienced continuous growth over time

Since Bangladesh's independence in 1971, rice production has increased fourfold. Annual production grew steadily from 11.0 million metric tons in 1970/71 to reach 39.1 million metric tons by 2022/23. Initially, *aman* was the predominant rice variety, but its dominance shifted to irrigated *boro* rice in the 1990s. The rapid expansion of boro production through the mid-2000s was spurred by the introduction of high-yielding varieties and expansion of irrigation infrastructure.

Most farmers grow just two popular rice varieties

The Bangladesh Rice Research Institute (BRRI) and the Bangladesh Institute of Nuclear Agriculture have developed and released more than 100 modern rice varieties over the past few decades. However, 70.1 percent of farmers cultivated only two varieties during the 2018 boro season, *BRRI Dhan 28 and BRRI Dhan 29*, both of which were released in 1994. *BRRI Dhan 28* continues to be popular partly due to its shorter growth cycle, which allows farmers to increase their cropping intensity.

Irrigation coverage remains uneven across the country

More than half (52.5 percent) of Bangladesh's cropped areas is irrigated, with significant disparities by division. In 2022/23, Khulna Division had the highest level of irrigation coverage (71.5 percent), whereas Barishal had the lowest share by far (15.7 percent irrigated land in gross cropped area). Salinity, in both surface- and groundwater, largely explains the low level of irrigation coverage in Barishal.

Grain yields have increased significantly over time

Rice yields tripled from 1.1 to 3.4 metric tons per hectare between 1970/71 and 2022/23. Wheat yields have fluctuated but rose from 1.5 metric tons in 2005/06 to 3.7 metric tons in 2022/23. Maize yields have far surpassed those of rice and wheat, exhibiting a nearly eight-fold increase from 1.2 metric tons per hectare in 1999/00 to 9.3 metric tons per hectare in

2022/23. In Bangladesh, maize is not primarily grown for human consumption, but instead serves as a key feed ingredient for poultry, livestock, and fish.

Fruit leads in profitability, while wheat and rice have the lowest margins

Fruit production has the highest gross margin, followed by flowers and vegetables. By contrast, wheat has the lowest profitability, followed by rice.

Crop diversification is low, with most farmers only cultivating rice

In 2018/19, around 59 percent of all farmers in Bangladesh cultivated only one crop and 20 percent cultivated only two crops, signifying minimal crop diversification. About 55 percent of all farmers only cultivated rice in 2018/19.

Most rural households do not produce enough rice to feed themselves

Overall, one-quarter (26 percent) of rural households were net sellers of rice in 2018/19, meaning they consumed less rice than they produced and sold the surplus. However, three-quarters (74 percent) of rural households were net buyers, meaning they consumed more rice than they produced and thus had to purchase additional rice.

Dependence on imported fertilizers increases susceptibility to price and supply shocks

Bangladesh relies heavily on imported fertilizers, making it vulnerable to price fluctuations and global supply disruptions, especially from those caused by the Russia-Ukraine war. Fertilizer prices have surged, with urea prices jumping from US$238 per metric ton in 2021 to US$599 per metric ton in 2023.

In 2022/23, domestic urea production accounted for 26 percent of the country's total supply, with the remaining 74 percent imported. Similarly, only about 10 percent of the supply of triple super phosphate was produced domestically, while the other 90 percent was imported. Domestic production contributed around 8 percent of the diammonium phosphate supply, with 92 percent imported. There is no domestic production of muriate of potash, so demand is met entirely through imports.

Outdated machinery and gas shortages limit capacity for urea production

The Bangladesh Chemical Industries Corporation operates six urea fertilizer factories, with a combined capacity of 2.3 million metric tons per year. However, actual production has declined significantly due to outdated machinery, inefficiencies, and lack of modernization. Currently, four of the six urea factories are closed, with two shuttered due to gas shortages.

Access to finance is limited, especially for smallholder farmers

Access to finance is essential for farmers to invest in productive resources, enhance agricultural productivity, and provide a cushion against economic shocks. However, financial access remains constrained, particularly for smallholder farmers, who face significant obstacles in obtaining formal financing from banks.

Instead, many farmers turn to higher-cost credit sources such as microfinance institutes and nongovernmental organizations, and informal sources such as local moneylenders or family and friends, from whom they typically face high interest rates and less favorable repayment terms.

Limited access to agricultural extension hinders development

Agricultural extension services play a pivotal role in empowering farmers by providing them with essential knowledge, skills, and techniques to enhance their agricultural practices. Unfortunately, many farmers in Bangladesh, especially smallholders, lack access to such support. Instead, they often rely on informal networks, learning about new technologies and practices through peer-to-peer exchanges rather than from extension officials.

Although marginal- and small-scale farmers constitute the largest share of farmers in Bangladesh, contact with agricultural extension officials among these groups is very low and considerably less than for medium- and large-scale farmers. Overall, about 23 percent of all farmers received extension services in 2018/19.

Farm mechanization holds significant potential to address labor shortages

Rural agricultural labor in Bangladesh is no longer abundant. Historically, real agricultural wages either declined or remained stable. However, since the mid-2000s, real rural wages have increased significantly, which has reduced farmers' profitability. To mitigate the impact of rising labor costs, promoting farm mechanization has become essential.

The aquaculture subsector shows unrealized potential

The fisheries subsector contributed 21.7 percent to agricultural GDP and 2.5 percent to national GDP in 2022/23. However, the subsector's growth rate dropped from 4.1 percent in 2020/21 to 2.8 percent in 2022/23, likely due to reduced productivity growth from high feed costs and declines in the fish export trade.

The livestock subsector has experienced steady growth

The livestock subsector experienced a growth rate of 3.2 percent in 2022/23, contributing 16.4 percent to agricultural GDP and 1.9 percent to the country's GDP that same year. The subsector has maintained steady growth, hovering around 3 percent from 2020/21 to 2022/23.

Food Access

Food access refers to the ability of individuals or households to obtain sufficient safe and nutritious food. IFPRI examined factors such as economic growth, poverty, inequality, agricultural wages, food prices, social protection programs, and employment opportunities, which impact the ability of households to access food.

Poverty has declined substantially over time as GDP has risen

Since 1990, Bangladesh has made significant strides in reducing poverty, with the proportion of people living below the upper poverty line dropping from 40.0 percent in 2005 to 18.7 percent in 2022. Over the same period, those living below the lower poverty line, which can be interpreted as the threshold for extreme poverty, also decreased dramatically, from 25.1 percent to 5.6 percent. This decline has been especially pronounced in rural areas.

Bangladesh's average GDP growth rate was 6.6 percent from 2015/16 to 2021/22. With annual population growth of 1.1 percent, per capita GDP increased by 5.6 percent per year. Increases in income have improved access to food.

Real agricultural wages have risen sharply since 2006

Rural real wages (adjusted for inflation) remained relatively stable until the mid-2000s. Starting in 2006, the wages of male agricultural laborers accelerated significantly, rising from BDT 179 per day to BDT 406 per day.

Rice-equivalent wages have increased over time

From 2000 to 2007, the ratio of wages to rice prices stayed relatively stable, with daily wages equivalent to approximately 5 kg of rice. By 2020, the rice-equivalent wage had risen to about 14 kg of rice. However, since 2021, this has declined, averaging around 11 kg of rice per day through 2023.

Food inflation surged in July 2024 amid political upheaval

In July 2024, food inflation reached a record high of 14.1 percent, driven largely by major disruptions to the food supply chain. This surge occurred amid a nationwide student-led movement that disrupted logistics, transportation, and food distribution networks. The growing public discontent culminated in the then-government’s fall on August 5. Following the government’s collapse, activists curtailed local extortion activities, which had previously added costs for traders and distributors. With these pressures lifted, retail food prices began to decrease in August 2024, easing inflation as supply chains normalized.

Rice yields have risen 2.5-fold over time, lowering real rice prices

Real prices of rice have declined significantly over time, as shown by long-term trends in annual real wholesale prices (adjusted for inflation) of coarse rice from 1981/82 to 2023/24. Between 1981/82 and 2019/20, the real price of rice dropped by 52 percent, from BDT 52 per kg to BDT 25 per kg. In parallel, rice yields increased 2.5-fold, from 1.3 metric tons per hectare in 1981/82 to 3.2 metric tons per hectare in 2019/20, a rise that was largely driven by yield-enhancing technological advancements in rice production.

Social safety net programs receive a significant amount of government spending

In fiscal year (FY) 2016, the government spent US$4.7 billion on social safety net programs, or about 13.6 percent of the total budget and 2.1 percent of the country's GDP. By FY2024, the allocation had surged to US$11.8 billion, representing 16.6 percent of the national budget and 2.5 percent of GDP.

Streamlining and revamping the social protection system could enhance impact

During FY2023/24, Bangladesh had 115 social safety net programs. Five programs received more than 58 percent of the budget but served only 6.2 percent of beneficiaries, leaving the other 110 programs with less than 42 percent of the budget.

A significant share of the budget for these programs—21.7 percent in FY2024—was allocated to the pension program for government employees, which primarily benefits the nonpoor. Out of 115 social safety net programs receiving funding in FY2024, 10 (excluding government employee pensions) received 66 percent of the budget. This leaves resources stretched thin for the remaining programs, limiting benefits for participants. Most of these programs have limited coverage, are uncoordinated, and are not adequately funded.

Nearly half of Bangladesh’s population is employed in agriculture

In 2022, nearly half (45.4 percent) of the total employed population worked in agriculture, followed by 37.6 percent in the service sector and 17.0 percent in the industry sector.

Overall unemployment has fallen, but youth unemployment is still high

Unemployment decreased from 4.6 percent in 2010 to 3.5 percent in 2022, but youth unemployment remains a concern, affecting 11.2 percent of 15- to 19-year-olds and 10.8 percent of 20- to 24-year-olds in 2022. As education levels increase, unemployment rates rise. Notably, unemployment is highest among individuals with tertiary education (bachelor’s degree and higher).

Food Utilization

Food utilization refers to how well individuals can properly consume and benefit from the foods they access, which depends on factors such as nutrition, health, and hygiene. IFPRI examined child nutrition status; water, sanitation, and hygiene; and menstrual hygiene practices.

Dietary intake has increased, but gaps remain

Between 2016 and 2022, actual food intake increased for most food groups. Despite improvements, substantial gaps exist between actual and desirable intakes for several food groups, such as pulses, vegetables, eggs, and milk products. Between 2011 and 2018, dietary diversity also improved, yet diets remain imbalanced, with approximately 70 percent of energy intake coming from carbohydrates such as rice. Similarly, micronutrient intakes have increased but are still suboptimal.

Child nutrition has improved but remains suboptimal, with progress uneven

In 2019, 61.5 percent of children under six months of age were exclusively breastfed, though significant regional variations exist. Stunting among children under five years of age declined from 60 percent in 1996/97 to 24 percent in 2022, yet it remains alarmingly high. Child wasting decreased from 21 percent to 11 percent during the same period, although the downward trend has been inconsistent. In 2022, only 28.7 percent of children ages 6–23 months received a minimum acceptable diet, with notable disparities across divisions.

Early childbearing and low birth weight are concerning, though women's diets show moderate diversity

In 2019, 29.9 percent of women gave birth before age 18, and 14.8 percent of babies were born with low birth weight. Inadequate maternal nutrition can adversely impact infant health, and as of 2020, only 64.9 percent of women ages 15–49 achieved minimum dietary diversity.

Women's Empowerment

Women are becoming more empowered, closing the gender gap and strengthening agricultural and dietary diversity

IFPRI research shows that empowering women enhances agricultural diversity, improves dietary diversity for children and families, and helps to break the cycle of chronic and transient poverty.

The proportion of empowered women (measured using the Women's Empowerment in Agriculture Index) nearly tripled between 2011/12 and 2018/19, rising from 29 percent to 62 percent. Men's empowerment also increased over time. Gender parity increased from 45 percent to 70 percent, reducing the empowerment gap from 27 percent to 16 percent.

Geographic Identification of Food Insecurity

District-level hotspots of food insecurity highlight opportunities to target vulnerabilities in Bangladesh

IFPRI used principal component analysis to create vulnerability scores for food availability, access, and utilization, leading to the creation of a district-level food insecurity index that can support policymakers in targeting food vulnerabilities across 64 districts in Bangladesh.

IFPRI's analysis reveals that Bagerhat, Bandarban, Bhola, Khulna, and Satkhira Districts have the lowest levels of food availability. Access to food is lowest in Bandarban, Jamalpur, Khagrachhari, Kurigram, and Patuakhali Districts. The five most vulnerable districts in terms of food utilization vulnerability are Bandarban, Lakshmipur, Netrakona, Noakhali, and Sherpur Districts.

Overall food insecurity hotspots are Bandarban, Cox’s Bazar, Khagrachhari, Sherpur, and Sunamganj Districts.

Further analysis unveils that districts in the southern coastal region of Bangladesh—Bagerhat, Barishal, Jhalokati, Khulna, and Pirojpur—face the highest climate and environmental risks.

CHAPTER 1 INTRODUCTION

Food is fundamental for human survival. The right to food is recognized as a basic human right. Food security, a cornerstone of national development, is intricately linked to the well-being of Bangladesh's population. Ensuring consistent access to sufficient and nutritious food for millions of Bangladeshis is a critical responsibility for those guiding the nation's welfare. Given recent political shifts and developments, it is essential to reassess existing strategies to continue improving food security and nutrition in Bangladesh effectively.

The International Food Policy Research Institute (IFPRI) has prepared this report to address the opportunities and challenges of food security and nutrition in Bangladesh. Since its establishment in 1975, IFPRI has been at the forefront of providing research-based policy solutions aimed at sustainably reducing poverty, hunger, and malnutrition in developing countries. IFPRI's work in Bangladesh has significantly influenced the advancement of food security, nutrition, and women's empowerment in agriculture. Through rigorous, evidence-based research, IFPRI has supported the formulation of key national programs and offered essential policy analysis, particularly during periods of crisis.

OBJECTIVES

The objectives of this report are to:

- Assess the current state of food security in Bangladesh, highlighting key challenges and areas for improvement.
- Identify specific geographic areas needing targeted food security interventions.
- Provide actionable recommendations to strengthen the resilience and sustainability of food systems.
- Support the development of policies to improve food security and nutrition in Bangladesh.

We have produced this report with the aim of reaching a wide audience, including those beyond professionals like economists, agricultural scientists, and nutrition experts. To make it accessible, we have simplified technical terms and explained them in clear, non-technical language.

DATA SOURCES

Most of our analyses are based on highly disaggregated, district-level data. IFPRI researchers primarily utilized data from the following sources to ensure a robust analysis:

- **IFPRI's Bangladesh Integrated Household Surveys (BIHS):** The IFPRI-designed BIHS is the most comprehensive, nationally representative rural household panel survey in the country. The first round survey took place in 2011/12, the second round survey took place in 2015, and the third round survey was administered in 2018/19. BIHS is the only survey to collect detailed data on 1) plot-level agricultural production and practices, 2) dietary intake of household members, 3) anthropometric measurements of all household members, and 4) women's empowerment via the Women's Empowerment in Agriculture Index (WEAI). BIHS samples are statistically representative of national rural Bangladesh and all administrative divisions of the country.

- **Bangladesh Bureau of Statistics (BBS)**
    - **Household Income and Expenditure Surveys (HIES):** We used HIES data to analyze farmers' access to credit, various poverty indicators, and consumption expenditure, as well as diet-related measures such as desirable and actual intakes of different food groups for the Bangladeshi population. Additionally, we developed district-specific vulnerability maps by integrating HIES data with other secondary sources.
    - **Labor Force Surveys (LFS):** We used Labor Force Survey (LFS) data to analyze employment distribution by economic sectors, unemployment rates by education and sex, and youth employment trends. This included metrics on youth unemployment and training received by the population aged 15 and older.
    - **Statistical Yearbooks:** We utilized data from various years of the Statistical Yearbook of Bangladesh to analyze key agricultural indicators, including production values and real agricultural wages, as well as the national average wholesale prices of key commodities.
    - **Yearbooks of Agricultural Statistics:** We utilized various years of the Yearbook of Agricultural Statistics to analyze agricultural production, crop and non-crop yields, import shares, input use, and land use.

- **Bangladesh Demographic and Health Surveys (BDHS):** We used BDHS data to analyze trends in stunting and wasting among children under-five, categorized by division and wealth quintile, as well as trends in minimum acceptable diets for children under-two nationwide.

- **Multiple Indicator Cluster Surveys (MICS):** We used MICS 2019 data to analyze various key indicators, including exclusive breastfeeding rates among children under 6 months, early childbearing among women, and the prevalence of low-birth-weight infants. Additionally, we examined access to improved drinking water sources, sanitation facilities, and handwashing practices, as well as stunting, wasting, and dietary quality among the population. We also used MICS 2019 data to explore the availability of electricity.

Several other data sources were used throughout this report to achieve a comprehensive assessment of food security in the country.

STRUCTURE OF THE REPORT

This report is organized into eight chapters. Chapter 1 introduces the report. Chapter 2 provides an overview of food security in Bangladesh. Chapters 3, 4, and 5 present analysis on food availability, access, and utilization, respectively. Chapter 6 presents the status of women's empowerment in agriculture. Next, Chapter 7 identifies geographic areas for targeting food security interventions. Finally, Chapter 8 closes with policy conclusions and evidence-based recommendations focused on improving food availability, access, and utilization. All tables have been placed in a dedicated section at the end of the report.

CHAPTER 2 CONCEPT AND OVERVIEW OF FOOD SECURITY IN BANGLADESH

CONCEPT

Food security is broadly defined as access by all people at all times to sufficient food to meet their dietary needs for a healthy and productive life. One essential element of food security is the availability of adequate food at national and household levels. Another essential element is the access to adequate food at household and individual levels. However, the availability of and access to adequate food are necessary but are not sufficient conditions for a healthy life. Hence, the third essential element of food security is the effective biological utilization of food, which depends on a number of other factors, such as the health and sanitation environment, and household or public capacity to care for vulnerable members of society.

Food availability

Food availability at the national level is determined by domestic food production, public and private food stockholding, food imports including food aid, and food exports. With the liberalization of international trade, global availability of food is of increasing importance for national food security. Availability of food at the household-level depends on the household's own capacity to produce food, household food stockholding, and availability of food in the local markets, which, in turn, is a function of market operations, infrastructure, flow of information, and seasonal variations in domestic food production.

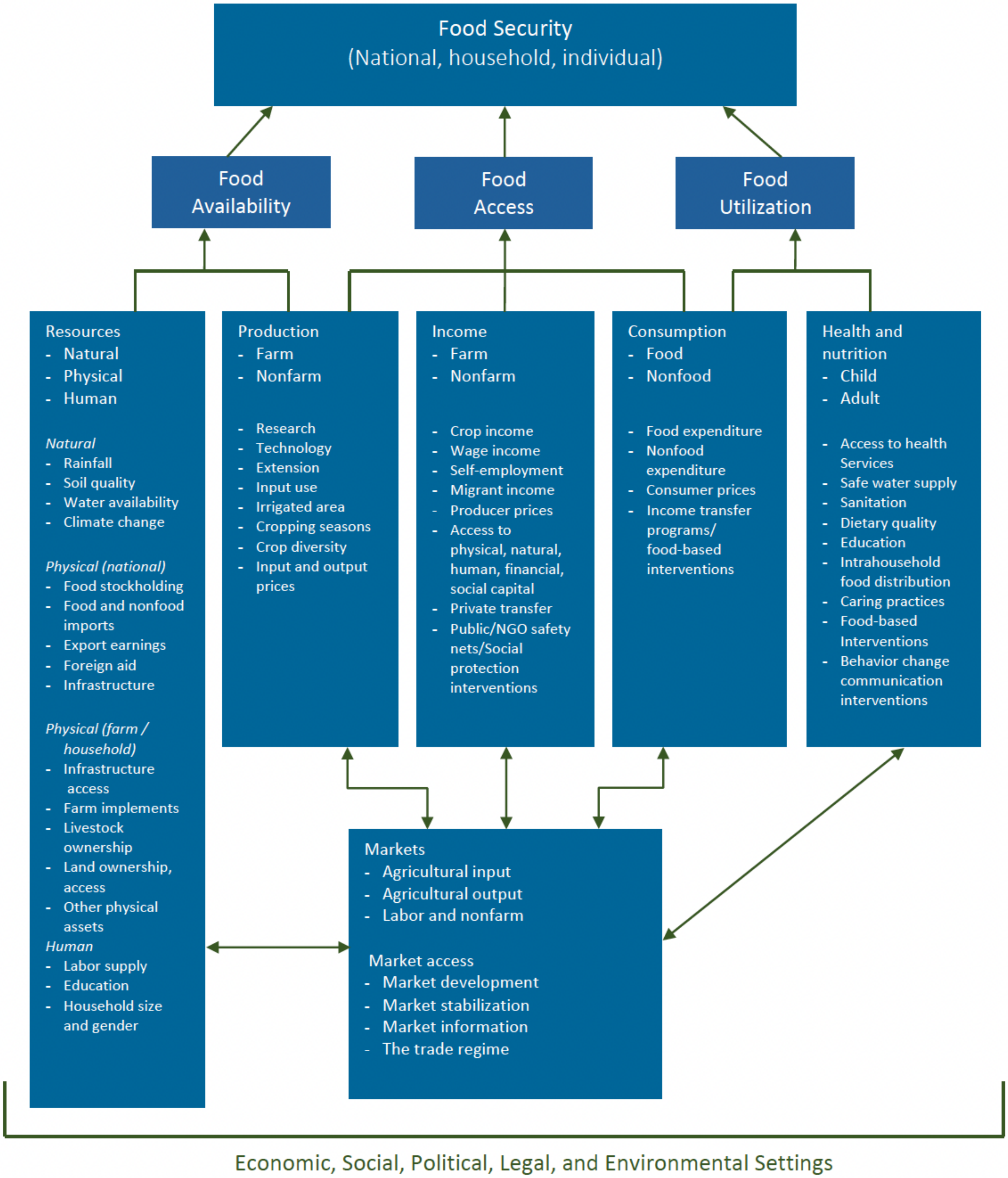
Food access

A country's access to globally available food is a function of export earnings, world prices, and debt-service obligations. Household's access to food depends on food prices, household income, and assets or resource base. Increased income of households can improve household food security in terms of improved access to food. In addition, expanded asset bases reduce the vulnerability of households to short-term disruptions in income flows, because part of the asset base can be sold in times of adversity. This helps to prevent degradation of household food security. Poverty is a major determinant of chronic household food insecurity. The poor do not have adequate purchasing power to secure their access to food, even when food is available in local markets. Moreover, the poor are vulnerable to shocks (such as natural disasters, crop failure) that cause transitory food insecurity. Increased food prices also result in transitory food insecurity of the low-income households by lowering their real income and, hence, eroding their purchasing power.

Food utilization

Food utilization – the other dimension of food security – is closely related to nutrition. As food availability and accessibility to food increase, hunger may decrease, but not necessarily malnutrition. One reason for persistent malnutrition may lie in the complex interaction between food intake and illness, affecting the food utilization by the body, which in turn, is influenced by the overall health and care-giving environment. Improvements in availability and access to the foods that are important for good nutritional status may be offset by poor access to non-food inputs, such as quality healthcare facilities and services, education (particularly for mothers), sanitation, and safe water, or ineffective mechanisms for delivering these services. Figure 2.1 summarizes the diverse determinants of food security status in a general conceptual framework. The framework highlights the hypothesized causal relationships between the various elements of food availability, access, and utilization.

Figure 2.1: Determinants of Food Security



Source: Prepared by authors.

OVERVIEW OF FOOD SECURITY IN BANGLADESH

Bangladesh has progressed well in improving food security. The focus of its food policy has shifted perceptibly in the past decades. A complete picture of food security is provided under the framework of food availability, access, and utilization.

Food availability

Despite declining arable agricultural land, Bangladesh has made commendable progress in boosting domestic food production. The growth in overall food production has been keeping ahead of population growth, resulting in higher per capita availability of food over time. In the early 1970s, Bangladesh was a food-deficit country with a population of about 75 million. Today, the population is 170 million (BBS 2023b), and the country is now near self-sufficient in rice production, which has increased four-fold over the past five decades. Seed, fertilizer, and irrigation technologies known as 'Green Revolution technologies' have played major roles in the growth of rice production in Bangladesh.

In the 1980s, the government liberalized the input markets, gradually eliminated subsidies on agricultural inputs, and removed bans on private sector imports of agricultural machinery. These policy changes induced private investment into small-scale irrigation such as shallow tube wells and power pumps, all of which have contributed to accelerated growth of dry season irrigated rice (boro) during the last two decades. However, fertilizer subsidies were reintroduced in the 1990s, which currently account for over two-thirds of the public sector's expenditure on agriculture.

Rice constitutes around one-third of the agricultural gross domestic product (GDP). Total rice production increased from 38.1 million metric tons (MT) in 2021/22 to 39.1 million MT in 2022/23. There are shortfalls in the production of certain non-rice crops, such as wheat, maize, pulses, oilseeds, and onions. The shortfalls are met by imports. Bangladesh also imports rice sporadically. In 2017/18, rice imports were 3.6 million MT, the highest import amount since 1985/86. The country imports large volumes of edible oil (soybean and palm oil) and powder milk.

Food access

Along with food availability, access to food has also improved in Bangladesh. Bangladesh's average GDP growth rate of 6.7 percent from 2015/16 to 2021/22 contributed to the reduction in poverty from 24.3 percent to 18.7 percent during the same period (BBS 2023b). With 1.1 percent annual population growth, per capita income increased by 5.6 percent per year. Increased income has improved access to food. Most significantly, real wages in Bangladesh have accelerated since 2006. As more workers have shifted to the formal sector and other non-farm jobs, labor in rural areas has become scarcer, bidding up rural real wages and thereby enhancing total labor earnings. Increasing real wages since 2006 has significantly contributed to poverty reduction. On average, the daily wage of a male agricultural laborer could buy only 4.8 kg of rice in 2006. In 2023, it could buy 11.4 kg of rice.

However, the COVID-19 pandemic and continued conflict between Ukraine and Russia have likely reversed the gains made in access to food. A PPRC-BIGD Rapid Response Survey on the poverty impact of COVID-19 (April 2020) recorded a reduction of more than 70 percent in the income of the extreme poor, vulnerable non-poor, and moderate poor within the first week of lockdown in March 2020 (PPRC and BIGD 2020). This translated into a 40 percent and 35 percent per capita food expenditure reduction for the poor and vulnerable non-poor, respectively (FPMU 2022).

The rate of inflation, as measured by Consumer Price Index (CPI), was 11.7 percent in July 2024, the highest since 2011. The rate decreased to 10.5 percent in August 2024, and further to 9.9 percent in September 2024 (Trading Economics 2024). High inflation, coupled with reduced incomes and repeated climatic shocks, is causing acute food insecurity and putting extreme stress on the poorest households.

Social safety nets in Bangladesh have been quite effective in smoothing the consumption and the income of poor households and helping them cope with stresses and shocks. Bangladesh allocates a significant share of its national budget to run the safety net and social protection programs. In the fiscal year just prior to the pandemic (2018/19), the government allocated US$8 billion to social protection (inclusive of government pensions), or 13.8 percent of the total budget and about 2.5 percent of GDP (Ahmed, Islam, and Mujeri 2021).[2] This was substantially increased during the pandemic. In 2019/20 and 2020/21, the allocation to social protection was 14.2 percent and 16.8 percent of the total budget, respectively. In 2023/24, the budget allocation for the social safety net system surged to $11.8 billion, constituting about 17 percent of the total budget and 2.5 percent of GDP (Ministry of Finance 2023).

Food utilization

There has been significant progress in nutritional outcomes in Bangladesh. A cross-country study concluded that, from 1997 to 2007, Bangladesh had recorded one of the fastest prolonged reductions in child underweight and stunting prevalence in history (Headey 2013). The rate of stunting (low height-for-age) among children under-5, which reflects the state of chronic undernutrition, has decreased from 55 percent in 1997 to 24 percent in 2022 (Osmani et al. 2016; National Institute of Population Research and Training (NIPORT) and ICF 2023).

Another indicator of nutritional status is maternal undernutrition, as measured by low body mass index (BMI), which is a symptom of chronic energy deficiency in adult women. Using this measure, undernutrition among women of reproductive age has declined sharply from 34 percent in 2004 to 19 percent in 2014 (NIPORT 2021). Yet another indicator is child mortality.

[2] All dollar amounts ($) referenced in this document refer to USD.

Although various factors can influence the level of child mortality, undernutrition is known to be one of the major factors: international evidence suggests that almost half (45 percent) of all under-5 deaths in the developing world can be attributed to undernutrition (Black et al. 2013). The under-5 mortality rate has declined in Bangladesh from 65 deaths per thousand live births in 2007 to 31 deaths per thousand in 2022 (National Institute of Population Research and Training (NIPORT) and ICF 2023).

Bangladesh has made remarkable progress in water, sanitation, and hygiene (WASH) indicators, with 97 percent of the people having access to improved drinking water sources in 2019. Handwashing with water and soap is the most cost-effective health intervention to reduce the incidence of diarrhea in children. In 2019, 75 percent of households had a handwashing facility with soap and water available on the premises (BBS and UNICEF Bangladesh 2019).

Challenges

Although Bangladesh has made substantial progress in enhancing food security by increasing domestic production of food and improving access to food by increasing household income and strengthening safety net transfer programs over the years, the challenges to food and nutrition security are still formidable. Future agricultural growth and food and nutrition security are threatened by population growth, worsening soil fertility, deteriorating access to increasingly scarce natural resources (water and land), increasing vulnerability of improved crop varieties to pests and diseases, and persistent poverty leading to poor access to food. In addition, the impacts of climate change – an increase in the incidence of natural disasters, sea intrusion, and salinity – will exacerbate food and nutrition insecurity in the coming decades if corrective measures are not taken.

There were substantial socioeconomic impacts in Bangladesh as a result of the COVID-19 outbreak, such as widespread disruptions to businesses, loss of livelihoods, and increased poverty and food insecurity (Ahmed, Bakhtiar, and Ghostlaw 2020). While government assistance was received by many needy households, there were flaws in targeting assistance. Among farmers, access to credit and assistance was limited, and supply chain disruptions affected crop and non-crop agriculture. The government implemented stimulus packages and relief measures that aimed to support farmers and other agricultural value chain actors, yet very few farmers obtained this assistance (Ahmed et al. 2020).

The Russia-Ukraine conflict has had far-reaching consequences on food security in Bangladesh and globally. IFPRI researchers identified three key threats to Bangladesh’s food system due to the war in Ukraine (Mamun, Glauber, and Laborde 2022). First, the disruption in wheat imports from Russia and Ukraine, which accounts for a significant portion of Bangladesh's wheat supply, forces Bangladesh to find alternative sources. Second, the war has increased vegetable oil prices globally, affecting Bangladesh's imports of palm oil and soybean oil.

These price increases added to the import costs, resulting in reduced availability of vegetable oil in the domestic market and increased prices for consumers in Bangladesh. Third, fertilizer costs have also been increased due to export disruptions from major fertilizer exporters, such as Russia and Belarus. Consequently, Bangladesh's access to fertilizer in the global market is becoming increasingly difficult. Additionally, rising global prices for corn and soybeans, which Bangladesh imports, could increase production costs for poultry, cattle, and fish products, further impacting the food system.

At the same time, Bangladesh is increasingly experiencing climate change, including rising sea levels that threaten coastal areas through increased flooding and salinization of farmland, more frequent and intense cyclones causing widespread destruction and displacement of communities, as well as changing rainfall patterns and higher temperatures that disrupt agriculture. In addition to its effects on agriculture, climate change directly impacts nutrition by reducing food availability and access, limiting dietary diversity, and diminishing the nutritional content of food (Fanzo et al. 2018).

Climate change has differential effects on key populations and geographic regions. IFPRI's research in Bangladesh shows that climate change disproportionately affects the rural poor, who have the least capacity to adapt to its impacts (Fanzo et al. 2018). Evidence shows that, compared with large farmers, smallholder farmers are more susceptible to environmental degradation and climate change impacts due to their limited access to resources, such as human, social, and financial capital, as well as information (Ahmed, Islam, and Mujeri 2021). Moreover, farmers who are exposed to climate-induced shocks are less likely to adopt stress-tolerant technologies, particularly smallholder farmers and sharecroppers (Yesuf and Bluffstone 2009).

CHAPTER 3 KEY FACTORS INFLUENCING FOOD AVAILABILITY

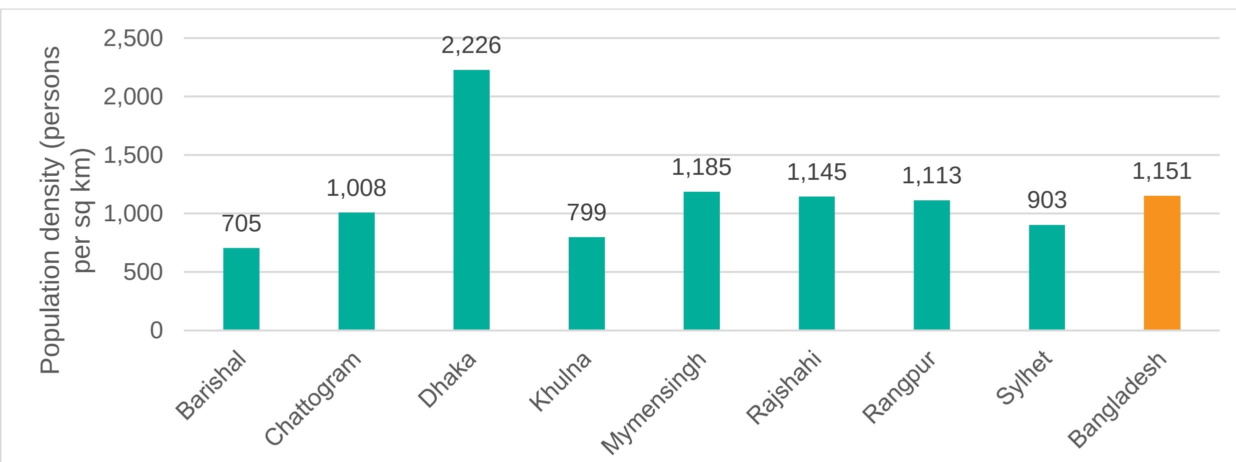
POPULATION

Bangladesh is the eighth-most populated country in the world with almost 2.2 percent of the world's population. The Final Report of the 2022 Population and Housing Census provides the Post Enumeration Check adjusted population figures released by the Bangladesh Bureau of Statistics (BBS 2023d). As per the final adjusted results, the country's population is 169.83 million.[3] In 2022, the annual rate of population growth was 1.08 percent, with about 68 percent of the population living in rural areas.

Population density is important for resource allocation and affects the environment, economy, and social dynamics in an area. The population density of Bangladesh in 2022 was 1,151 people per square kilometer – the second most densely populated country in the world after the city-state of Singapore.

Figure 3.1 shows the adjusted population density by division. Shaped by the metropolitan Dhaka city, Dhaka is by far the most densely populated division, with 2,226 people per square kilometer. The least populous division is Barishal at 705 people per square kilometer.

Figure 3.1: Adjusted population density by division, 2022



Source: Calculated from division-level adjusted population data reported in Table 3.1. Final Report of the Population and Housing Census, 2023, and Post Enumeration Check (PEC) Adjusted Population, 2023, Bangladesh Bureau of Statistics.

[3] The Bangladesh Bureau of Statistics (BBS) provided adjusted population figures after corrections for Net Coverage Error (NCE), following the methodology outlined by the Bangladesh Institute of Development Studies (BIDS) (Sen, Yunus, and Chowdhury 2023). BBS reports adjusted population for the following strata: (1) national and rural/urban, (2) division, (3) sex, (4) religion, and (5) age group. However, district-level adjusted population and household figures are not reported.

District-level adjusted population and household figures are not reported by BBS. Therefore, district-wise population density shown in Table 3.1 reflects unadjusted population density. Dhaka is the most densely populated district, with 10,067 people per square kilometer, followed by Narayanganj, 5,712 people per square kilometer. The Hill Tracts districts of Rangamati with 106 persons per square kilometer and Bandarban with 107 persons per square kilometer are the two least densely populated areas of the country (Table 3.1).

AGRICULTURE

Agriculture plays a crucial role in Bangladesh. Although the share of agriculture in GDP declined from 22.7 percent in 2000 to 11.3 percent in 2023 (Finance Division, Ministry of Finance 2024), the agricultural sector continues to be the largest employer, involving about 45 percent of the total labor force in 2022. Agriculture has a profound impact on several macroeconomic objectives, such as employment generation, poverty reduction, human resources development, and food security (Biogeny 2018). Therefore, despite the diminishing share of agriculture in GDP, agriculture remains a cornerstone of the economy and livelihoods in Bangladesh.

Suitability for agricultural technology adoption in Bangladesh

Bangladesh has a sub-tropical monsoon climate, with mostly flat and fertile land, except for the hilly regions in the north-east and south-east. A vast network of seven major rivers – Padma, Jamuna, Teesta, Meghna, Brahmaputra, Surma, and Karnaphuli – along with 230 tributaries, supplies abundant water. This provision enriches the alluvial soil through silt deposits during the rainy season, making the land highly suitable for agriculture.

The country is divided into 30 agro-ecological zones (AEZ), each with distinct environmental characteristics such as climate (temperature and rainfall), soil type, topography, and water availability. These zones are critical in determining the types of crops that can be cultivated, the appropriate farming techniques, and overall agricultural productivity. The unique conditions of each AEZ guide the suitability of adopting specific agricultural technologies.

An IFPRI study by Pender (2007) assessed the potential of various technological approaches to improve productivity, enhance natural resource management, and reduce poverty in favored and less-favored areas of the South and East Asia and Pacific (SEAP) region (Pender 2007). The study highlights the diverse climate across the region. The southeastern and southernmost areas, including much of the Philippines, Indonesia, Malaysia, Thailand, Vietnam, southeastern China, Laos, Cambodia, Myanmar, Bangladesh, Sri Lanka, and parts of southern and eastern India, are dominated by a warm, humid, and subhumid tropical climate. In contrast, western India and Pakistan experience semi-arid and arid subtropical conditions, while the cooler, temperate arid and semi-arid zones are found in western and northern China and Mongolia. The northernmost parts, including the Himalayas in northern India, Nepal, Bhutan, and southern China, have a cold mountain climate.

Pender (2007) ranks Bangladesh as the most "favored" area among SEAP countries for adopting agricultural technology (Pender 2007). Over the past several decades, Bangladesh has experienced remarkable growth in agricultural productivity and rural livelihoods, largely due to the Green Revolution and complementary factors. Areas with high agricultural potential and better access to urban markets typically have denser rural populations. Infrastructure and market access are key determinants of agricultural options for farmers, with irrigation being particularly crucial. Irrigated agriculture is widespread across Bangladesh, and the country's rapid urbanization has created diverse and expanding markets for agricultural products.

Beyond agricultural potential, proximity to urban centers, roads, ports, and other infrastructure play a significant role in shaping market opportunities for farmers. Bangladesh's access to ports enhances its ability to export agricultural goods, further boosting the sector's potential.

Bangladesh has one of the highest rural population densities in the world, which influences its agricultural production practices and market dynamics. In these densely populated areas, small farm sizes and a high labor-to-land ratio encourage more intensive farming methods. The introduction of improved rice varieties, coupled with increased irrigation and fertilizer use, has resulted in significant gains in rice yields across the country.

Figure 3.2 highlights the favorability of agricultural technology adoption across the SEAP region, based on factors, such as terrain, irrigation availability, and market access. In Bangladesh, approximately 76 percent of the land is suitable for adopting agricultural technologies, leading the region. India, Thailand, and Cambodia follow, with 35 percent, 34 percent, and 29 percent of their land being favorable for agricultural technology adoption, respectively.

Figure 3.2: Favorability of agricultural technology adoption in South and East Asia and the Pacific

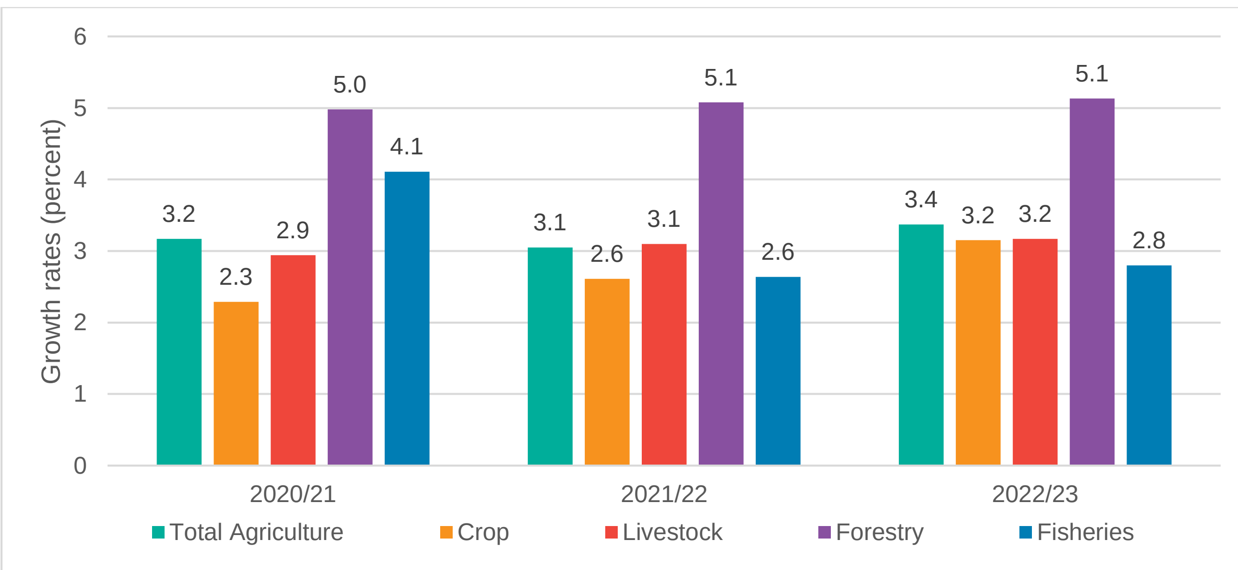
Source: (Pender 2007)

SEAP: South, East Asia, and Pacific.

Agricultural growth

Over the past decade, Bangladesh's economy has shown modest agricultural growth (3-4 percent), in contrast to the stronger national GDP growth (6-8 percent). Figure 3.3 shows that the overall GDP growth rate of the agricultural sector (that is, the growth rate of value added in agriculture) was 3.4 percent in 2022/23. This was a slight increase from the previous two years—3.1 percent in 2021/22 and 3.2 percent in 2020/21. The crop and horticulture sub-sector grew by 3.2 percent in 2022/23, compared to lower growth rates of 2.6 percent in 2021/22 and 2.3 percent in 2020/21, likely due to the global COVID-19 pandemic and its impact on agricultural activities. The fisheries sub-sector, which experienced a growth rate of 4.1 percent in 2020/21, dropped to 2.8 percent by 2022/23, likely due to lowered productivity growth owing to high feed costs and shrinking fish export trade. Meanwhile, the livestock sub-sector maintained steady growth, hovering around 3 percent from 2020/21 to 2022/23.

Figure 3.3: Growth rates of agriculture sector at constant prices, FY 2020/21 to 2022/23 (Base: 2015/16=100)



Source: National Accounting Wing, Bangladesh Bureau of Statistics.

Assessing the impact of agricultural growth on poverty reduction

Agricultural growth has historically played a pivotal role in reducing poverty in developing countries. GDP growth originating in agriculture triggers significant income growth among the poorest. The influence of agriculture comes not only from its direct poverty reduction effect but also from its potentially strong growth linkage effects on the entire economy (de Janvry and Sadoulet 2009). Agriculture's indirect contributions stem from backward linkages to the non-farm sector through the industrial production of inputs such as fertilizers, irrigation equipment, pesticides, and feed. Forward linkages involve the packaging, transportation, industrial processing, storage, and marketing of agricultural commodities. These activities result in substantial growth in the off-farm sector, leading to increased employment and income. However, the advantage of agricultural growth over non-agricultural growth in reducing poverty tends to diminish as countries become wealthier (Christiaensen and Martin 2018).

As of 2022, 68 percent of Bangladesh's population resides in rural areas, relying primarily on agriculture for their livelihoods. Despite a decline in its GDP share from 22.7 percent in 2000 to 11.3 percent in 2023, the agricultural sector remains the largest employer, engaging about 45 percent of the total labor force in the country.

An IFPRI study by Diao et al. (2023) assessed the effectiveness of the agrifood system (AFS) growth led by productivity gains in different agricultural value chains in promoting multiple development outcomes in Bangladesh (Diao et al. 2023; Ecker et al. 2024). Table 3.2 presents the structure of Bangladesh's AFS in 2019 based on official national accounts data and sectoral employment statistics, as compiled in a 2019 Social Accounting Matrix (SAM) for Bangladesh (IFPRI 2023). National estimates are broken down into estimates for the AFS and the rest of the economy. The AFS is further broken down into the on-farm (primary agriculture) and off-farm activities. The four off-farm components are agro-processing, trade and transport services, food services, and input supply. As shown in Table 3.2, the AFS accounted for 23.8 percent of Bangladesh's national GDP and 49.5 percent of employment in 2019. Primary agriculture alone contributed 12.5 percent of GDP and 38.6 of employment, while the four off-farm components of the AFS contributed 11.3 percent to GDP and 10.8 percent of total employment in Bangladesh in 2019, the year preceding the COVID-19 pandemic.

The rapid transformation of Bangladesh's AFS between 2009 and 2019 occurred in conjunction with a rapid structural change in the entire economy. Over this period, the GDP of the national AFS grew much faster than the agriculture sector alone, with an average annual growth rate during the pre-COVID decade of 5.4 percent compared with 3.5 percent growth in primary agricultural GDP. Hence, AFS growth was primarily driven by growth in its off-farm components, including domestic agricultural input production, agricultural trade and transport, agro-processing, and food services (Diao et al. 2023; Ecker et al. 2024).

To evaluate the impact of agriculture on poverty reduction, we estimated growth elasticities of poverty reduction for both agricultural and non-agricultural sectors. Agricultural GDP is comprised of crops and horticulture, animal farming, fishing, and forestry. Non-agricultural GDP includes industry (manufacturing industries, electricity and gas, water supply, construction) and services (trade, transportation, financial services, education, health, public administration and defense, and other service activities).

We calculated the annualized percentage change in poverty rates and real per capita GDP (adjusted for inflation) generated in agricultural and non-agricultural sectors to derive the growth elasticities of poverty. We used head count poverty rates in 2016 and 2022 and data from BBS for 2016-2022 on per capita agricultural and non-agricultural real GDP for both sectors.

The estimated agricultural growth elasticity of poverty is -2.26, signifying that a 10 percent increase in per capita real agricultural GDP led to a 22.6 percent reduction in poverty during 2016-2022. In contrast, the non-agricultural growth elasticity of poverty is -0.72, indicating that a 10 percent increase in per capita real non-agricultural GDP was associated with a 7.2 percent reduction in poverty. This implies that agricultural sector growth is 3.1 times more effective at reducing poverty than an equivalent amount of growth generated in non-agricultural sectors of the economy.

These findings underscore the crucial role of agriculture-led growth in poverty reduction in Bangladesh. The results have important policy implications for formulating strategies for poverty reduction, recognizing the unique contributions and linkages that agriculture establishes within the economy. A comprehensive approach that promotes yield-increasing technological change and a shift to higher-value agricultural production is essential for enhanced agricultural growth and, consequently, faster poverty reduction in Bangladesh.

With arable land diminishing, technological innovations are essential to address production challenges arising from worsening soil fertility, increasing vulnerability of crop varieties to pests and diseases, and the impacts of climate change – an increase in the incidence of natural disasters, sea intrusion, and salinity. Furthermore, it is important to bridge the gap between average farmers' yields and research station achievements. Efforts are needed to understand why the gap is often large between the yield potentials of existing technologies and those in use by farmers.

Specific strategies for enhancing agricultural growth include intensifying rice production through increased yields rather than expanding the gross area under rice cultivation. This will allow diversification into higher-value crops, including maize, pulses, oilseed crops, vegetables, and fruits. To accomplish this goal, farmers will require timely and sufficient provisions of agricultural inputs, such as fertilizers, improved seeds, irrigation, farm machinery, and diesel fuel.

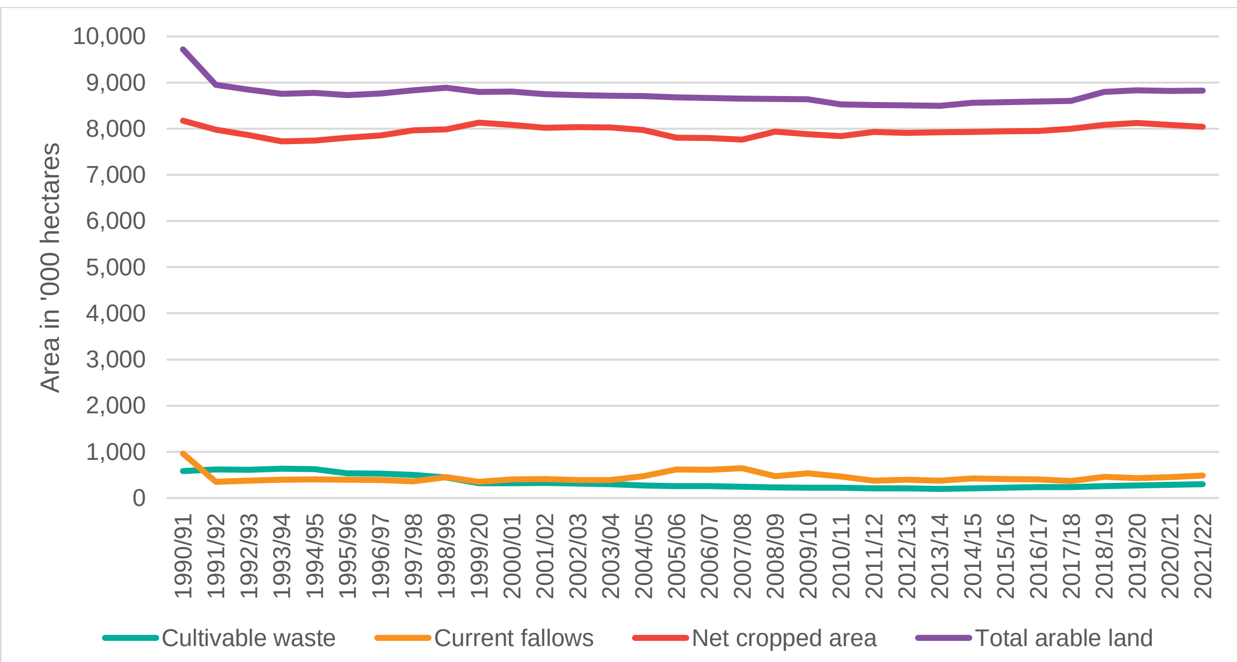
Given that smallholder farmers constitute the majority in Bangladesh, increasing their incomes aligns with the broader goal of poverty reduction. Because smallholder farmers have relatively less access to land, their production of high-value crops like horticulture is pivotal for increased incomes. Adequate access to institutional credit and effective agricultural extension services are vital for them. Access to finance is crucial for farmers to invest in productive resources, improve agricultural productivity, and mitigate the impacts of shocks. Currently, access to finance is constrained, particularly for smallholder farmers. Relaxing the constraint necessitates innovative financing models such as post-harvest loan repayment schemes to overcome collateral-related challenges. Furthermore, the implementation of innovative financing schemes is essential to invest in technologies aimed at reducing loss and waste in post-harvest operations, including storage and processing of fresh produce.

Emerging agricultural technologies offer significant promise for augmenting agricultural productivity but can only be realized if the technologies are disseminated to farmers through effective extension systems. Agricultural extension services are crucial for empowering farmers with the necessary skills and techniques to improve their agricultural practices. However, smallholder farmers often lack access to such support. Modernizing extension services through information and communication technologies such as mobile phone-based services and video-based training can provide tailored and timely agricultural information to farmers.

Land availability for agricultural production

In Bangladesh, arable land is comprised of cultivable waste, current fallows and net cropped area. Figure 3.4 shows that, between 1990/91 and 2021/22, total arable land area has diminished, mainly driven by urbanization, industrialization, and the expansion of the road network. We have estimated least-squares growth rate of -0.3 percent for total arable area between 1990/91 and 2021/22, which suggests that land available for cultivation has been decreasing at an average rate of 0.3 percent per year during this period. This led to a significant reduction in the total amount of land available for agriculture over the 30-year period.

Figure 3.4: Cultivable waste, current fallows, net cropped area, and total arable land, 1990/91 to 2021/22



Source: Yearbook of Agricultural Statistics, several years, Bangladesh Bureau of Statistics.

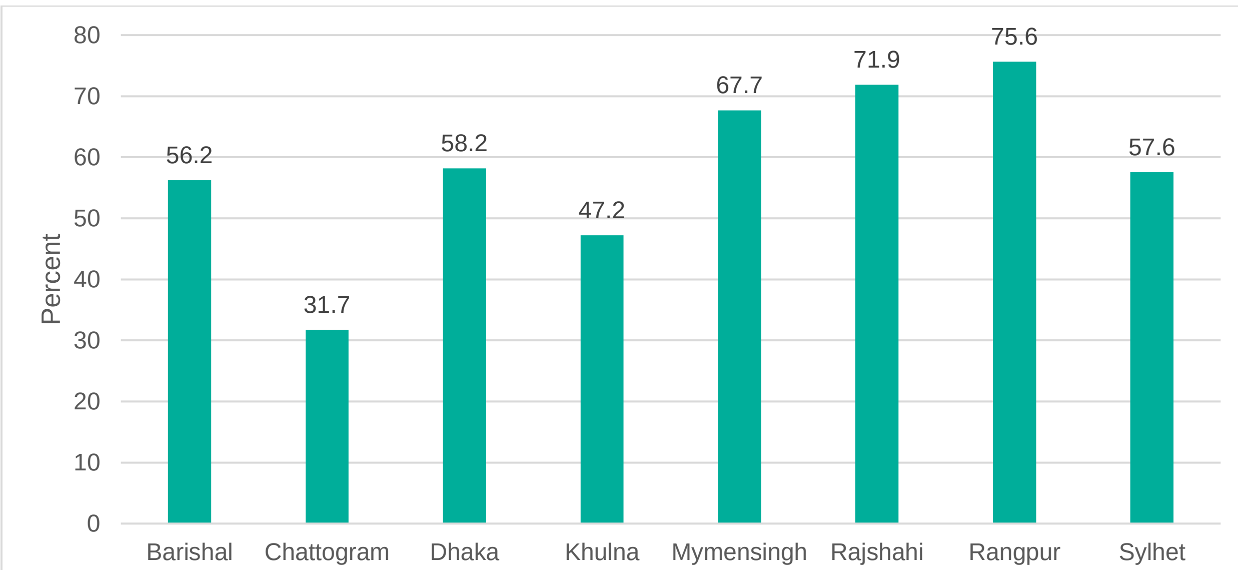
Share of net cropped area in total area and cropping intensity

Net cropped area refers to the total area of land cultivated with one or more crops during the year, excluding periods when the land remains fallow. It represents the actual area under cultivation in a specific year.

Figure 3.5 shows substantial differences in the share of net cropped area in total area by division. Rangpur Division had the highest share of net cropped area in total area (75.6 percent), indicating a high level of land use for agricultural purposes. By contrast, Chattogram Division had the lowest share (31.7 percent), suggesting low levels of land use for agriculture.

Table 3.3, which reports district-wise land utilization, shows that three of the five lowest-ranking districts for net cropped area in total area are Rangamati (5.4 percent), Bandarban (7.2 percent), and Khagrachhari (12.2 percent), followed by Bagerhat (27.1 percent) and Khulna (27.2 percent). Conversely, the five districts with the highest shares of net cropped area in total area are all located in Rangpur and Rajshahi Divisions: Thakurgaon (88.2 percent), Joypurhat (84 percent), Rajbari (81.9 percent), Dinajpur (79.7 percent), and Rajshahi (78.8 percent).

Figure 3.5: Net cropped area as percent of total area, 2021/22



Source: Calculated using district-level data in Table 3.3. Yearbook of Agricultural Statistics, 2023, Bangladesh Bureau of Statistics.

Cropping intensity is defined as the number of crops a farmer grows in a given agricultural year on the same field.[4] Table 3.3 shows that, in 2021/22, the top five ranking districts in terms of cropping intensity were Meherpur (279 percent), Chuadanga (263 percent), Bogura (243 percent), Kushtia (242 percent), and Joypurhat (240 percent). The bottom five districts for cropping intensity were Bandarban (109 percent), Barguna (140 percent), Bagerhat (146 percent), Satkhira (147 percent), and Jhalokati (148 percent).

[4] Cropping intensity = (Gross cropped area / Net cropped area) x 100.

Cropping patterns

Cropping patterns in Bangladesh play a crucial role in maximizing agricultural productivity. Cropping patterns refer to the yearly sequence and spatial arrangement of crops on a given piece of land, influenced by climate, environment, and socioeconomic factors. This management practice affects various aspects of crop production, soil health, and input management.

A study by the Bangladesh Rice Research Institute (BRRI) researchers revealed 316 major cropping patterns across Bangladesh. The top five cropping patterns, all consisting solely of rice, accounted for 51 percent of the net cropped area (Nasim et al. 2018).

Among the identified patterns, the most widespread is boro−fallow−t. aman, which accounts for 27 percent of the net cropped area and is observed in 63 districts and 426 upazilas (Table A3.1). This pattern is particularly dominant in medium-high land areas, with Mymensingh Division being a key example, where it spans 188,650 hectares, comprising 65 percent of the district's net cropped area. The second most prominent pattern, boro−fallow−fallow, covers 13 percent of the net cropped area and is common in flood-prone, low-lying regions such as Sunamganj, where it occupies 68 percent of the district's net cropped area (Table A3.2). Fallow−fallow−t. aman, prevalent in 36 districts and 162 upazilas, covers 6 percent of the net cropped area, with Chattogram showing the highest concentration at 33 percent, largely due to the district's saline and drought-prone conditions (Table A3.3).

The boro−aus−t. aman pattern is found in 47 districts and 177 upazilas, while the mustard−boro−t. aman pattern is prominent in 51 districts and 203 upazilas, signifying the importance of oilseed crops in these areas. Districts like Dinajpur and Mymensingh, with some of the highest net cropped areas (276,840 hectares and 289,660 hectares, respectively) underscore the dominance of rice-based cropping systems, with boro-fallow-t. aman and boro-fallow-fallow being the most practiced patterns. Other notable cropping patterns, such as boro−aus−t. aman (2.4 percent of the net cropped area), fallow−aus−t. aman (2.3 percent), and mustard−boro−t. aman (2.2 percent), demonstrate the adaptability of agricultural practices to local environmental conditions (Tables A3.4–6). In regions facing adverse conditions such as the saline-prone areas of southern Bangladesh, patterns like fallow−fallow−t. aman emerge as more suitable.

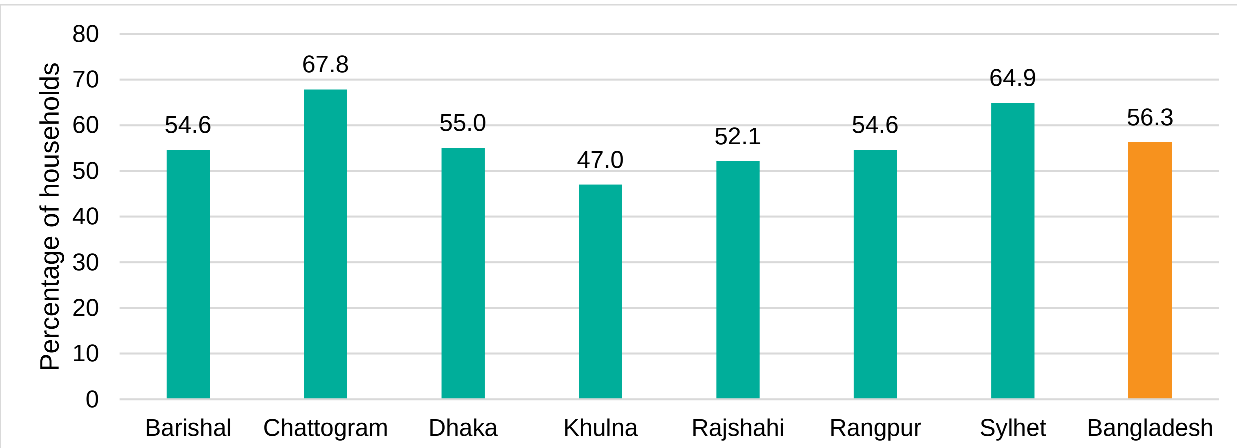
This geographical distribution of cropping patterns provides critical insights into how regional characteristics–ranging from flood-prone lowlands to drought-affected areas–shape agricultural practices in Bangladesh. Examining these dominant patterns is crucial to understand the strategic deployment of resources and inputs tailored to the specific needs of each region, fostering improved crop yields and sustainability (Nasim et al. 2018).

Structure of land distribution and land tenure arrangements

Incidence of landlessness and inequality in land distribution

Land is the most important factor for agricultural production. Landlessness refers to the condition where individuals or households own no land, either for agricultural purposes or for living. Landlessness often leads to poverty, food insecurity, and social marginalization, as households without land struggle to generate income, produce food, or access resources and opportunities essential for economic and social well-being (Chowdhury 2009). In rural Bangladesh, 56 percent of households are landless, owning no cultivable land other than their homestead plots. The incidence of landlessness ranges from 47 percent in Khulna Division to 68 percent in Chattogram Division (Figure 3.6).

Figure 3.6: Prevalence of landlessness in rural Bangladesh, by division, 2018/19



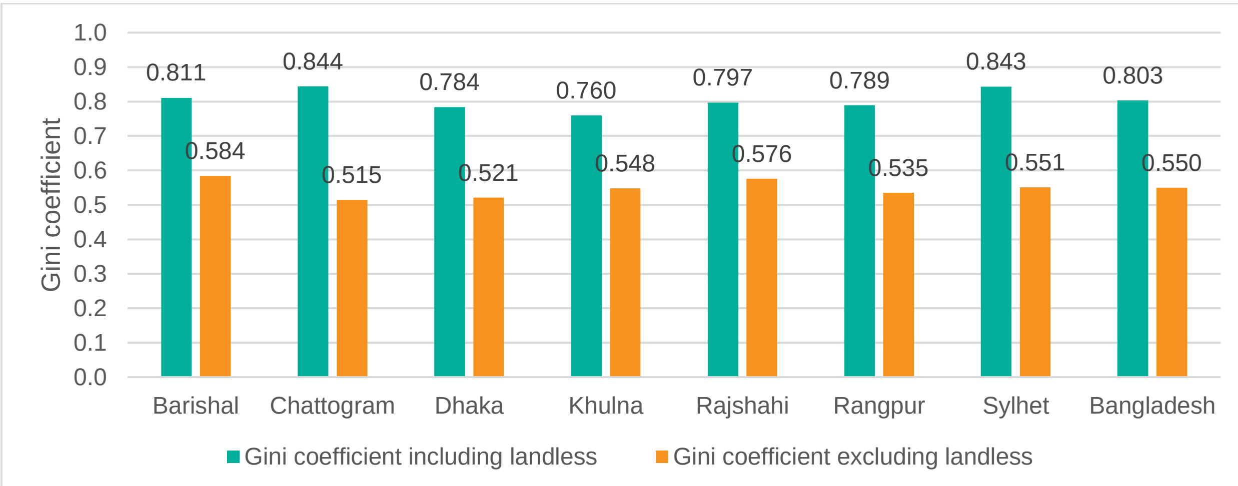
Source: IFPRI Bangladesh Integrated Household Survey, 2018/2019, national rural stratum

Turning to inequality measures, Table 3.4 describes the distribution of owned cultivated land in rural Bangladesh, a simple way to measure inequality. In the table, the households are divided into 20 equal groups and are ranked from lowest to highest based on their ownership of total cultivable land. The average size of owned cultivable land for each group is also reported in the table. The numbers indicate that the distribution of arable land is extremely unequal. Among those who own cultivable land, the bottom 25 percent of all households own only 3.8 percent of total cultivable land. At the other extreme, the top 5 percent of all households own 26.4 percent, and the top 10 percent own 39.7 percent of all cultivable land in rural Bangladesh.

The most widely used summary measure of inequality is the Gini coefficient, which is mainly used for comparing inequality over time and space. The Gini coefficient varies between 0 (everyone has the same amount of land) and 1 (one person has all the land). For all of rural

Bangladesh, the Gini coefficients are 0.803 when including the landless and 0.550 when excluding them. Interestingly, the inequality in land ownership is highest in Chattogram Division when the prevalence of landlessness is considered. However, inequality is the lowest in the same division among those who own cultivable land (Figure 3.7).

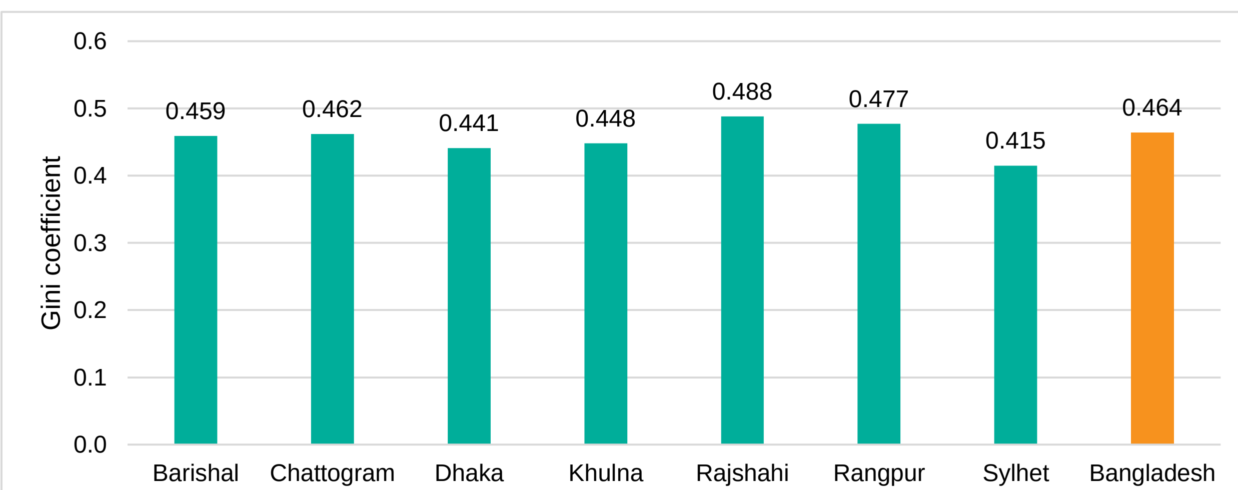
Figure 3.7: Inequality in cultivable landownership: Gini coefficient



Source: IFPRI Bangladesh Integrated Household Survey, 2018/2019, national rural stratum

The estimated Gini coefficient for distribution of operated land is 0.464 for rural Bangladesh (Figure 3.8). The inequality in operated land is highest in Rajshahi Division (0.488) and lowest in Sylhet Division (0.415). Table 3.5 presents the distribution of operated land by 20 equal groups in rural Bangladesh, by district.

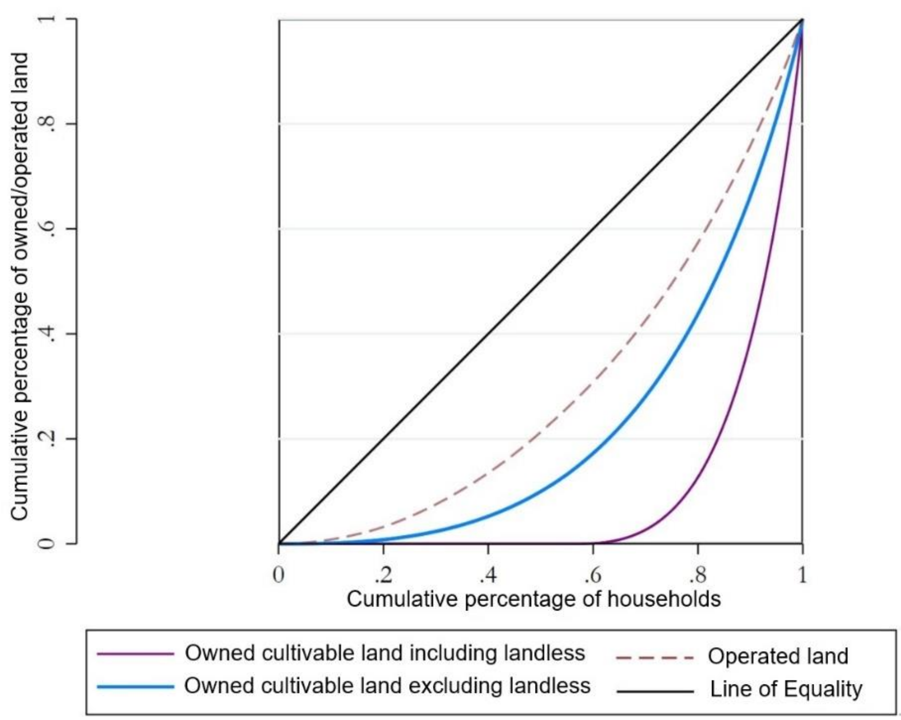
Figure 3.8: Inequality in operated landholding: Gini coefficient



Source: IFPRI Bangladesh Integrated Household Survey, 2018/2019, national rural stratum

The Gini coefficient can be interpreted in the context of a Lorenz curve. Figure 3.9 shows Lorenz curves of land distribution in rural Bangladesh. The Lorenz curve provides a visual representation of land distribution inequality. It plots the cumulative percentage of total landholdings against the cumulative percentage of households, showing, for example, the share of total land held by the bottom 25 percent of households. The 45-degree line represents perfect equality, where all households have the same amount of land. The area between this 45-degree line and the Lorenz curve measures the extent of inequality. The Gini coefficient quantifies this inequality as the ratio of the area between the Lorenz curve and the 45-degree line to the area of the triangle beneath the 45-degree line. Figure 3.9 shows that the distribution of owned cultivable land is more unequal than the distribution of operated landholding, even when the landless are excluded from the estimation.

Figure 3.9: Lorenz curves of land distribution in rural Bangladesh



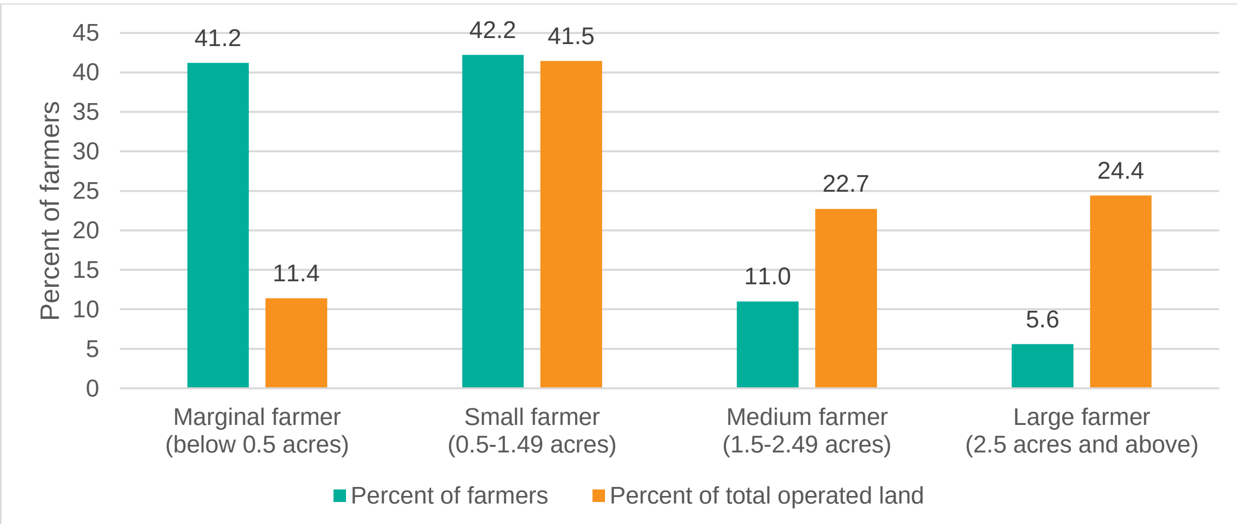
Source: IFPRI Bangladesh Integrated Household Survey, 2018/2019, national rural stratum

Farm size groups

Most farmer-level analysis in this section disaggregates the sample farmers into four operated farm size groups: (1) marginal (operating less than 0.5 acres of land), (2) small (operating 0.5 to 1.49 acres of land), (3) medium (operating 1.5 to 2.49 acres of land), and (4) large (operating 2.5 acres or more land). The four farm size groups match the cut-off points of the six operated farm size groups presented in BBS's 2010 HIES report by aggregating the two smallest HIES farm size groups under the marginal farm category and the two largest groups under the large farm category. Marginal and small farmers constitute the largest share of farmers in Bangladesh (BBS 2011).

Figure 3.10 shows the distribution of operated land by farm size groups in 2018/19, presented by the percentage of all farmers and total operated land. Overall, a high degree of inequality in distribution of operated land was observed in 2018/19. In 2018/19, marginal farmers represented 41 percent of all farmers who operate 11 percent of land. The share of large farmers was about 6 percent who operated about 24 percent of land.

Figure 3.10: Percent of farmers and total operated land, 2018/19



Source: IFPRI's Bangladesh Integrated Household Survey (BIHS), 2018/2019, national rural stratum

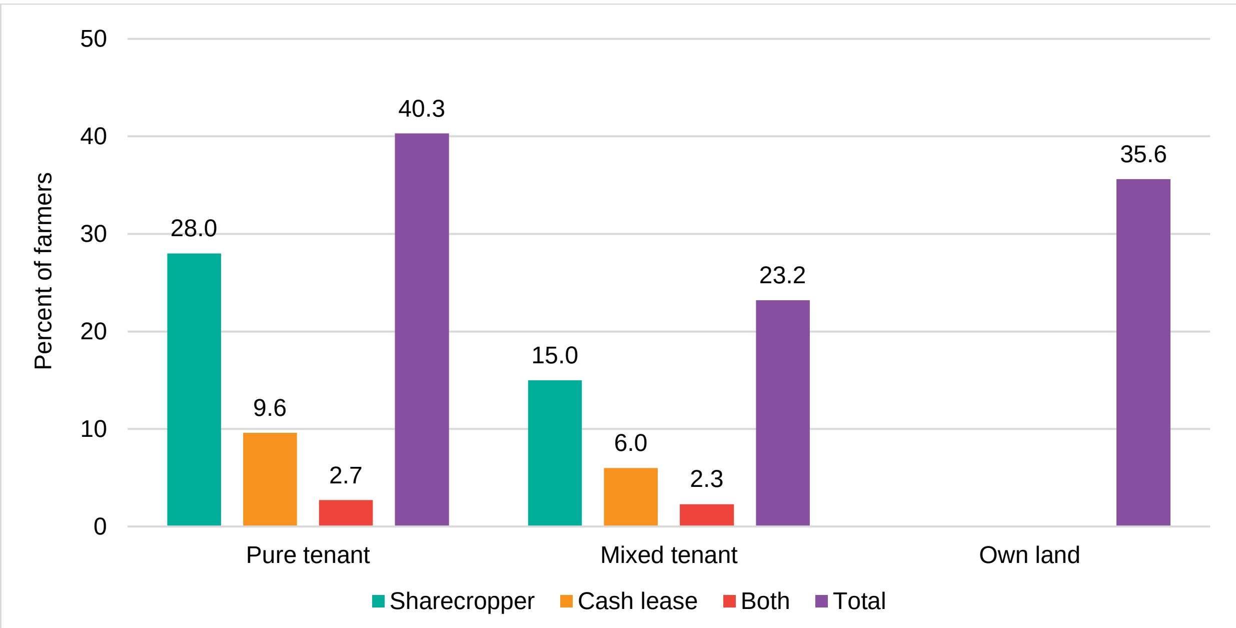
Land tenure

Figure 3.11 shows the land tenancy arrangements in rural Bangladesh in 2018/19. Land tenure is crucial because it determines how people access and use land resources, impacting agricultural productivity and community self-reliance (FAO (Food and Agriculture Organization) 2002). In 2018/19, 40 percent of all farm households were pure tenants; that is, they did not own the land they cultivated. About 36 percent of farmers cultivated only their own land in 2018/2019. The proportion of mixed-tenant farmers – those who cultivate their own land and take land in as sharecroppers and/or leaseholders – was 23 percent in 2018/19.

The dominant land-tenure arrangement is sharecropping, where the crops produced are shared between the cultivator and the landowner in different proportions that have been agreed upon prior to cultivation. About 43 percent of farmers were sharecroppers (28 percent pure tenants and 15 percent mixed tenants), and about 16 percent of the farmers had cash-lease arrangements (10 percent pure tenants and 6 percent mixed tenants) in 2018/19.

Table 3.6 illustrates the land tenancy arrangements by division in rural Bangladesh in 2018/19, by division. Chattogram and Sylhet Divisions have the highest percentage of pure tenants at 50 percent and 47 percent, respectively. Mixed tenant tenure practice was higher in Barishal Division than all other divisions. The percentage of farmers who cultivated their own land only was the highest in Dhaka Division (41 percent), followed by Khulna (39 percent), Rajshahi (37 percent), and Sylhet (35 percent).

Figure 3.11: Land tenancy arrangements in rural Bangladesh, 2018/19



Source: IFPRI's Bangladesh Integrated Household Survey, 2018/19, national rural stratum

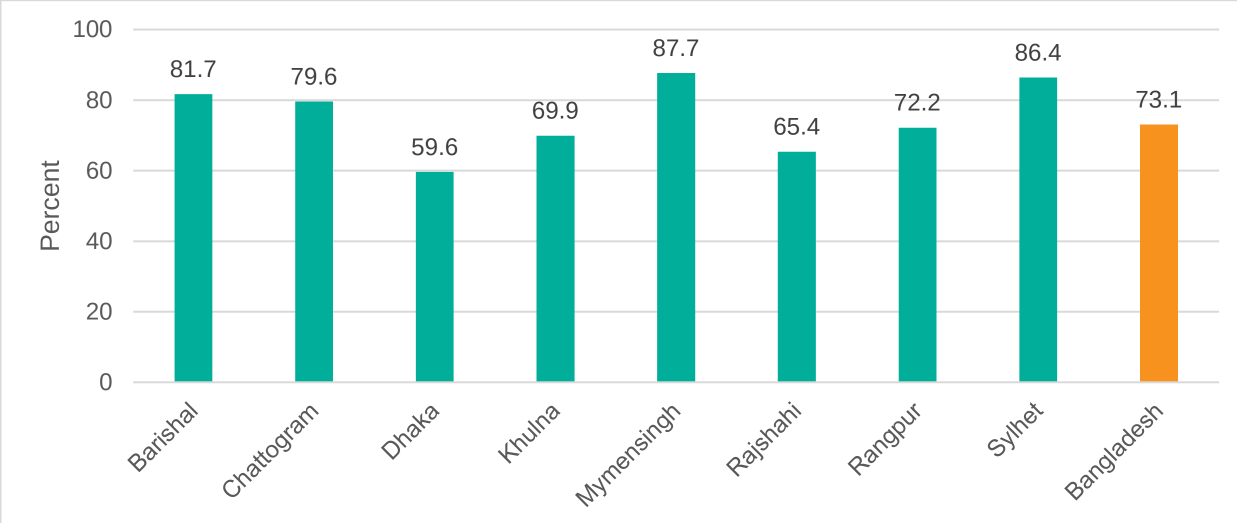
Share of crops in gross cropped area

The overwhelming majority of land for agriculture in Bangladesh continues to be dominated by rice, as reflected in its share in gross cropped area.[5] Rice alone accounted for nearly three-quarters (73.1 percent) of gross cropped area in 2022/23 (Figure 3.12). Among all divisions, Mymensingh (87.7 percent) and Sylhet (86.4 percent) had the highest shares of rice in gross cropped area. Meanwhile, Dhaka Division had the lowest share of rice in gross cropped area (59.6 percent), followed by Rajshahi Division (65.4 percent).

Table 3.7 shows the district shares of several crops in gross cropped area, including rice, wheat, maize, potato, pulses, oilseeds, all vegetables, chilis, onions, sugarcane, and jute. The districts with the highest percentage of area under rice were Barguna (98.8 percent), Sunamganj (96.5 percent), and Netrokona (95.8 percent). Rajbari (32.5 percent), Faridpur (35.1 percent), and Shariatpur (37.6 percent) Districts had the lowest share of area under rice.

[5] Gross cropped area refers to the total area sown once or more in a year.

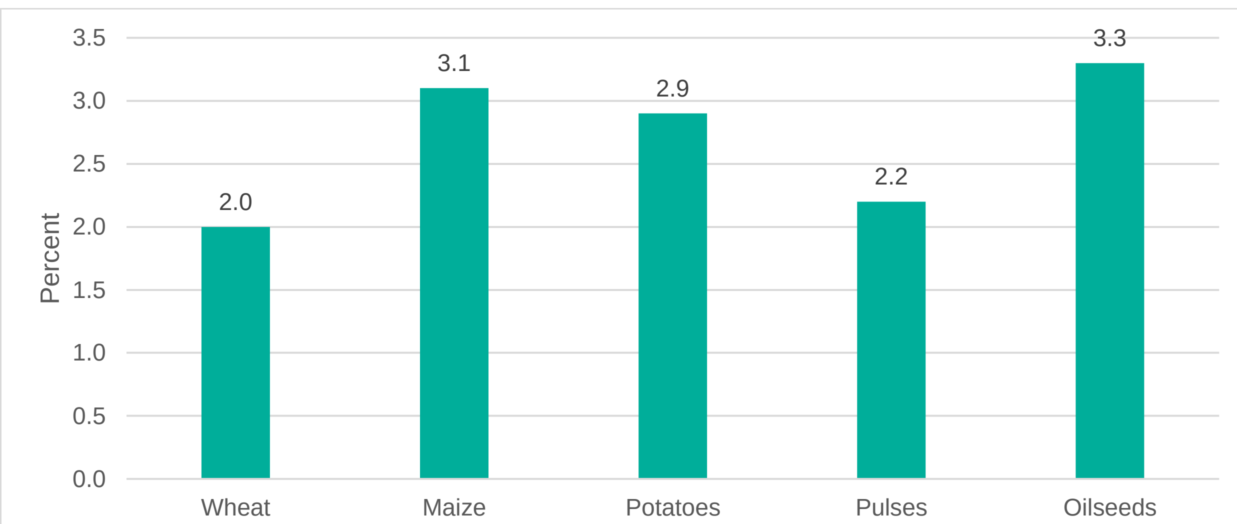
Figure 3.12: Share of rice in gross cropped area, by division, 2022/23



Source: Calculated from district-level data reported in Table 3.7. Yearbook of Agricultural Statistics, 2023, Bangladesh Bureau of Statistics.

Figure 3.13 shows the shares of wheat, maize, potatoes, pulses, and oilseeds in gross cropped area in 2022/23. At the national level, wheat occupies only 2 percent of gross cropped area, while maize occupies3.1 percent, potatoes 2.9 percent, pulses 2.2 percent, and oilseeds 3.3 percent.

Figure 3.13: Shares of wheat, maize, potatoes, pulses and oilseeds in gross cropped area, 2022/23

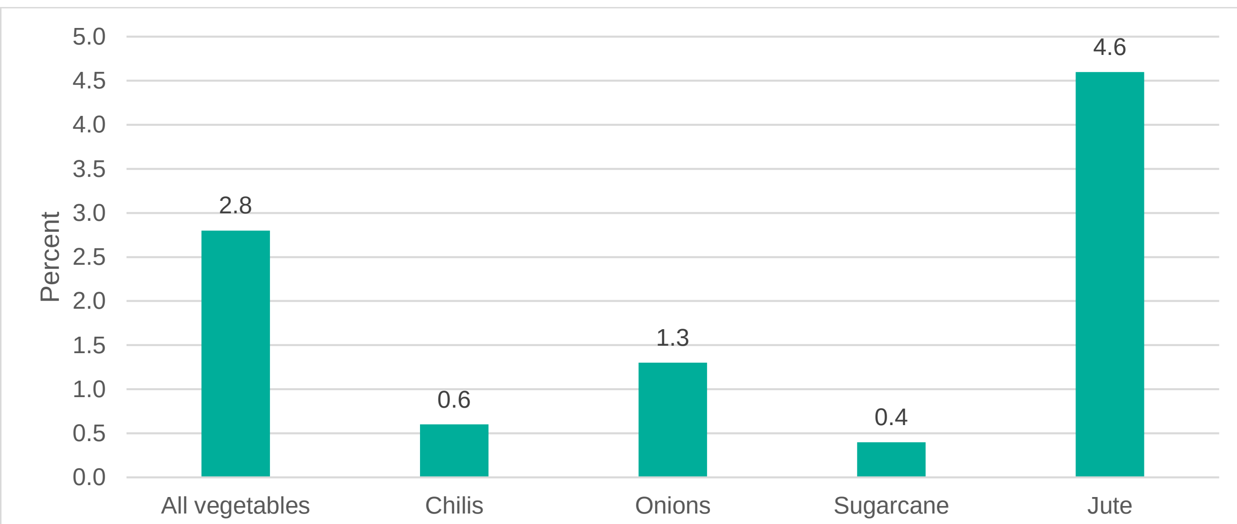


Source: Calculated from district-level data reported in Table 3.8. Yearbook of Agricultural Statistics, 2023, Bangladesh Bureau of Statistics.

Wheat is only grown in certain regions, and shares of wheat in gross cropped area were highest in the northwestern districts of Thakurgaon (12.9 percent) and Chapai Nawabjanj (10.6 percent). Likewise, shares of maize in gross cropped area were highest in Chuadanga (22.9 percent) and Lalmonirhat (17.1 percent). Munshiganj (36.3 percent) and Rangpur (11.8 percent) ranked highest for potatoes, followed by Bogura (10.2 percent). Narail (10.2 percent) and Noakhali (9.1 percent) had the highest shares of pulses in cropped area, while Joypurhat (23.5 percent) and Lakshmipur (21.7 percent) ranked highest for oilseeds (Table 3.8).

Finally, we examined the shares of other food and cash crops in gross cropped area in 2022/23, namely all vegetables, chilis, onions, sugarcane, and jute (Figure 3.14). Nationally, jute ranks highest among all non-rice crops, occupying 4.6 percent of gross cropped area. Around 2.8 percent of land is dedicated to vegetables, 1.3 percent onions, 0.6 percent chilis, and 0.4 percent sugarcane.

Figure 3.14: Shares of all vegetables, chilis, onions, sugarcane, and jute in gross cropped area, 2022/23



Source: Calculated from district-level data reported in Table 3.7. Yearbook of Agricultural Statistics, 2023, Bangladesh Bureau of Statistics.

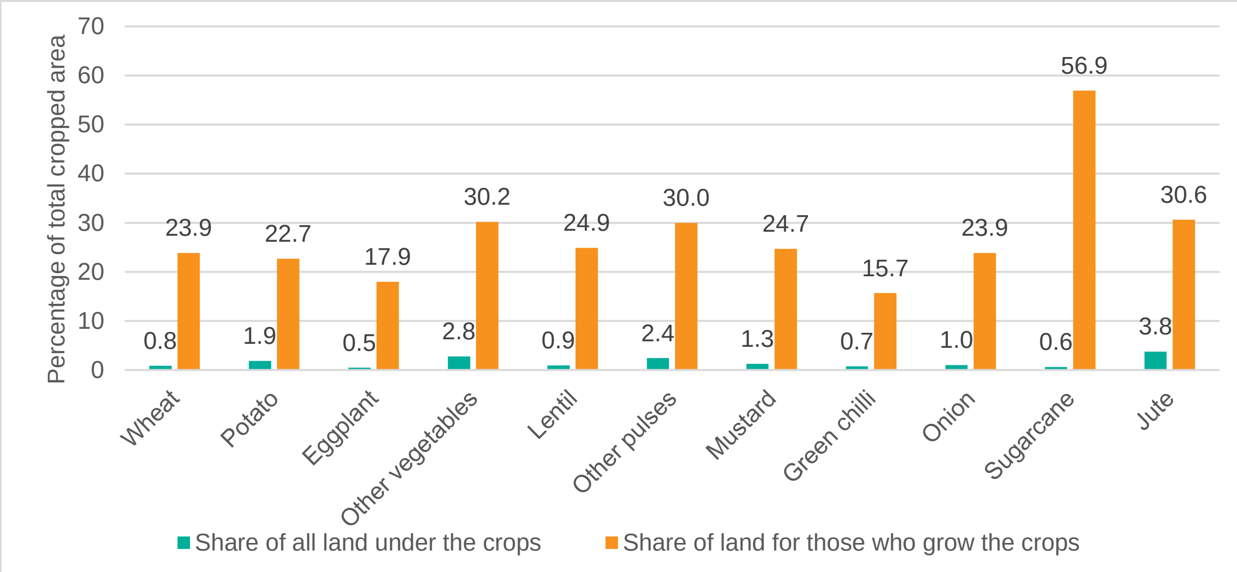
Table 3.7 shows that, at the district-level, the Hill Tracts districts of Khagrachhari (14.2 percent) and Rangamati (13.2 percent) had the highest shares of land under vegetables. For chilis, Shariatpur (3.4 percent) and Bhola (2.9 percent) ranked the highest. The share of area under onion cultivation was highest in Rajbari (14.9 percent) and Faridpur (13.0 percent) Districts. By far the highest share of land under sugarcane is in Natore (7.1 percent), followed by Rajshahi (1.3 percent). Finally, shares of jute area are highest in Faridpur (27.9 percent) and Rajbari (25.2 percent) Districts.

Next, we complement the national figures from BBS with estimates from IFPRI's Bangladesh Integrated Household Study (BIHS) 2018/19, which is statistically representative of rural Bangladesh.

Figure 3.15 shows the average area under individual non-rice crops as a percentage of total cropped land for all farmers, and the share of total cropped area for those who produced the crops in 2018/19.[6] On average, farmers devote very small shares of total cropped land to produce non-rice crops. However, farmers who do cultivate a non-rice crop allocate a substantial share of their total cropped land to that crop. For example, wheat occupies only 0.8 percent of the total cropped area, but those who cultivate wheat devote nearly one-quarter (23.9 percent) of their total cropped area to wheat. This pattern indicates that producers might be facing various agroecological and other constraints to increased cultivation of potentially higher value crops than rice per unit of land. For example, if the type of soil, land elevation, irrigation water availability, rainfall, and temperature are not suitable for non-rice crops, then farmers would not be able to diversify their crop production. Moreover, effective connectivity to farmers' markets is essential. Farmers residing in areas with limited access to roads or waterways that link to urban consumption centers may struggle to sell their non-rice crops, which are generally more perishable than rice. A remarkable example is sugarcane: although only 0.6 percent of total cropped area is under sugarcane, those who cultivate sugarcane allocate 56.9 percent of their total cropped area to the crop, probably because they live near sugar mills and can sell their harvest easily. These findings may have important policy implications for promoting crop diversification in Bangladesh.

[6] The crop shares were calculated as follows: Share of crop X (say, rice) on total cropped land = Total area under crop X cultivated by all sample households in rural Bangladesh from December 1 to November 30 (12 months) divided by total area under all crops cultivated by all sample households in rural Bangladesh from December 1 to November 30. Estimates were based on plot-level data, accounting for cropping intensity (that is, how many crops were grown on each plot in the 12-month period). Permanent trees (e.g., mango, jackfruit, coconut, and betel leaf trees) and plantations (e.g., tea and rubber plantations) were excluded from total cropped land calculations.

Figure 3.15: Share of all land under crops and share of land for those who grow the crops, 2018/19



Source: IFPRI's Bangladesh Integrated Household Survey (BIHS), 2018/2019, national rural stratum

Food production

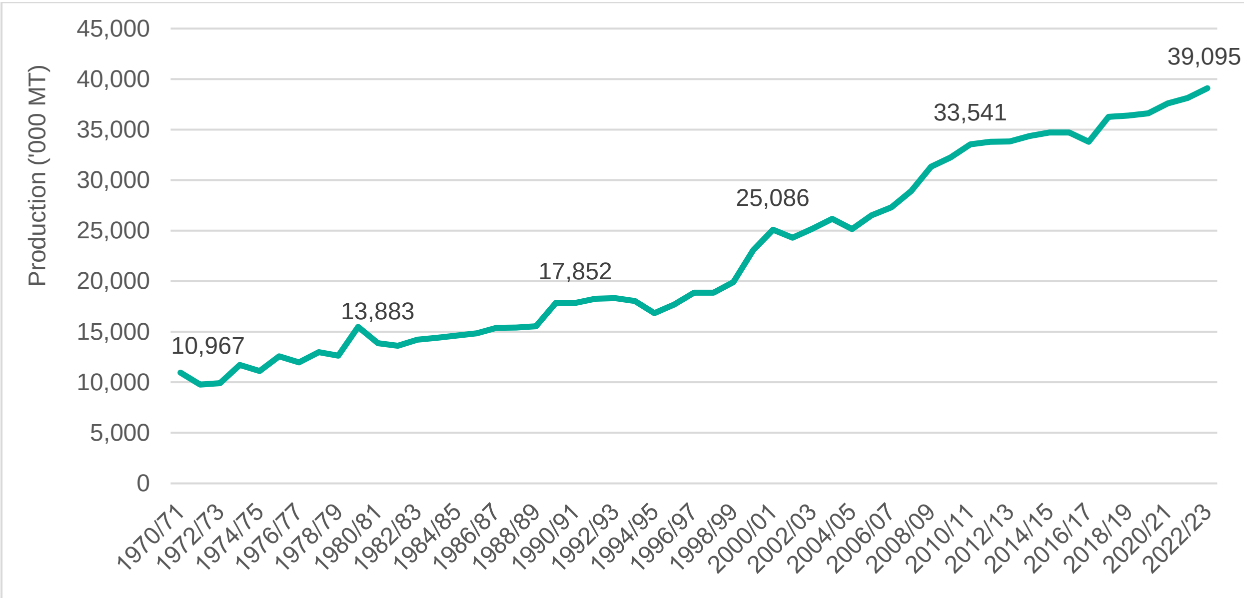
Production, in broad terms, is a function of land area utilized for agriculture and corresponding productivity. The level of food production in the country largely determines the availability of food for consumption, alongside imports. This sub-section looks at the long-term trends in food production in Bangladesh for some key commodities, as well as the current levels of production.

Trends in production

Bangladesh's success in its ability to ensure enough food for its population has largely been through expansion of its rice production capacity. The country ranks third in global rice production, behind only China and India (FAO 2022).

Rice production in Bangladesh has experienced continuous growth since the 1970s. Since independence, rice production has increased fourfold (Figure 3.16). Between 1970/71 and 1980/81, annual production grew steadily from 11.0 million MT to 13.9 million MT. With the onset of the Green Revolution, the 1990s saw a significant surge, where production rose from 17.9 million MT in 1990/91 to 25.1 million MT by the end of the decade. The upward trend continued into the 2000s, reaching 33.5 million MT by 2010/11. More recently, production has continued to climb, reaching 39.1 million MT by 2022/23. Despite occasional fluctuations, the overall trajectory indicates a robust and sustained growth in rice production over the decades.

Figure 3.16: Total rice production, 1970/71 to 2022/23



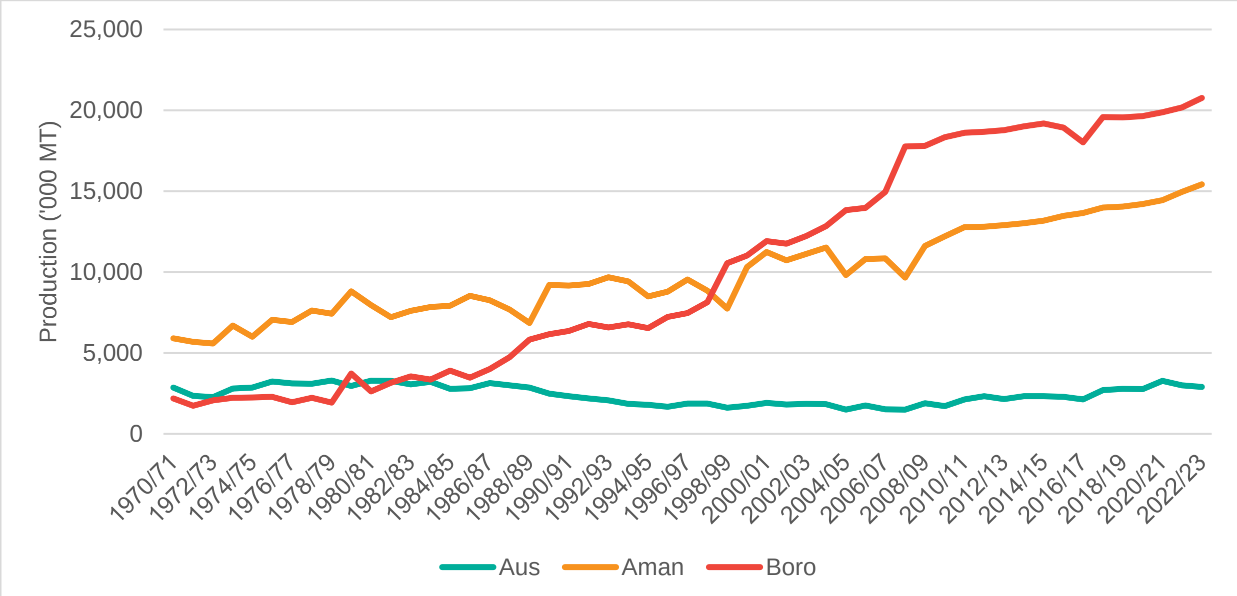
Source: Yearbook of Agricultural Statistics, Bangladesh Bureau of Statistics (several years).

There are three rice-growing seasons in Bangladesh: (1) aus, (2) aman, and (3) boro. Aus is the pre-monsoon rice-growing season under rainfed conditions. Aus rice is sown March-April and harvested between July and August. The monsoon-season rainfed rice is aman, which is planted in two ways: (1) direct-seeding (broadcast or b. aman) with aus in March-April, and (2) transplanted (t. aman) in July-August. Both types are harvested from November-December. Boro is the dry-season irrigated rice planted from December-early February and harvested April-June (Shelley et al. 2016).

In 2022/23, the total area under rice was 11.6 million hectares, of which aus accounted for 9.1 percent; aman, 49.2 percent; and boro, 41.7 percent. In the same year, total rice production was 39.1 million MT, of which aus rice accounted for 7.4 percent; aman rice, 39.4 percent; and boro rice, 53.2 percent.

Figure 3.17 illustrates the production trends for aus, aman, and boro rice from 1970/71 to 2022/23. Aman rice production demonstrated a consistent and steady increase, growing from 6.6 million MT in 1960/61 to 15.4 million MT in 2022/23. Initially, aman was the predominant variety, but its dominance shifted to irrigated boro rice in the 1990s. Boro's rapid expansion into the mid-2000s was spurred by the introduction of high-yielding varieties and expansion of irrigation infrastructure. Although production continued to increase post-2006, the rate of growth in boro production has declined. Conversely, aus rice production peaked in the 1980s, and has since plateaued to around 3 million MT by 2022/23. Overall, there was a significant increase in total rice production, driven largely by the growth of boro rice and steady gains in aman production.

Figure 3.17: Production trends of aus, aman and boro rice, 1970/71 to 2022/23

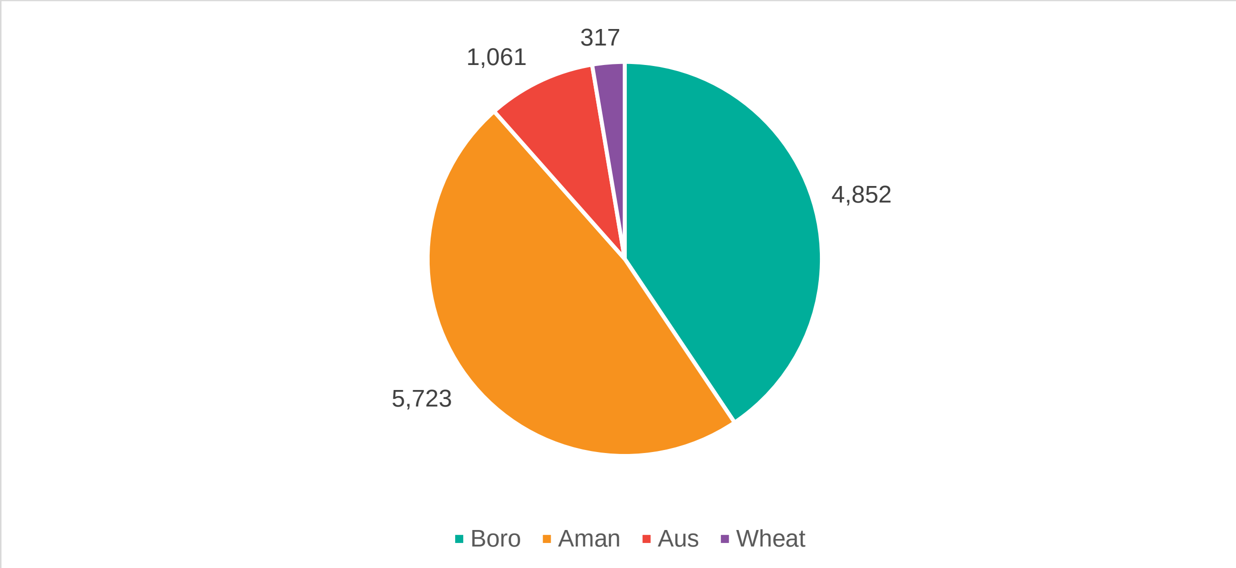


Source: Yearbook of Agricultural Statistics, Bangladesh Bureau of Statistics (several years).

Foodgrain area and production

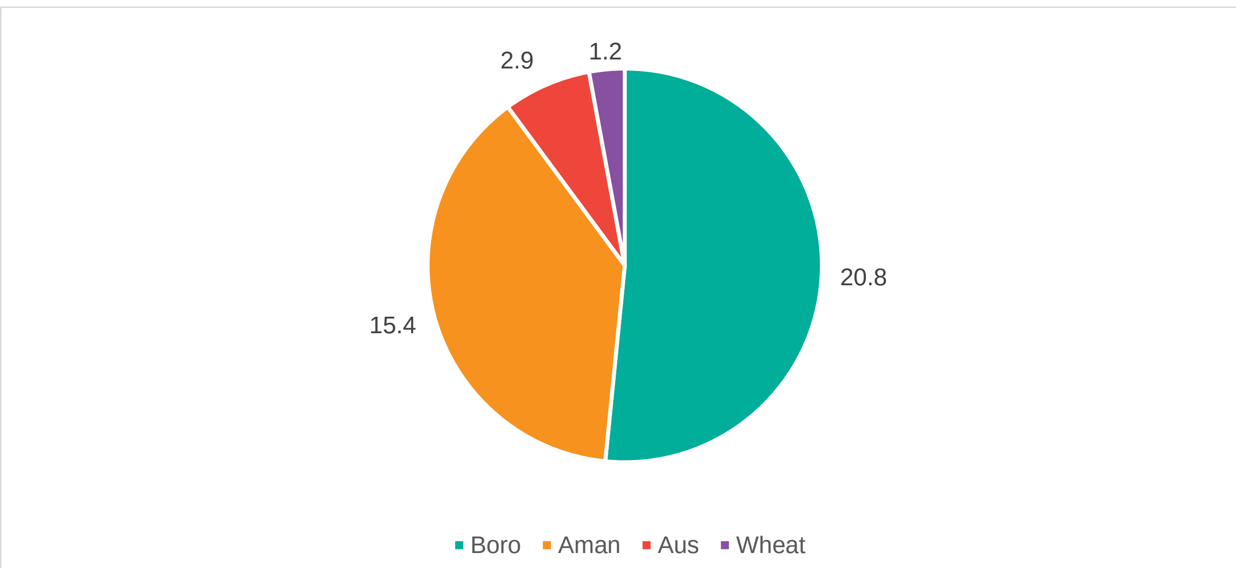
Figures 3.18 and 3.19 present the area and production under foodgrains (that is, rice and wheat), respectively, in 2022/23. While around 41 percent (or 4.8 million hectares) of the total area under foodgrains was for the boro harvest, the crop contributed 52 percent (20.8 million MT) of total foodgrain production in 2022/23. On the other hand, nearly half the area under foodgrains (48 percent, or 5.7 million hectares) was under aman, but aman production was 38 percent (15.4 million MT) of total foodgrain production. This disparity in area and production between boro and the other two rice crops emerges due to higher productivity of boro compared to aman and aus.

Figure 3.18: Foodgrain area (in thousand hectares), FY 2022/23



Source: Yearbook of Agricultural Statistics, 2023, Bangladesh Bureau of Statistics.

Figure 3.19: Foodgrain production (in million MT), FY 2022/23



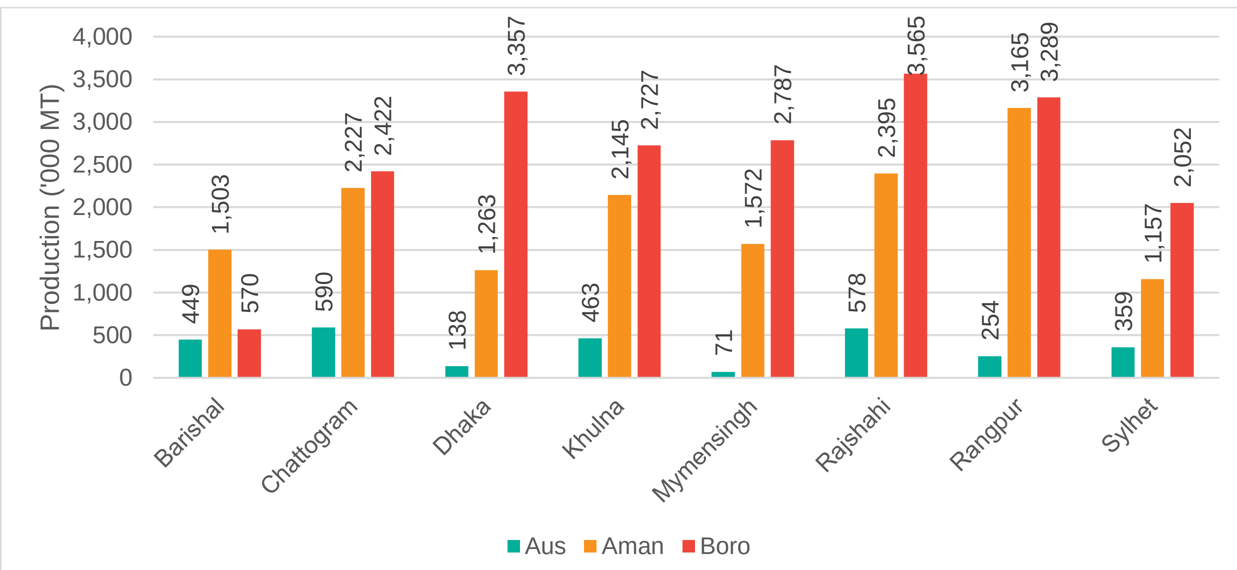
Source: Yearbook of Agricultural Statistics, 2023, Bangladesh Bureau of Statistics.

Regional patterns of crop production

Figure 3.20 shows division-level production of rice by season in 2022/23 from district-level data in Table 3.8. Total rice production in 2022/23 was 39.1 million MT, of which boro production was 20.8 million MT (53.1 percent), aman production was 15.4 million MT (39.5 percent), and aus production was 2.9 million MT (7.4 percent). For boro rice production, Rajshahi Division ranked the highest (3.6 million MT), followed by Dhaka (3.4 million MT) and Rangpur (3.3 million MT). Barishal Division had the lowest level of boro rice production (570 thousand MT). Rangpur Division had the highest level of aman rice production (3.2 million MT), while Sylhet Division ranked the lowest (1.2 million MT). Chattogram Division ranked the highest in aus rice production (590 thousand MT), while Mymensingh ranked the lowest (71 thousand MT).

Table 3.8 reveals that, among the districts, Mymensingh ranked the highest in terms of overall rice production (1.8 million MT), followed by Naogaon (1.6 million MT). Rangamati (69 thousand MT) and Bandarban (78 thousand MT) have the lowest levels of rice production. Mymensingh District also ranked the highest for boro production (1.1 million MT), followed by Sunamganj (988 thousand MT). Patuakhali (13 thousand MT) produced the least amount of boro rice. Dinajpur produced the most aman rice (732 thousand MT), while Narayanganj produced the least (10 thousand MT). Chapai Nawabganj produced the most aus rice (130 thousand MT), while Munshiganj produced the least (420 MT).

Figure 3.20: Production of aus, aman and boro rice, by division, 2022/23

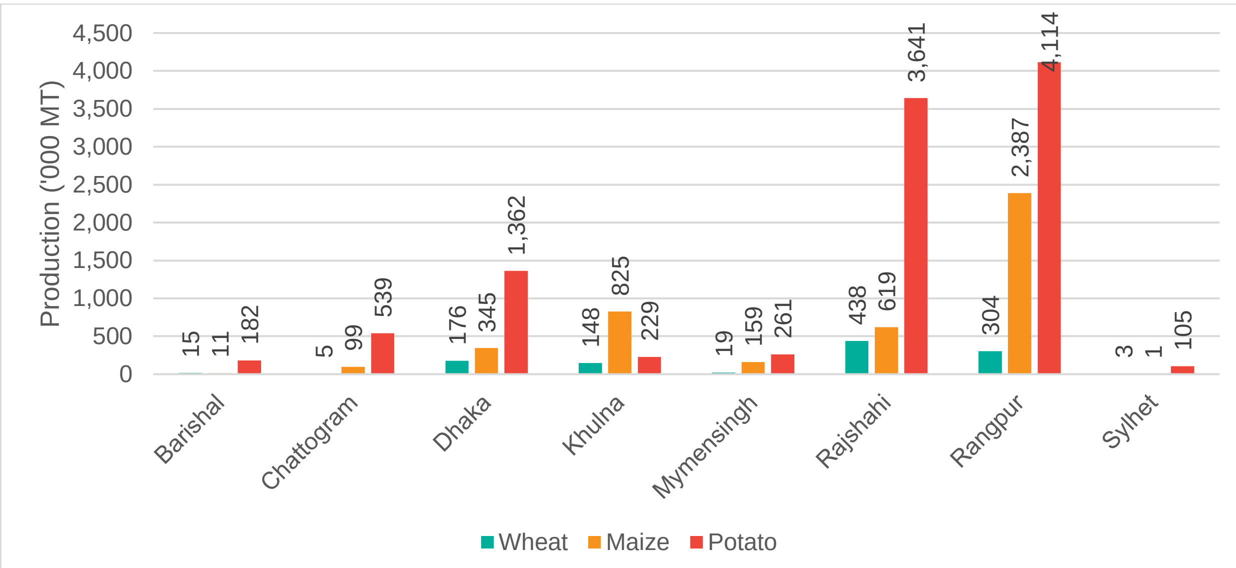


Source: Calculated from district-level data in Table 3.8. Yearbook of Agricultural Statistics, 2023, Bangladesh Bureau of Statistics.

Figure 3.21 illustrates production levels of other staple crops, namely wheat, maize, and potatoes, calculated from district-level data in Table 3.8. In 2022/23, Bangladesh produced 1.1 million MT of wheat, 4.4 million MT of maize, and 10.4 million MT of potatoes. Among all divisions, most wheat production was centered in Rajshahi (438 thousand MT) and Rangpur (304 thousand MT). Thakurgaon District produced the highest amount of wheat (165 thousand

MT). Rangpur Division produced more than half of the country's maize (2.4 million MT), with Dinajpur being the highest maize-producing district (641 thousand MT). In terms of potato production, Rajshahi (4.1 million MT) and Rangpur Divisions (3.6 million MT) ranked the highest by far. Of the districts, Rangpur (1.2 million MT), Bogura (1.1 million MT), Dinajpur (1.1 million MT), and Chapai Nawabganj (1.1 million MT) reported the highest levels of potato production in the country.

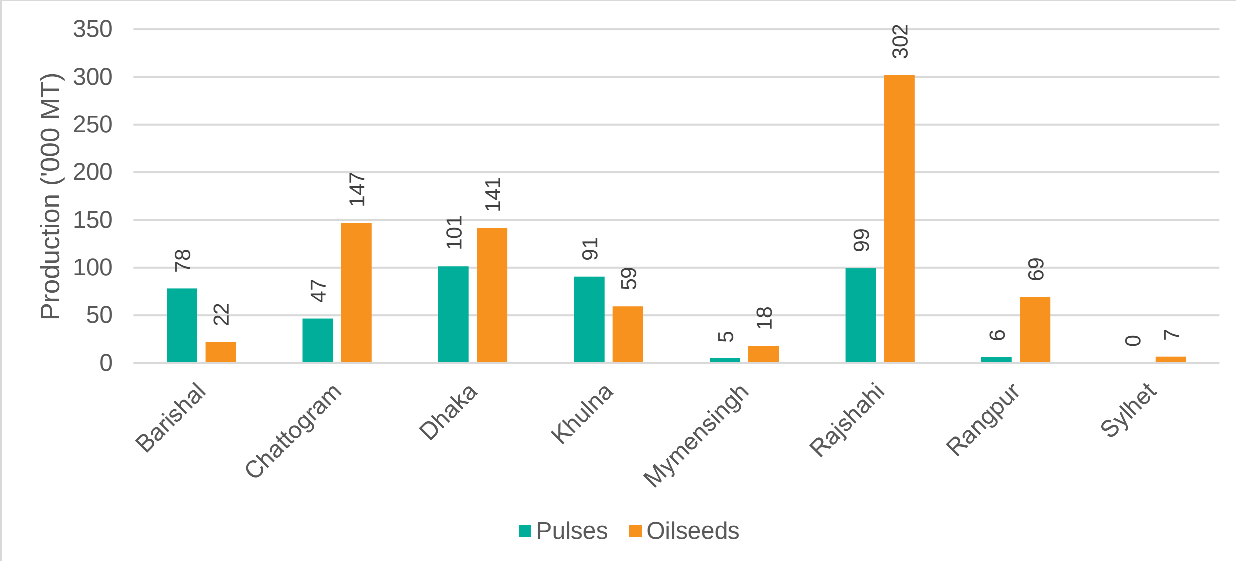
Figure 3.21: Production of wheat, maize and potato, by division, 2022/23



Source: Calculated from district-level data in Tables 3.8. Yearbook of Agricultural Statistics, 2023, Bangladesh Bureau of Statistics.

Figure 3.22 reports pulses and oilseeds production by division for 2022/23, from district-level data in Table 3.8. The country produced 427 thousand MT of pulses and 764 thousand MT of oilseeds in 2022/23. Dhaka Division (101 thousand MT) ranked the highest for pulse production, and Rajshahi Division (302 thousand MT) ranked the highest for oilseed production. Sylhet Division ranked the lowest for both pulse (433 MT) and oilseed (7 thousand MT) production. At the district-level, Faridpur (36 thousand MT) produced the most pulses, while Lakshmipur produced the most oilseeds (86 thousand MT).

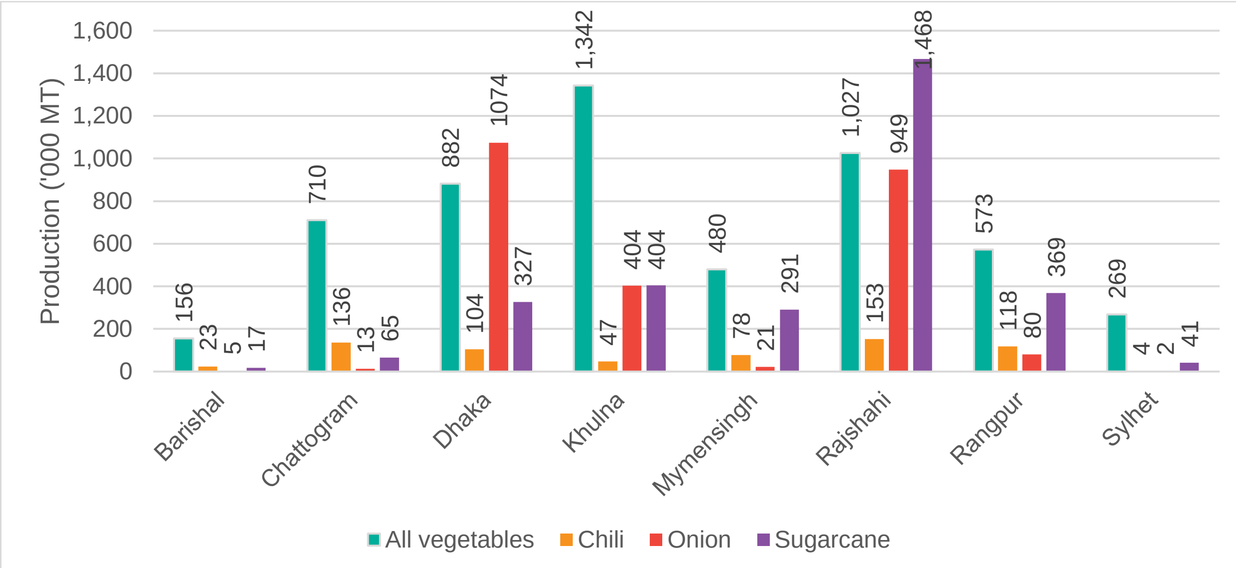
Figure 3.22: Production of pulses and oilseeds, by division, 2022/23



Source: Calculated from district-level data in Table 3.8. Yearbook of Agricultural Statistics, 2023, Bangladesh Bureau of Statistics.

Next, Figure 3.23 shows the division-level production of vegetables, chilis, onions, and sugarcane for 2022/23, calculated from district-level data in Table 3.9. Bangladesh produced 5.4 million MT of vegetables, 663 thousand MT of chilis, 2.5 million MT of onions, and 3.0 million MT of sugarcane in 2022/23. Khulna Division (1.3 million MT) produced the most vegetables, Rajshahi Division the most chilis (153 thousand MT) and sugarcane (1.5 million MT), and Dhaka Division produced the most onions (1.1 million MT). Among the districts, Magura had the highest level of vegetable production (469 thousand MT), Bogura ranked the highest for chilis (61 thousand MT), Faridpur produced the most onions (545 thousand MT), and Natore the most sugarcane (929 thousand MT).

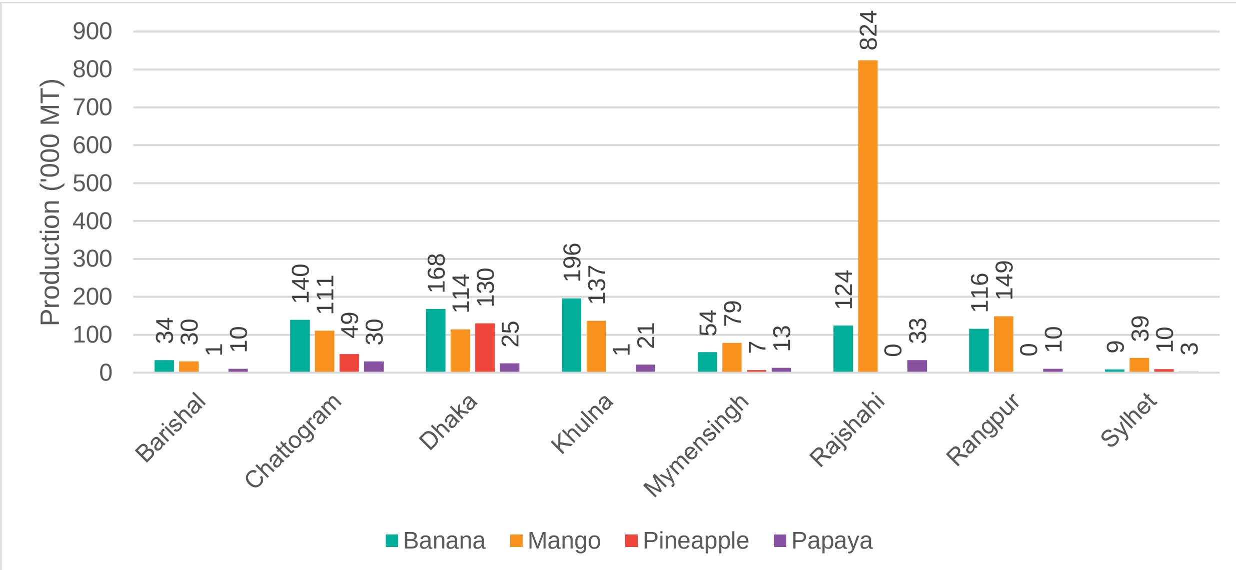
Figure 3.23: Production of all vegetables, chili, onion, and sugarcane, by division, 2022/23



Source: Calculated from district-level data in Table 3.9. Yearbook of Agricultural Statistics, 2023, Bangladesh Bureau of Statistics.

Finally, Figure 3.24 depicts the division-level production of fruits, namely bananas, mangoes, pineapples, and papayas in 2022/23, calculated from district-level data in Table 3.10. Fruit production remains primarily seasonal, with limited scope for year-round production. The country produced more mangoes than any other fruits (1.5 million MT). The second highest were bananas (840 thousand MT), followed by pineapples (197 thousand MT), and papayas (145 thousand MT). Rajshahi Division produced the most mangoes (824 thousand MT). Banana production is somewhat more evenly spread across divisions, with Khulna ranking the highest producer at 196 thousand MT. Dhaka Division ranked the highest for pineapple production (130 thousand MT), and Rajshahi Division ranked the highest for papaya production (33 thousand MT). Among the districts, Rajshahi produced the most mangoes (236 thousand MT) and papayas (9.6 thousand MT), while Tangail produced the most bananas (90 thousand MT) and pineapples (123 thousand MT).

Figure 3.24: Production of fruits, by division, 2022/23



Source: Calculated from district-level data in Table 3.10. Yearbook of Agricultural Statistics, 2023, Bangladesh Bureau of Statistics.

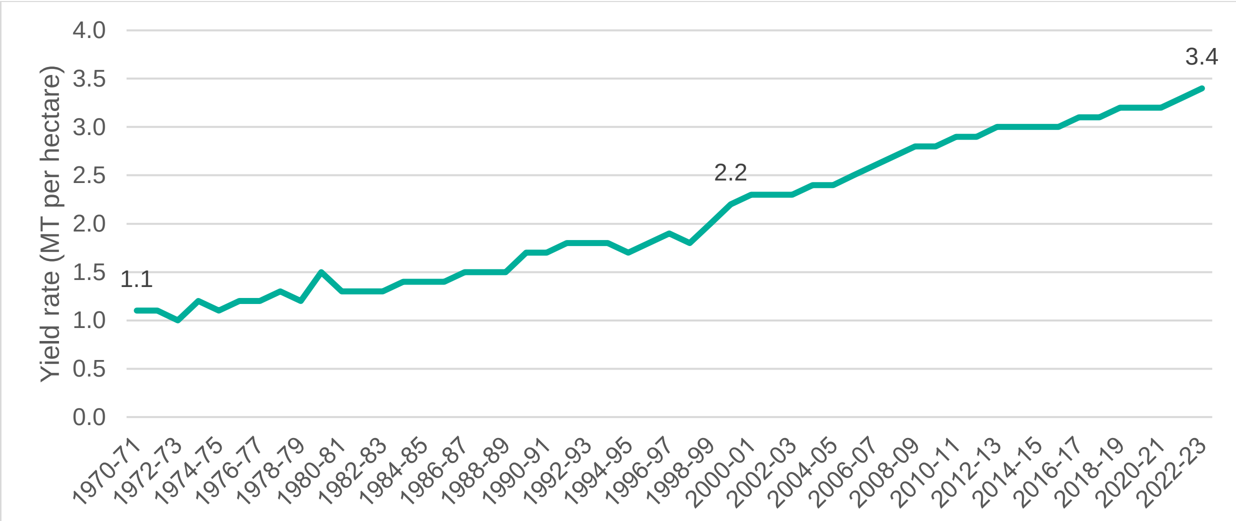
Productivity (yields) of crops

Given Bangladesh's limited land resources, it is increasingly important to invest in research on productivity-enhancing technologies and uptake of improved varieties. Higher yields and the cultivation of high-value crops are essential drivers of agricultural growth. Together, these factors can lead to poverty reduction, improved food security, higher incomes for farmers, and more sustainable rural development. Therefore, we assessed trends in agricultural productivity for major crops. Specifically, we examined the yield rate, which is a measure of total production per unit of area planted. Hazell and Rahman (2014) argue that higher yields, particularly in staple crops, free up land and resources that farmers can reallocate to high-value crops. As yields increase, the opportunity cost of not diversifying into more profitable crops also rises, encouraging a shift toward value addition in agriculture (Hazell and Rahman 2014).

Trends in rice yields

First, we explored long-term trends in rice yields, as they are overwhelmingly dominant in the country's cropping patterns (Ahmed et al. 2022). Figure 3.25 shows that rice yield rates tripled between 1970/71 and 2022/23, from 1.1 to 3.4 MT per hectare. Until the mid-1980s, only around 27 percent of rice area was under modern varieties (Headey and Hoddinott 2016). This situation changed dramatically in the 1990s, during the rapid dissemination of small-scale irrigation technologies, such as diesel pumps and shallow tubewells (N. Ahmed et al. 2007), fueling the adoption of high-yielding varieties in the boro season. This era of high productivity, referred to as the Green Revolution, was driven by the rise of the irrigated boro winter crop, driving rice productivity to unprecedented levels.

Figure 3.25: Trends in total rice yields, 1970/71 to 2022/23

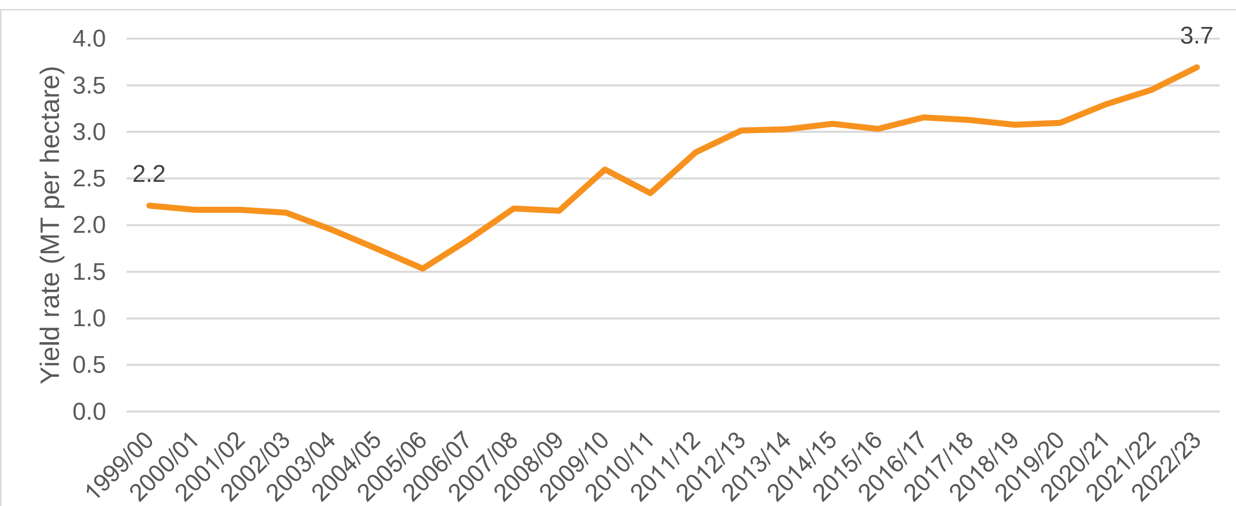


Source: Yearbook of Agricultural Statistics, Bangladesh Bureau of Statistics (several years).

Trends in yield rates of other cereals

Figure 3.26 shows the long-term trends in wheat yields in Bangladesh between 1999/00 and 2022/23. Compared to rice, wheat yields were more variable between 2003/04 and 2012/13, dropping to a minimum of 1.5 MT per hectare in 2005/06 and increasing to 3.0 MT per hectare in 2012/13. By 2022/23, wheat yields increased to 3.7 MT per hectare.

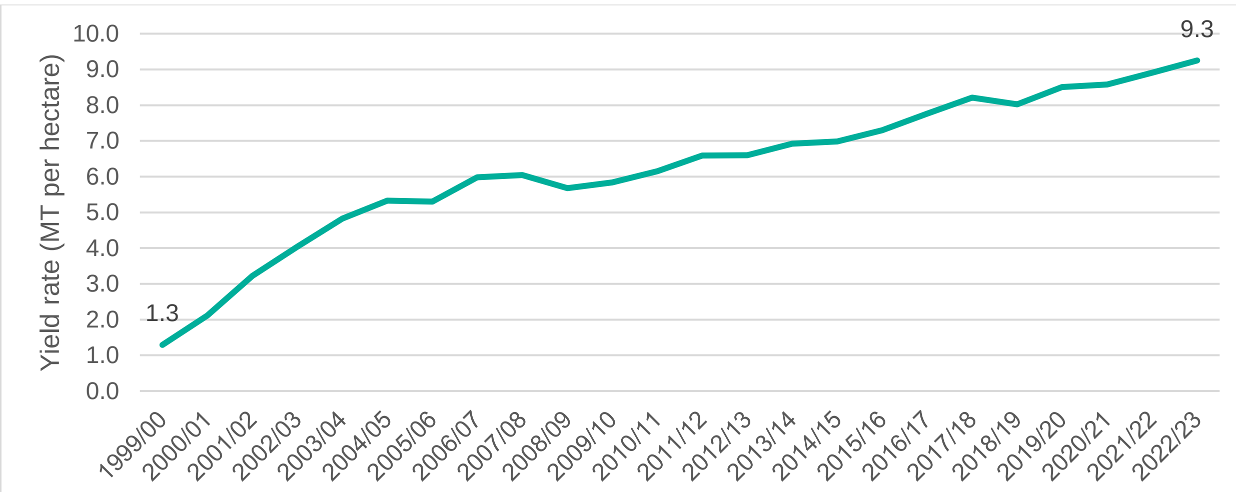
Figure 3.26: Trends in wheat yields, 1999/00 to 2022/23



Source: Calculated using data from the Yearbook of Agricultural Statistics, several years, Bangladesh Bureau of Statistics.

It is important to note that both rice and wheat are among five notified crops in Bangladesh (alongside jute, potatoes, and sugarcane), meaning that their germplasm imports are controlled by the government. Only select varieties of these crops (and their progeny) have historically been available for cultivation by farmers. On the other hand, maize is not a notified crop, which has resulted in the private sector sourcing seeds from various countries including the USA where maize yields are among the highest globally. Figure 3.27 shows that maize yields have far outstripped those for rice and wheat, exhibiting a nearly eight-fold increase from 1.2 MT per hectare in 1999/00 to 9.3 MT per hectare in 2022/23. Maize in Bangladesh is not primarily grown for human consumption, but rather serves as a key feed ingredient for poultry, livestock, and fish.

Figure 3.27: Trends in maize yields, 1999/00 to 2022/23

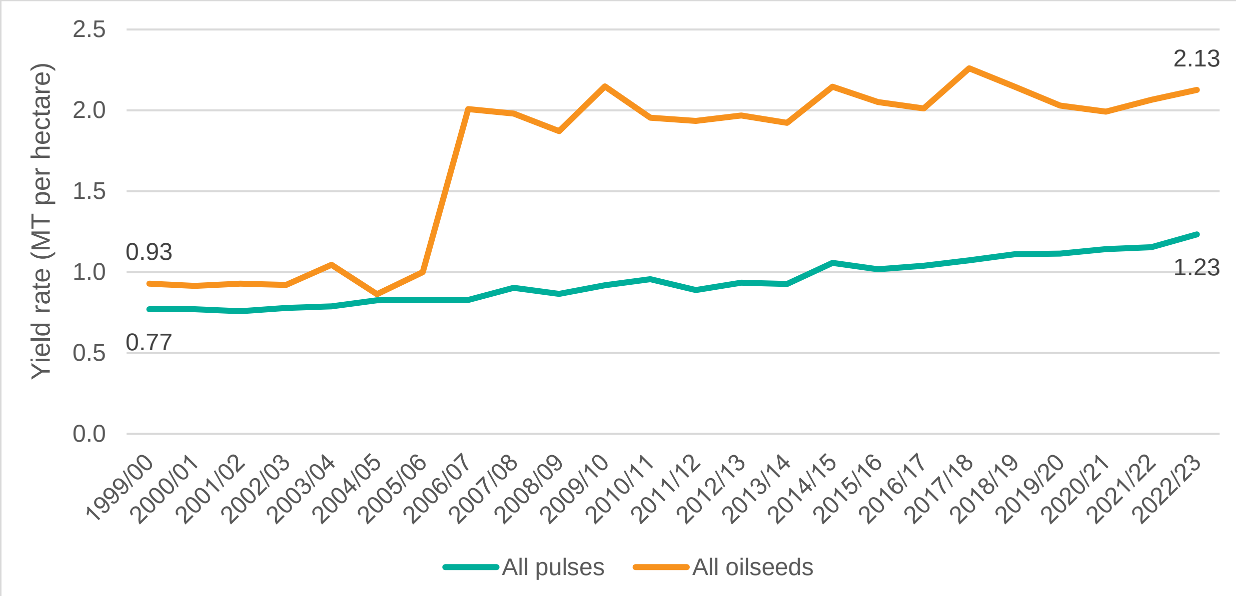


Source: Calculated using data from the Yearbook of Agricultural Statistics, several years, Bangladesh Bureau of Statistics.

Figure 3.28 shows long-term trends in yields of pulses and oilseeds. Yields of pulses increased only marginally from 0.8 MT per hectare in 1999/00 to 1.2 MT per hectare in 2022/23. This suggests the need for additional research fund allocations to promote productivity for pulses, which is a source of protein and an important part of the diet for much of the population.

Between 1999/00 and 2005/06, yields of oilseeds averaged 0.9 MT per hectare. However, Figure 3.28 shows a jump in yields of oilseeds from 1 ton per hectare in 2005/06 to 2.1 MT per hectare in 2006/07, mainly because BBS started reporting soybean yields in addition to yields of other oilseed crops in 2006/07.

Figure 3.28: Trends in yields for pulses and oilseeds, 1999/00 to 2022/23



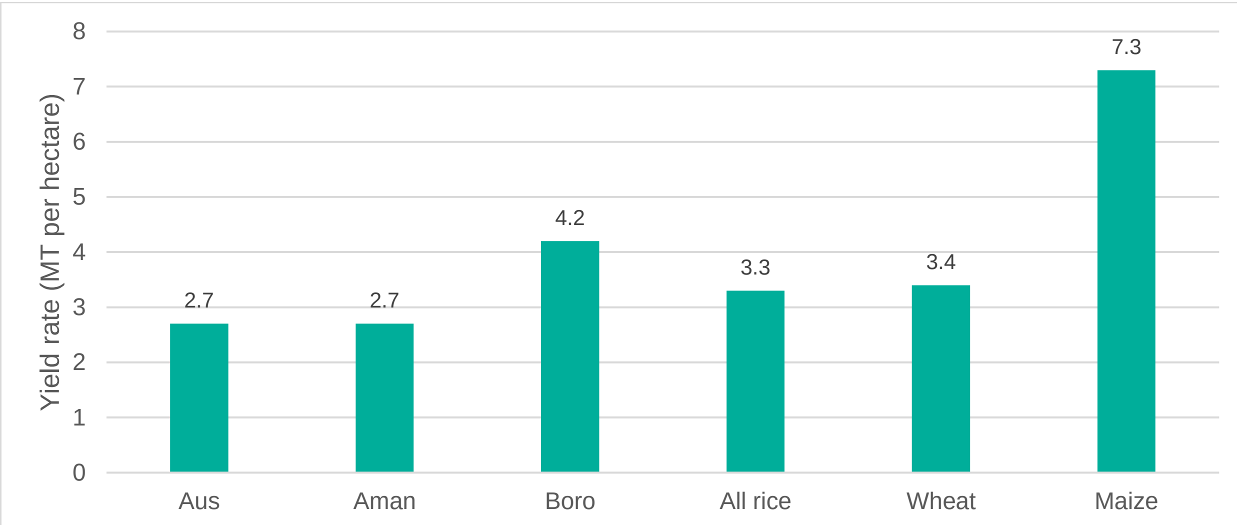
Source: Calculated using data from the Yearbook of Agricultural Statistics, several years, Bangladesh Bureau of Statistics.

Note: Pulses include lentils (masur), khesari, mashkalai, mung, motor, gram, fallon, and other minor varieties. Oilseeds include mustard, sesame (till), groundnut, soybean, coconut, linseed, and sunflower. Soybean production was not recorded until 2006/07 but constitutes more than 10 percent of total oilseed production, which may explain the rise in yield rates after 2006/07.

Recent yields of cereal crops

In 2022/23, the national average yields for rice were highest for boro rice (4.2 MT per hectare), while aus and aman yield rates were similar at 2.7 MT per hectare. Overall rice yield was 3.3 MT per hectare and wheat yield was 3.4 MT per hectare in 2022/23. By contrast, average yields were much higher for maize at 7.3 MT per hectare (Figure 3.29). Table 3.11 presents the district-level data for average yields for rice.

Figure 3.29: National average yields of cereal crops, 2022/23

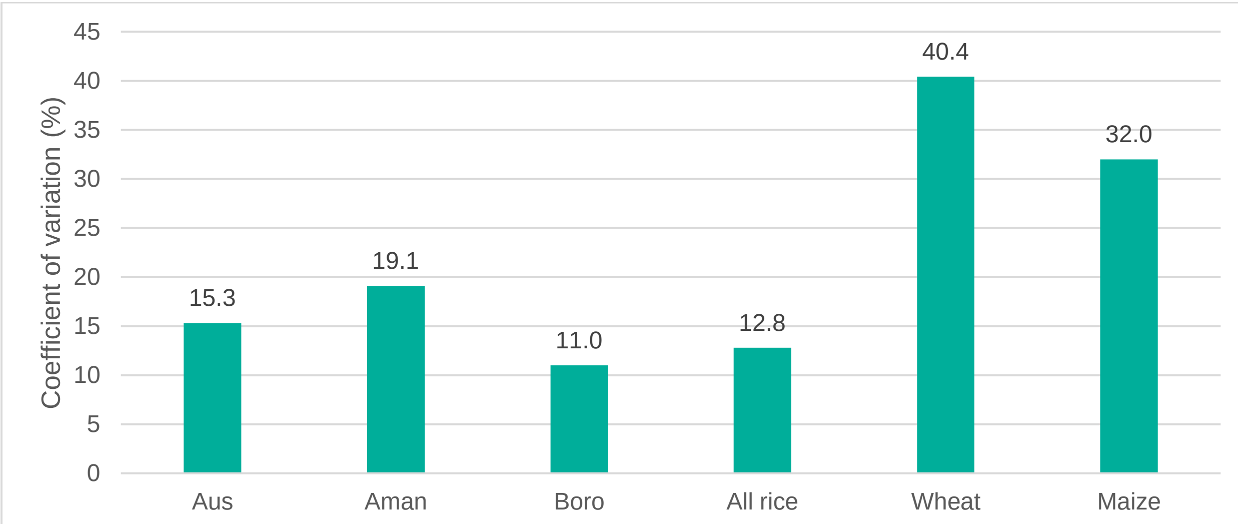


Source: Calculated using district-level data in Table 3.11. Yearbook of Agricultural Statistics, 2023, Bangladesh Bureau of Statistics.

A low level of yield variability encourages farmers to adopt improved technology in crop production. The interdistrict coefficients of variation of yield rates for rice crops (expressed as percentages) were lowest for boro (11.0 percent) and highest for aman (19.1 percent). By comparison, this variation was much higher for wheat (40.4 percent) and maize (32.0 percent) (Figure 3.30).

This coefficient of variation of yields for cereal crops emanates from several factors, such as variations in rainfall, temperature, and other climate conditions across districts, soil quality and fertility and access to inputs and technologies. According to Auffhammer et al. (2012), climate variations significantly affect agricultural productivity, especially in developing countries, where farming systems are more vulnerable to extreme weather conditions (Auffhammer, Ramanathan, and Vincent 2012). Lal (2001) highlights the crucial role of soil management in crop productivity, noting that soil quality degradation directly impacts agricultural output (Lal 2001). Pingali (2012) explains that technological advancements and input access play key roles in the green revolution's success, which led to significant yield differences across regions (Pingali 2012).

Figure 3.30: Interdistrict coefficients of variation of yields for cereal crops, 2022/23



Source: Calculated using district-level data in Table 3.11. Yearbook of Agricultural Statistics, 2023, Bangladesh Bureau of Statistics.

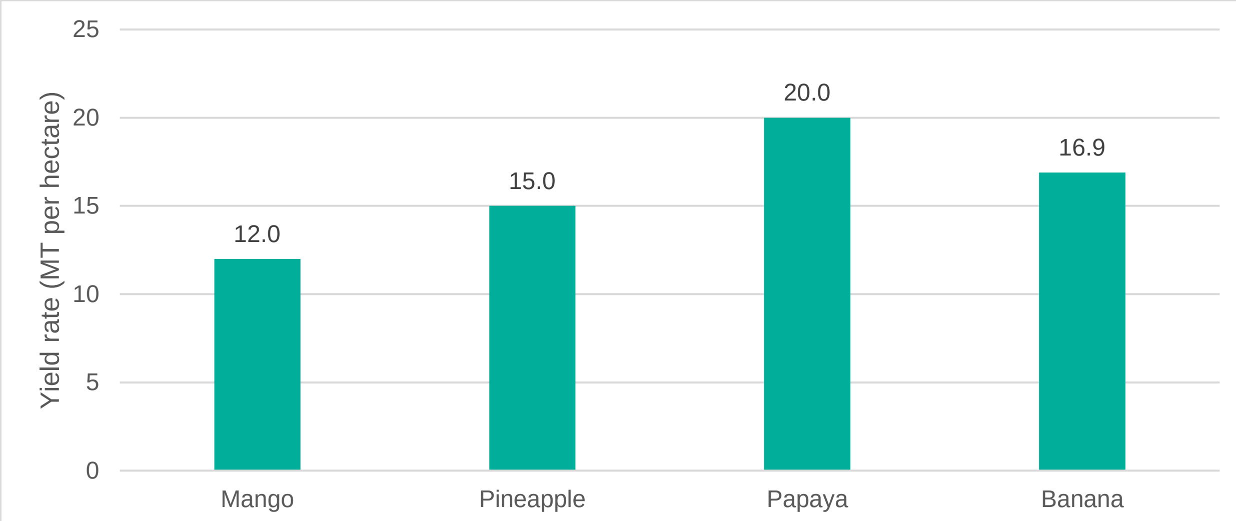
Table 3.11 lists yield rates for cereal crops by district in 2022/23. Boro rice yields were highest in Gopalganj (5.3 MT per hectare) and lowest in Patuakhali (2.4 MT per hectare). Gopalganj also ranked the highest in terms of total rice yields (4.5 MT per hectare), and Patuakhali ranked the lowest (2.1 MT per hectare). The highest yields of aus and aman rice in 2022/23 were in Cox's Bazar and Jhenaidah, respectively (3.4 MT per hectare), while the lowest yields were in Rangamati for aus rice (1.7 MT per hectare) and Munshiganj for aman rice (1.0 MT per hectare). Wheat yields were highest in Lakshmipur (4.3 MT per hectare) and lowest in Feni (1.6 MT per hectare). Maize yields were highest in Chuadanga (11.6 MT per hectare) and lowest in Meherpur (1.0 MT per hectare) although both are neighboring districts.

Yields of fruits

Figure 3.31 shows the national average yields for mangoes, pineapples, papayas, and bananas in 2022/23. Overall, national average yields were 12 MT per hectare for mangoes, 15 MT per hectare for pineapples, 20 MT per hectare for papayas, and 17 MT per hectare for bananas. Among districts, mango yields were highest in Sirajganj (67.5 MT per hectare) and lowest in Jhalokati (1.5 MT per hectare), pineapple yields were highest in Rangamati (19.0 MT per hectare) and lowest in Chandpur (3.2 MT per hectare), papaya yields were highest in Kushtia (107.1 MT per hectare) and lowest in Barguna (0.8 MT per hectare), and banana yields were highest in Naogaon (45.4 MT per hectare) and lowest in Barishal (5.3 MT per hectare) (Table 3.12).

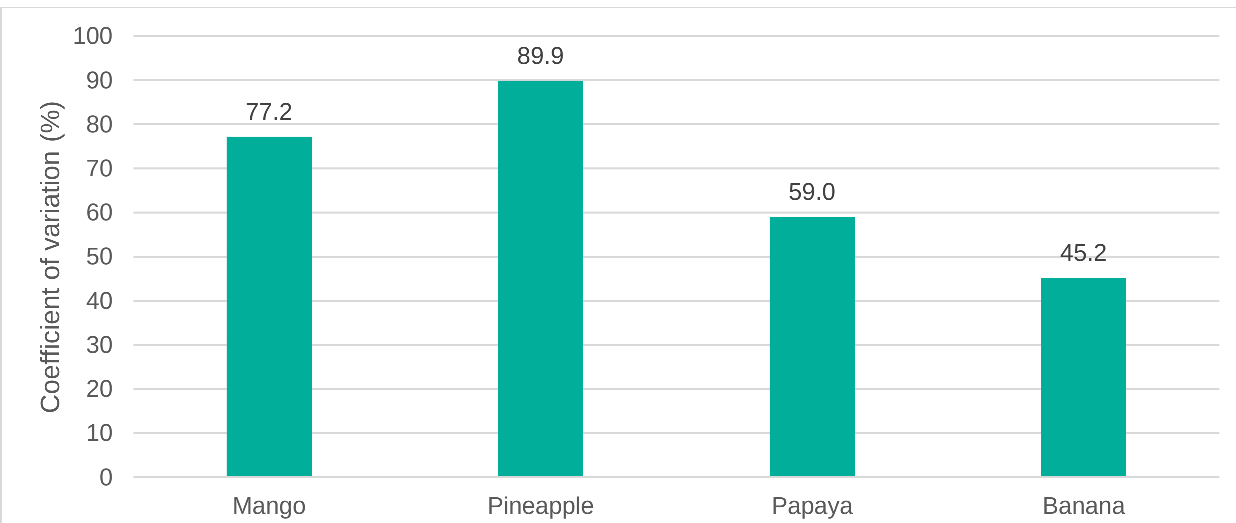
The interdistrict coefficients of variation for yields were 77.2 percent for mango, 89.9 percent for pineapple, 59.0 percent for papaya, and 45.2 percent for banana (Figure 3.32).

Figure 3.31: National average yields of fruits, 2022/23



Source: Calculated using district-level data in Table 3.12, 2023, Bangladesh Bureau of Statistics.

Figure 3.32: Interdistrict coefficients of variation of yields of fruits, 2022/23



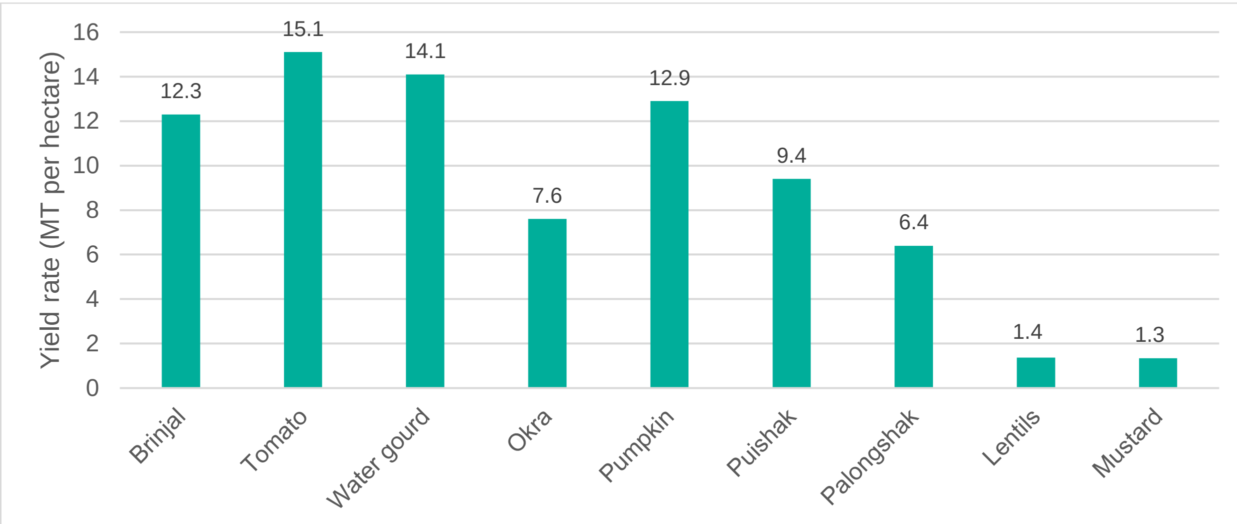
Source: Calculated using district-level data in Table 3.12, 2023, Bangladesh Bureau of Statistics.

Recent yields of vegetables, lentils, and mustard

Figure 3.33 depicts the yields of several vegetables in 2022/23, namely brinjal (eggplant), tomatoes, water gourd, okra, pumpkin, *puishak,* and palongshak, as well as lentils and mustard. National average yields were highest for tomato (15.1 MT per hectare), followed by water gourd (14.1 MT per hectare), and pumpkin (12.9 MT per hectare). Compared to vegetables, yields were lowest for mustard (1.3 MT per hectare) and lentils (1.4 MT per hectare).

Table 3.12 reports yields for vegetables, lentils, and mustard at the district-level. Brinjal yields were highest in Rajshahi (20.5 MT per hectare) and lowest in Pirojpur (3.8 MT per hectare). Tomato yields were highest in Mymensingh District (29.2 MT per hectare) and lowest in Patuakhali (3.1 MT per hectare). Lentil yields were highest in Rajbari District (2.2 MT per hectare), while mustard yields are highest in Chandpur (2.5 MT per hectare).

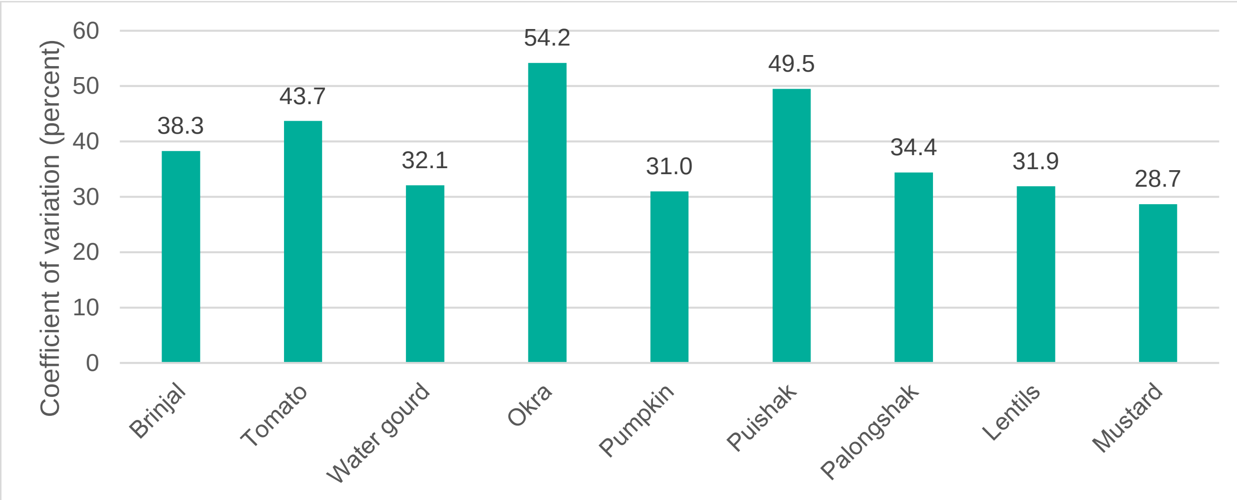
Figure 3.33: National average yield rates of vegetables, 2022/23



Source: Calculated using district-level data in Table 3.12. Yearbook of Agricultural Statistics, 2023, Bangladesh Bureau of Statistics.

Analysis of the difference in interdistrict yields of vegetables reveals that the coefficients of variation were highest for okra (54.2 percent) and *puishak* (49.5 percent), and lowest for pumpkin (31.0 percent) and water gourd (32.1 percent) (Figure 3.34). Both lentils and mustard have somewhat lower levels of variation in yields compared to vegetables at 31.9 percent and 28.7 percent, respectively.

Figure 3.34: Interdistrict coefficients of variation of yields of vegetables, 2022/23



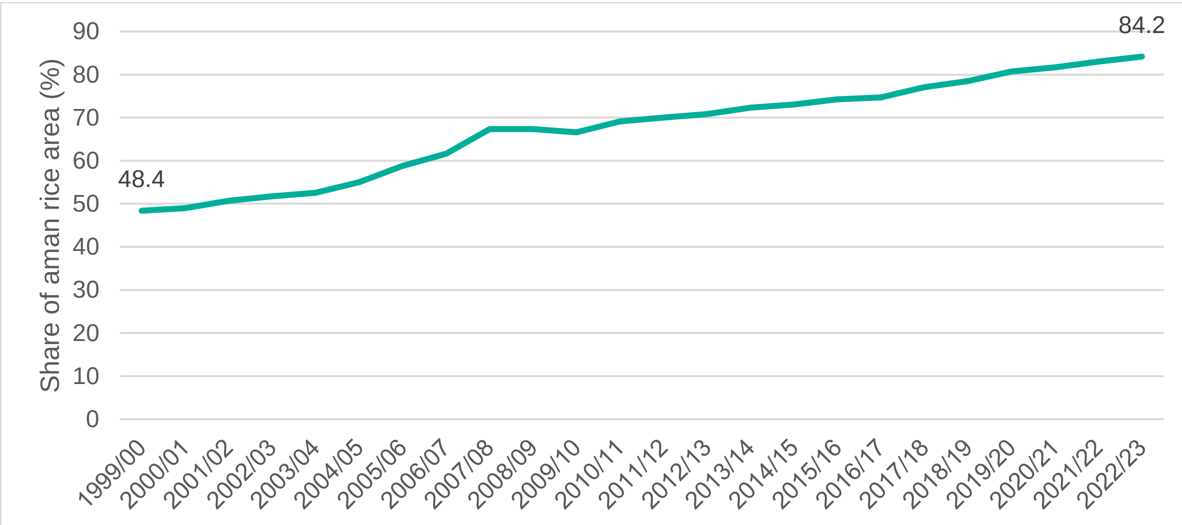
Source: Calculated using data in Table 3.12. Yearbook of Agricultural Statistics, 2023, Bangladesh Bureau of Statistics.

Adoption of high yielding variety (HYV) technology in rice cultivation

The entire boro rice area is under HYV cultivation. About 92 percent of the area under aus rice was under HYVs in 2022/23. However, in transplanted aman (t. aman) rice, farmers continue to grow both local (traditional) varieties and HYVs. In the case of broadcast aman (b. aman), only local rice varieties are cultivated.

Figure 3.35 illustrates the long-term trends in the adoption of HYV technology in aman rice cultivation. The share of aman rice area under HYV has significantly increased over time, rising from 48.4 percent in 1999/00 to 84.2 percent in 2022/23. This upward trend highlights the steady adoption of HYV technology in rice cultivation across Bangladesh.

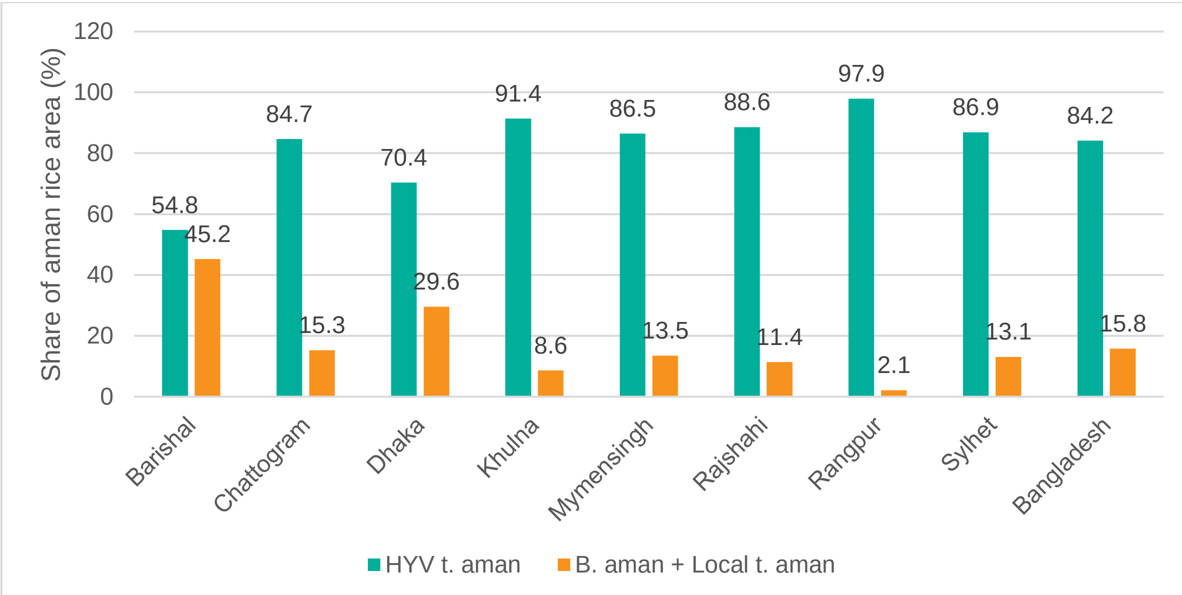
Figure 3.35: Trends in share of aman rice area under HYV, 1999/00 to 2022/23



Source: Authors' calculations using data from the Yearbook of Agricultural Statistics, 2023, Bangladesh Bureau of Statistics.

Figure 3.36 provides a breakdown of the HYV rice area under t. aman and local rice varieties under t. aman and b. aman in 2022/23 by division. Overall, 84.2 percent of the total aman rice area is under HYV cultivation, while the remaining 15.8 percent is planted with local b. aman and t. aman varieties. Among the divisions, Rangpur led with the highest proportion of HYV rice area (97.9 percent), followed by Khulna (91.4 percent) and Rajshahi (88.6 percent). In contrast, Barishal Division had the lowest share of aman rice area under HYV (54.8 percent), followed by Dhaka Division at 70.4 percent.

Figure 3.36: Share of aman rice area under HYV by division, 2022/23



Source: Authors' calculations using data from the Yearbook of Agricultural Statistics, 2023, Bangladesh Bureau of Statistics.

Note: Broadcast aman (b. aman) is comprised entirely of local varieties. Transplanted aman (t. aman) includes both local and high-yielding varieties.

Most popular rice varieties grown by farmers

IFPRI's BIHS collected plot-level data on all crops cultivated and all varieties of rice grown by farmers in Bangladesh.

Table 3.13 shows the 10 most popular boro paddy varieties grown in 2018, which account for 98 percent of boro farmers and 88 percent of total land under boro rice in Bangladesh. Despite the release of more than 100 modern rice varieties developed by the Bangladesh Rice Research Institute (BRRI) and the Bangladesh Institute of Nuclear Agriculture (BINA) over the past few decades, 70.1 percent of farmers cultivated only two varieties during the 2018 boro season, *BRRI Dhan 28 and BRRI Dhan 29*, both of which were released in 1994. A reason for the continued popularity of *BRRI Dhan 28* is its shorter growth cycle, which allows farmers to increase their cropping intensity (Ahmed, Hernandez, and Naher 2021).

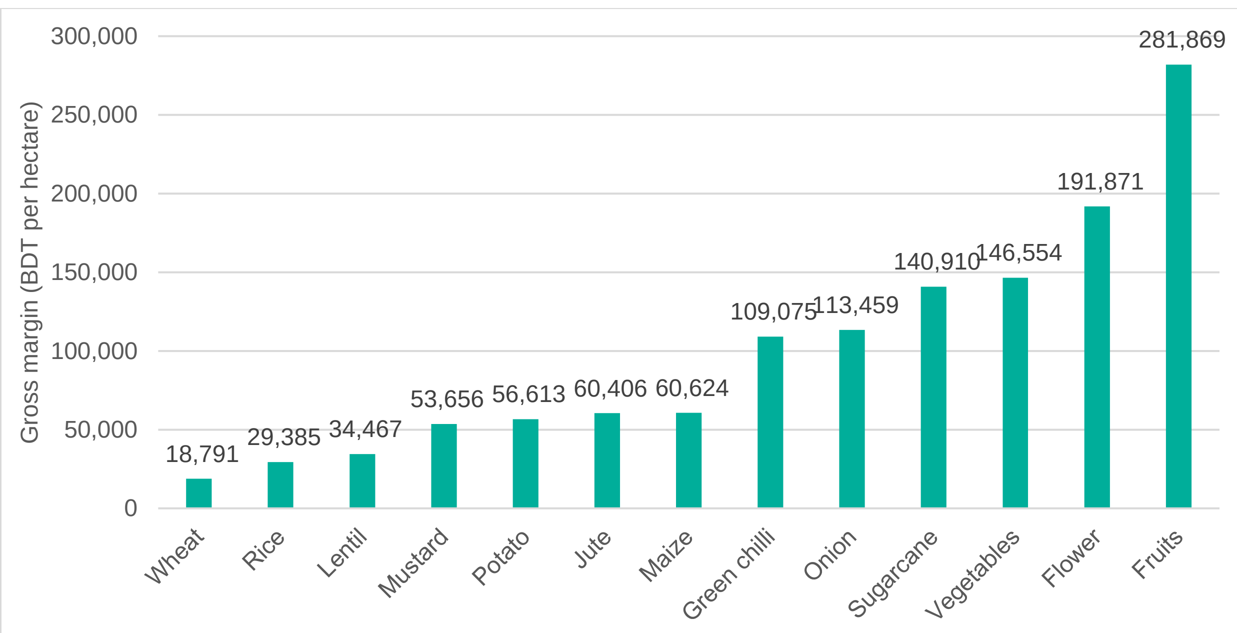
Table 3.14 shows the 10 most popular transplanted aman rice varieties cultivated in 2018. Among t. aman varieties, *Guti Shorna* has the highest adoption among farmers, grown by 31 percent of all t. aman farmers. *Guti Shorna* is of Indian origin and may have been introduced to Bangladesh through informal cross-border exchange. The most popular 10 t. aman varieties accounted for 72 percent of t. aman farmers and 64 percent of total land under t. aman in 2018.

Value and profitability of major crops

The cultivation of high-value crops such as fruits, vegetables, flowers, and export-oriented products like spices is essential for agricultural growth. High-value crops can generate greater revenue per hectare of land compared to staple crops like rice or wheat. Shifting from low-value staple crops to these more lucrative alternatives can lead to higher farm incomes, promote rural development, and spur overall agricultural growth. Barghouti et al. (2004) point out that diversification into high-value crops significantly boosts income for farmers, especially in developing countries (Barghouti, Kane, and Sorby 2004). This shift requires better infrastructure, market access, and technical knowledge but can enhance productivity and profitability by enabling farmers to tap into more lucrative markets (Ali 2004).

Figure 3.37 shows the gross margin per hectare for major crops expressed in taka (BDT) per hectare, estimated from IFPRI's 2018/19 BIHS. For context, the reporting period was 12 months prior to the 2018/19 survey. It is encouraging that all major crops have positive gross margins, meaning these crops are profitable for farmers. Fruit production has the highest gross margin, followed by flowers and vegetables. By contrast, wheat has the lowest profitability, followed by rice. These results have important implications for crop diversification and value chain development.

Figure 3.37: Gross margin (profit) per hectare of major crops, 2018/19

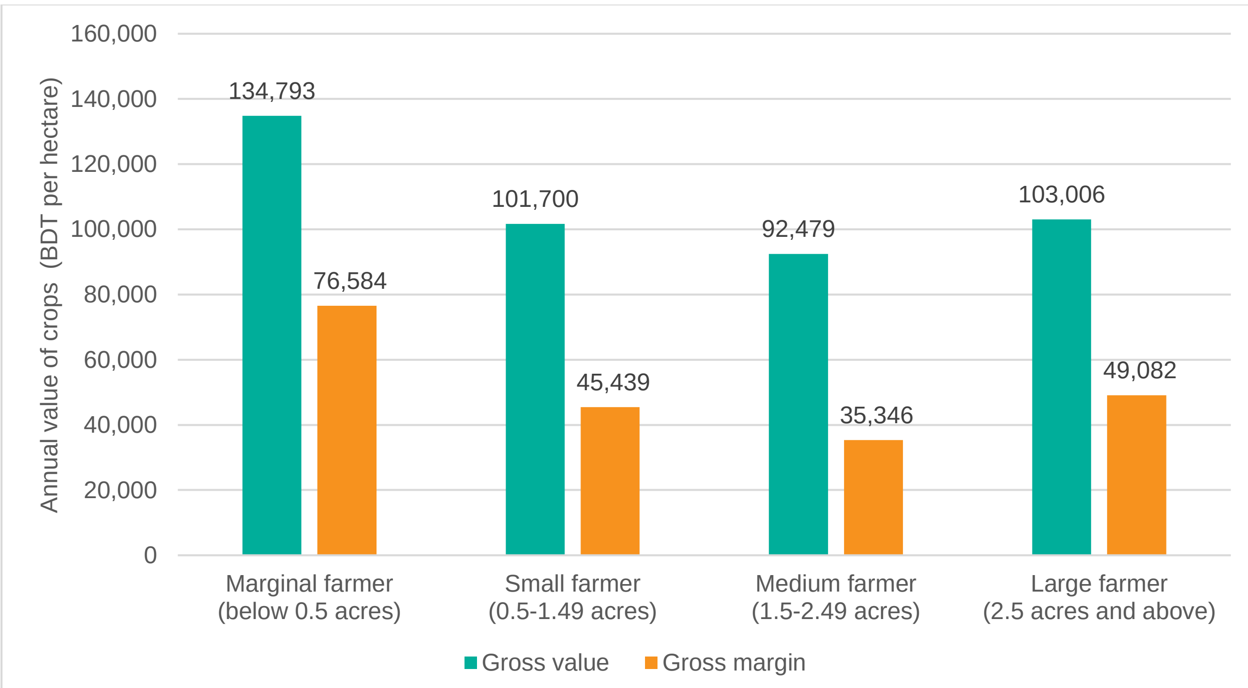


Source: IFPRI's Bangladesh Integrated Household Survey (BIHS), 2018/19, national rural stratum

Crops that have relatively low value output per unit of land such as rice offer less scope for sustained income growth than high-value agricultural commodities. Since smallholder farmers have relatively less access to land than larger farmers, production of high-value crops (e.g., horticultural crops) has significant potential to maximize value within a limited amount of land to increase smallholder incomes.

Figure 3.38 shows gross value and gross margin (net value) per hectare for all crops produced by marginal, small, medium, and large farmers during the 12 months prior to the 2018/19 BIHS. The results reveal that the smaller the farm, the higher the value of its crop-mix and, hence, its gross and net output value per hectare. Because of the smaller size of operated land, smallholder farmers can use family labor to grow more labor-intensive and higher-value crops, thereby avoiding the cost of hiring labor. The exception is for large farmers who use relatively more labor-saving agricultural machinery for farming.

Figure 3.38: Total value of crops per hectare by farm size groups, 2018/19

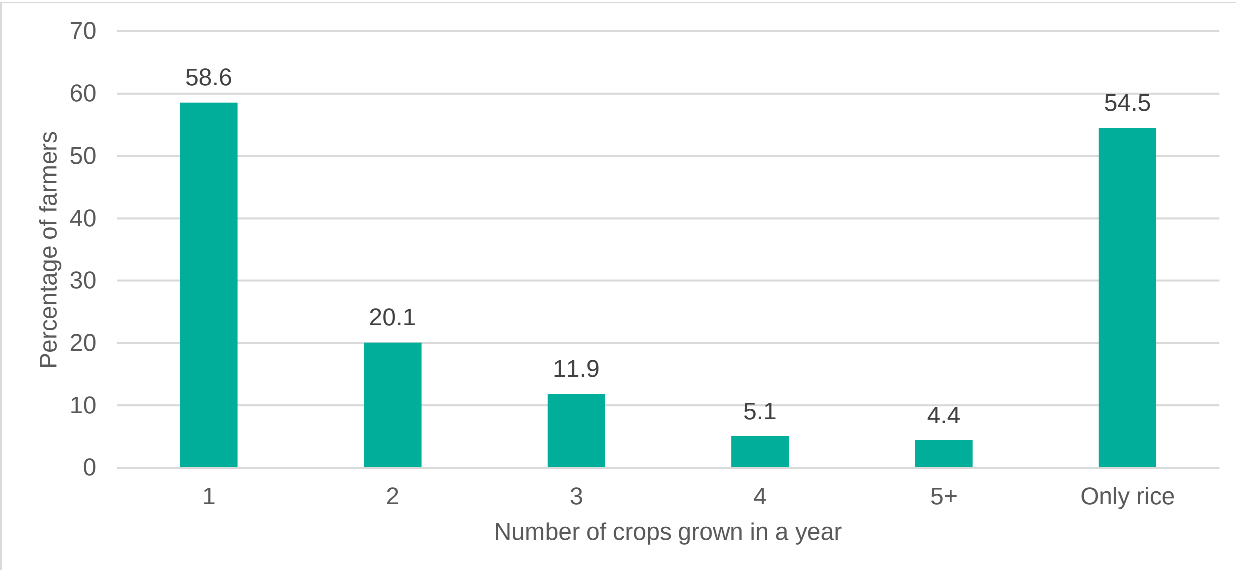


Source: IFPRI's Bangladesh Integrated Household Survey (BIHS), 2018/19, national rural stratum

Crop diversification

Figure 3.39 shows the number of crops grown by farmers in 2018/19. Around 59 percent of all farmers in Bangladesh cultivated only one crop and 20 percent cultivated two crops in 2018/2019, indicating minimal crop diversification. About 55 percent of all farmers cultivated only rice in 2018/19.

Figure 3.39: Number of crops grown by farmers



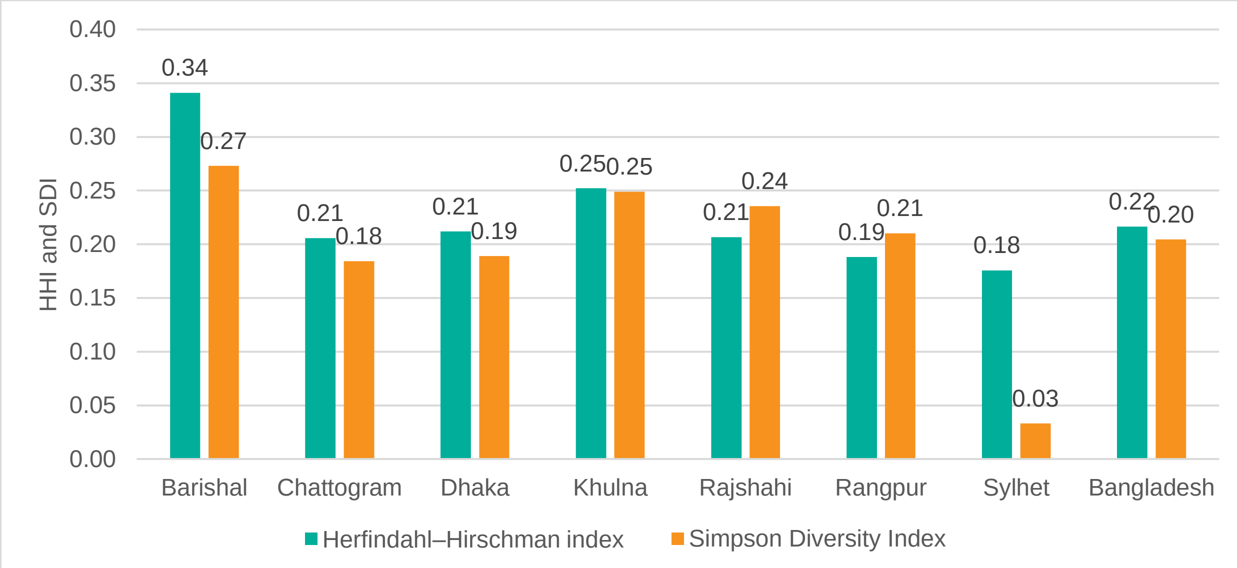
Source: IFPRI's Bangladesh Integrated Household Survey (BIHS), 2011/12 and 2018/19, national rural stratum

Simpson's Diversity Index (SDI) is a measure of diversity. The value of SDI ranges from zero to one. A high score (close to 1) indicates high diversity, and a low score (close to 0) indicates low diversity. SDI can be used to measure crop diversity. SDI for measuring area-based crop diversity is calculated as $SDI = 1 - \sum_{i=1}^{n} P_i^2$, where P_i is the proportionate area of the i[th] crop in gross cropped area.

Herfindahl-Hirschman Index (HHI) is used as a measure of value-based crop diversification. This index is calculated as $HHI = 1 - \sum_{i=1}^{n} V_i^2$, where V_i is the proportionate value of the i[th] crop in total value of the crops produced. Again, the value of the HHI lies between zero and one and a high score (close to 1) indicates high diversification, and a low score (close to 0) indicates low diversification.

Figure 3.40 illustrates the pattern of crop diversification, calculated using both the area-based SDI and value-based HHI, is low in Bangladesh (0.20 and 0.22, respectively). This reflects the large share of cropped land devoted to rice cultivation. Crop diversification is greater in Barishal and Khulna Divisions than Sylhet, Dhaka, and Chattogram Divisions in terms of SDI and HHI. Interestingly, the value-based HHI was very low in Sylhet Division because mostly rice is grown in Sylhet, which has the second lowest gross margin per hectare after wheat, as shown in Figure 3.39 above.

Figure 3.40: Herfindahl-Hirschman Index and Simpson Diversity Index, 2018/19

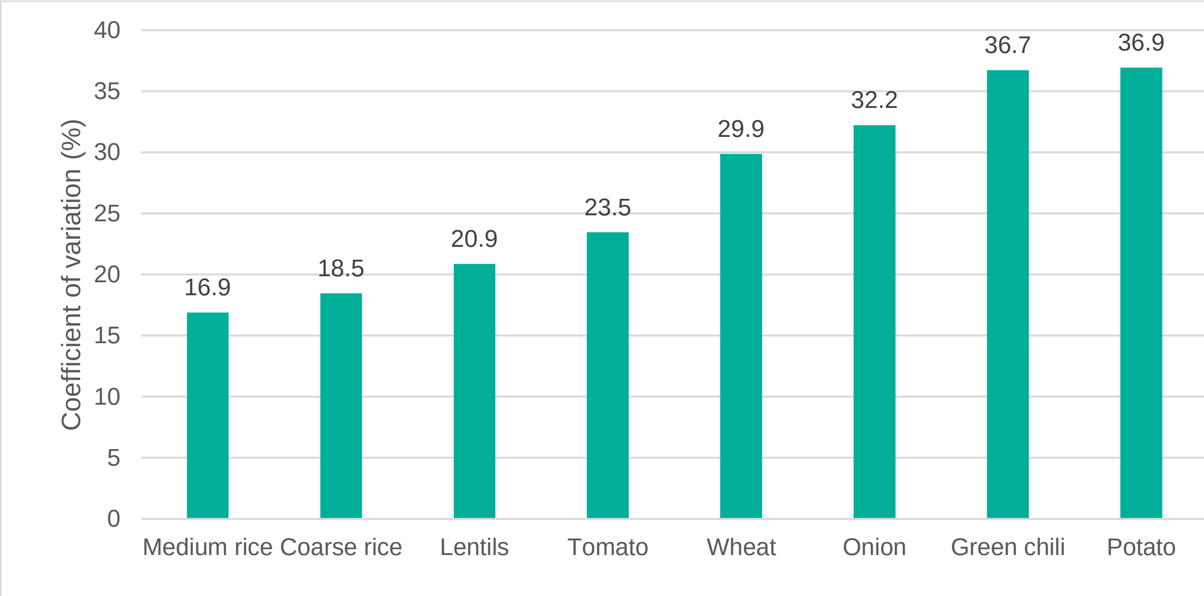


Source: IFPRI's Bangladesh Integrated Household Survey, 2018/19, national rural stratum

Figure 3.41 shows the coefficients of variation of annual average wholesale prices for select crops. The coefficients of variation were estimated from national average wholesale crop prices collected from the Department of Agricultural Marketing (DAM) under the Ministry of Agriculture between 2016 and 2024 (up to April). The coefficient of variation is helpful to understand how much volatility, or risk, is assumed in comparison to the amount of return expected from investments. For example, a farmer who is risk-averse may want to produce a crop with a historically low degree of market price volatility relative to the profitability of the crop.

The results indicate that the year-on-year price fluctuations were larger for non-rice crops than for rice, indicating relatively high levels of market-induced risks for production of non-rice crops. The price volatility was the lowest for coarse rice (18.5 percent). By contrast, onions (32.2 percent), green chilies (36.7 percent), and potatoes (36.9 percent) exhibited relatively higher levels of price fluctuations over the same period.

Figure 3.41: Coefficients of variation of annual wholesale prices of select crops, 2016-2024



Source: Annual average wholesale prices, Department of Agricultural Marketing, Ministry of Agriculture.

Rice is the staple food in Bangladesh and is overwhelmingly dominant in Bangladesh's cropping patterns. In 2018/19, more than half (55 percent) of all farmers cultivated only rice. However, the profit per hectare for rice was the second lowest (after wheat), whereas fruits have the highest gross margin, followed by flowers and vegetables among major crops grown in 2018/19. Despite its low value and profitability, why is rice cultivation so popular among farmers?

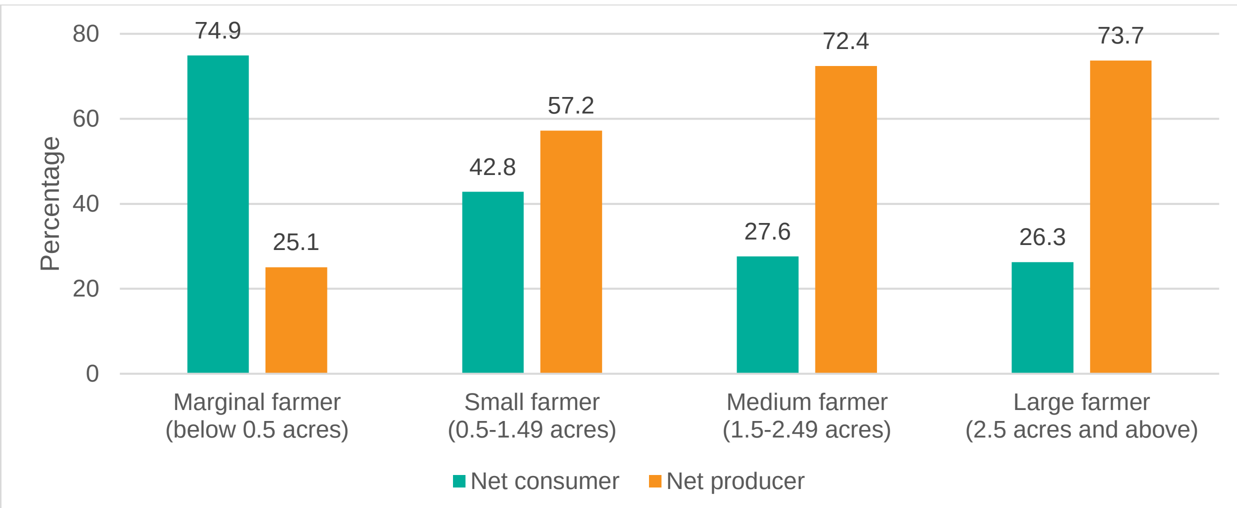
As shown above, year-to-year price fluctuations are much larger for non-rice crops than for rice, indicating relatively high levels of market-induced risks for production of non-rice crops. High-value crops such as vegetables and fruits have thin domestic markets, owing to relatively low levels of demand for them due to poverty and inadequate purchasing power. An increase in production causes a sharp decline in market prices. Supply of high-value crops are highly responsive to price changes. Currently, there are very few options that are being implemented that help reduce these risks for farmers.

Contract farming can protect farmers from the price risks of producing high-value crop and non-crop agricultural products, such as livestock, dairy, and fish. Under this arrangement, the farmer provides agreed-upon quantities of an agricultural product to an agribusiness firm, based on the quality standards and delivery requirements of the firm, usually at a price negotiated and established in advance. Agribusiness firms may also agree to support the farmers through input supply, credit, extension advice, and transporting produce to their premises Despite its potential, very few contract farming models have been adopted in Bangladesh, except for tobacco, which has been supported by multinational companies like the British American Tobacco Company, as well as select other crops.

Patterns of home consumption and marketable surplus of rice

Overall, one-quarter (26 percent) of rural households were net sellers, i.e., they consumed less rice than they produced and sold the surplus. On the other hand, three-quarters (74 percent) of rural households were net buyers, meaning they consumed more rice than they produced, requiring them to purchase additional rice. Among the rice farming households, marginal farmers were primarily net consumers of rice (75 percent), while large farmers are predominantly net producers of rice (74 percent) (Figure 3.42). As farm size increases, the proportion of net producers also increases.

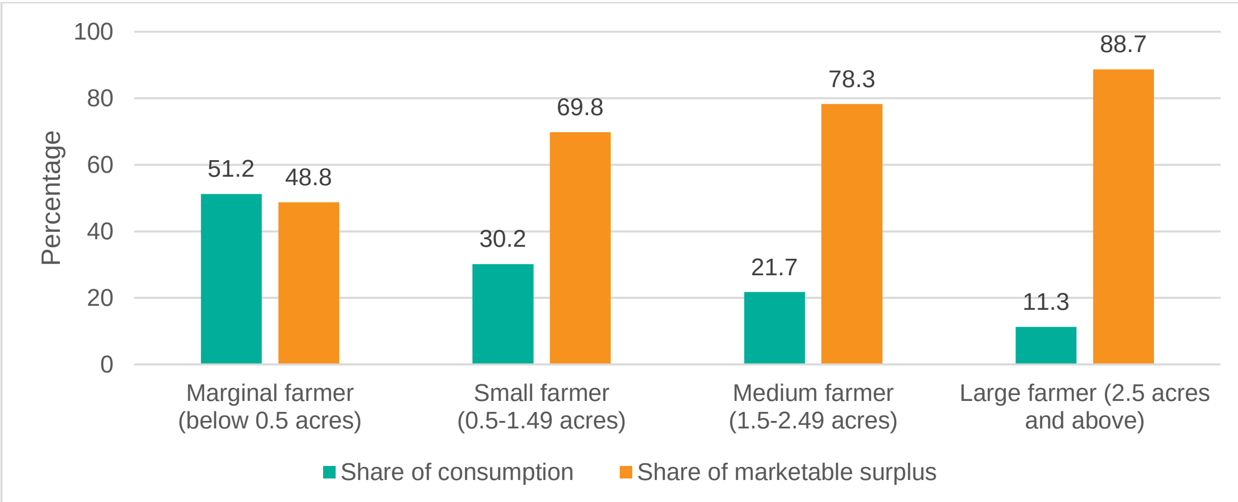
Figure 3.42: Percentage of net consumers and net producers of rice disaggregated by farm size (Only rice farmers)



Source: IFPRI's Bangladesh Integrated Household Survey, 2018/19, national rural stratum

Figure 3.43 shows the pattern of shares of rice consumption and marketable surplus by different farm size categories of rice farmers. Marginal farmers, who are primarily net consumers, showed a slightly higher share of rice consumption than marketable surplus, using 51 percent of their production for consumption and 49 percent available for sale. In contrast, large farmers, who engage in more commercial farming practices and are mostly net producers, had a significantly higher proportion of their rice production as marketable surplus, with 89 percent of their output available for sale and only 11 percent used for consumption.

Figure 3.43: Percentage share of consumption and marketable surplus of rice by farm size (only rice farmers)



Source: IFPRI's Bangladesh Integrated Household Survey, 2018/19, national rural stratum

Input use

Inputs play a critical role in agricultural production, acting as essential drivers of productivity and agricultural growth. These inputs include seeds, fertilizers, water (irrigation), labor, pesticides, and machinery. By improving the quality and quantity of inputs, farmers can achieve higher yields and increased profitability.

Seed

<u>Policy environment</u>

A crucial factor shaping agricultural productivity in a land-scarce country like Bangladesh is the quality of its seed supply and the policies regulating seed production and distribution to farmers. Bangladesh's seed system involves multiple actors across various stages. Plant breeding is conducted by the National Agricultural Research System (NARS) to generate new seed varieties. Seed multiplication, promotion, and distribution are handled by the Bangladesh Agricultural Development Corporation (BADC), the Department of Agricultural Extension (DAE), the private sector, and several non-governmental organizations (Naher and Spielman 2021).

NARS organizations produce breeder seeds, which are supplied to the BADC for multiplication to generate foundation seeds. These foundation seeds are then used to produce certified and truthfully labelled seeds (TLS) for commercialization (Seed Division, Ministry of Agriculture, 2020). The 1993 National Seed Policy introduced reforms that liberalized the sector, increasing private sector involvement, while limiting the BADC to producing seeds only for notified crops. However, the 2005 amendment to the Seeds Act restricted private entities from developing new varieties of notified crops, counteracting the liberalization efforts of the 1993 policy.[7]

In contrast, non-notified crops face fewer restrictions. Seed varieties for these crops only need to be registered with the National Seed Board's Seed Wing before commercialization and distribution (Ministry of Agriculture 2018), leading to lower costs for breeding, production, and marketing (Naher and Spielman 2021). Policy reforms for notified crops could be motivated by the experiences with non-notified crops to achieve similar cost reductions.

It is essential that seed sector policies remain adaptable. In 2020, the Ministry of Agriculture's Seed Division introduced the Seed Rules 2020, which outlined the roles and responsibilities of sector actors and procedures for seed sampling. One identified barrier in these rules was a five-year embargo on companies registering new crop varieties after registering as a dealer. Following lobbying efforts by the U.S. government, the Ministry of Agriculture amended this rule in August 2023, reducing the embargo period to one year to encourage more companies to enter the Bangladeshi market (USDA 2023).

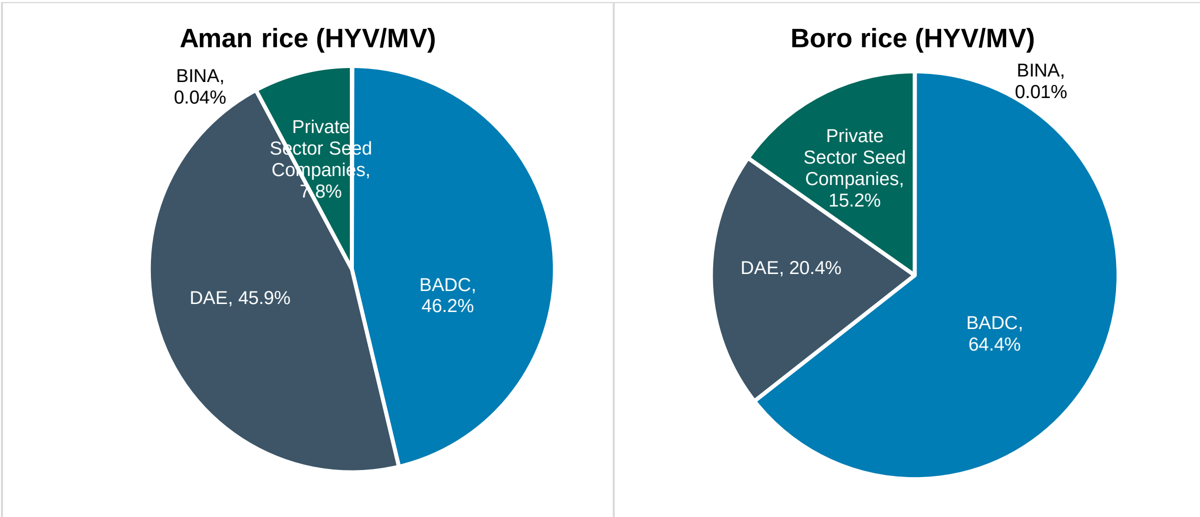
Naher and Spielman (2021) propose several key reforms to modernize the seed sector. First, better data governance is required to provide timely, harmonized, high-resolution data for researchers, such as data on farmer adoption rates of improved varieties. Second, fostering effective public-private partnerships is crucial to ensure private sector actors are not overshadowed by public entities like the BADC, and that import barriers are relaxed to allow improved seed varieties to enter the market. Third, regulatory burdens should be eased to eliminate duplicated efficacy trials by multiple entities. Fourth, research and development efforts need to be streamlined to avoid overlap between agricultural research organizations, with more emphasis placed on non-rice, high-value crops. Lastly, the role of agricultural extension services should be enhanced, ensuring that resources are used efficiently to improve their capacity to deliver valuable services to farmers, rather than being spent disproportionately on staff salaries (Naher and Spielman 2021).

Supply shares of certified and truthfully labelled seeds (TLS)

In 2017/18, the public sector played a dominant role in the supply of certified and truthfully labeled seeds (TLS) for cereal crops in Bangladesh, particularly for aman and boro high-yielding variety (HYV) and modern variety (MV) seeds. The primary suppliers of these seeds were government agencies, namely the Bangladesh Agricultural Development Corporation (BADC) and the Department of Agricultural Extension (DAE). Private sector contributions were relatively small, though their involvement was more significant in the supply of boro (HYV/MV) seeds compared to aman (HYV/MV). (Figure 3.44).

[7] Five crops in Bangladesh have been designated as "notified", namely rice, wheat, jute, potato, and sugarcane. Cultivars of notified crops must be tested by the government for value in cultivation and use (VCU) and distinctiveness, uniformity and stability (DUS) prior to approval for commercial distribution (Naher and Spielman 2021). Breeder and foundation seeds of all varieties are made available through negotiation to registered public and private seed producers for seed multiplication purposes.

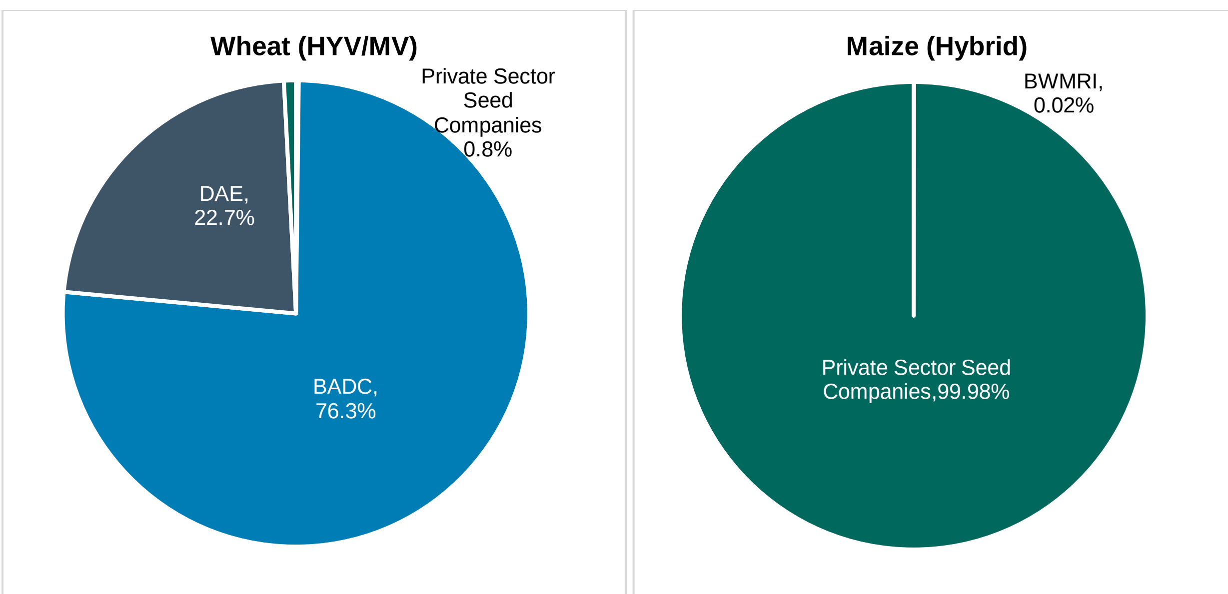
Figure 3.44: Supply shares of TLS, aman rice, and boro rice (HYV/MV)



Source: BRRI, BINA, BADC, DAE, and private sector, 2017/18

For wheat (HYV/MV), the public sector dominated the TLS supply, with BADC providing more than three-quarters of the seeds, while the remainder came from DAE. In contrast, the private sector had virtually no presence in the wheat seed market. A stark difference was noted in the maize (hybrid) seed market, which was almost entirely controlled by private companies (Figure 3.45).

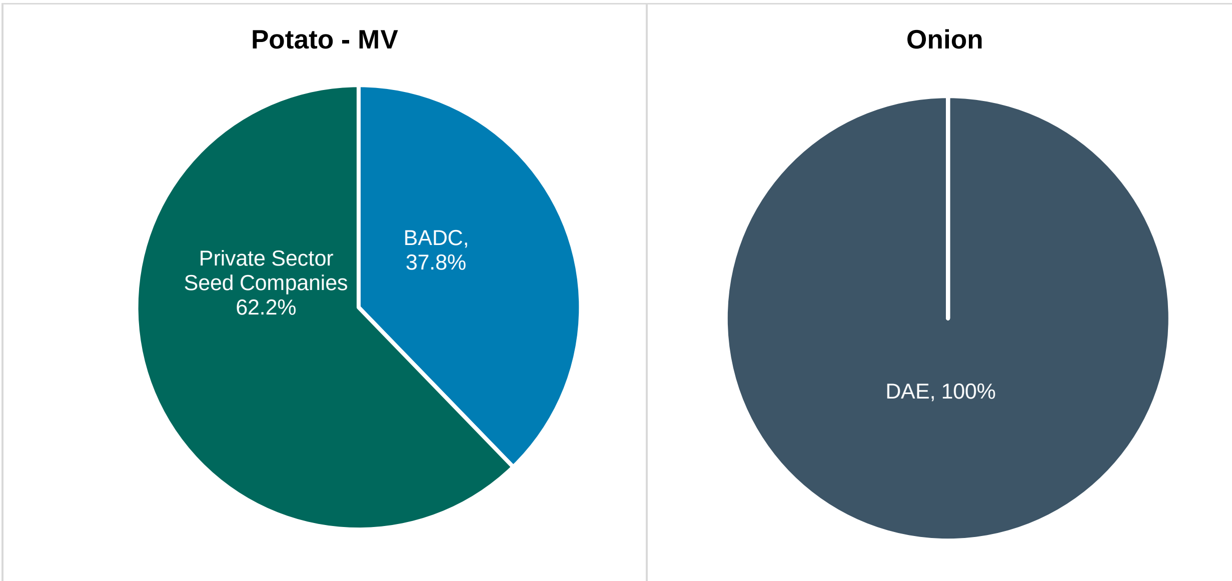
Figure 3.45: Supply shares of TLS, wheat (HYV/MV) and maize (hybrid)



Source: BARI, BWMRI, BADC, DAE, and Private Sector, 2017/18

The TLS market for modern potato varieties was largely dominated by private sector companies, with BADC being the only public entity contributing a smaller share. In the onion TLS market, DAE was virtually the sole supplier, fully controlling the market (Figure 3.46).

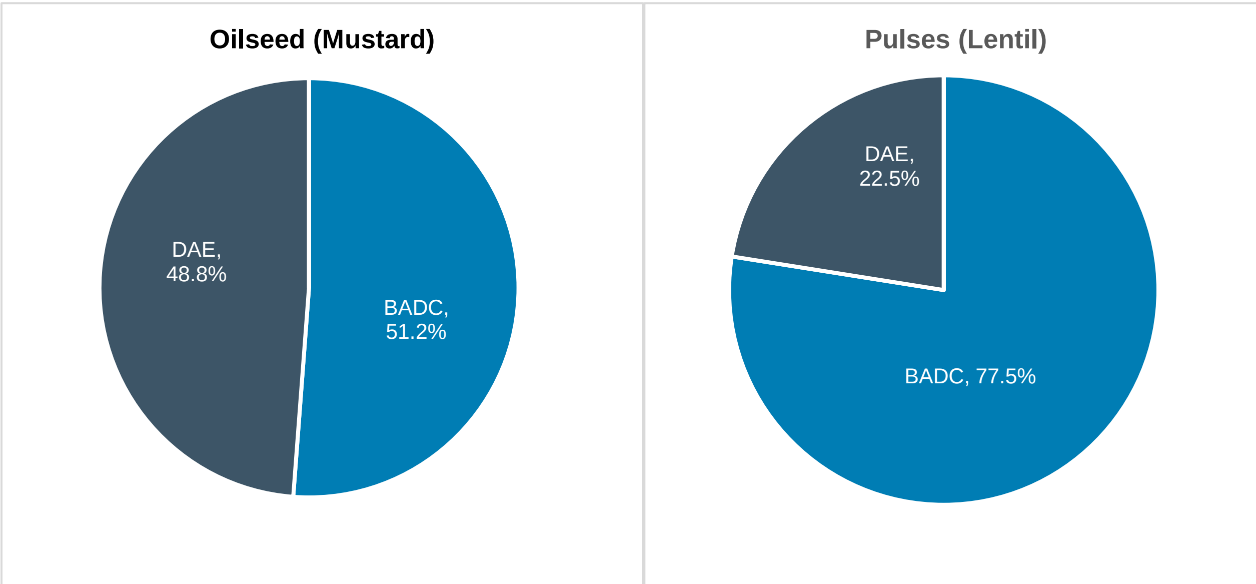
Figure 3.46: Supply shares of TLS, Potato (MV) and Onion



Source: BARI, BADC, DAE, and private sector, 2017/18

In the case of oilseeds (mustard) and pulses (lentil), the public sector maintained full control, with BADC being the primary supplier, followed closely by DAE. BADC and DAE shared the mustard TLS supply market almost equally, while BADC accounted for more than three-quarters of the supply in the pulses TLS market (Figure 3.47).

Figure 3.47: Supply shares of TLS oilseed (mustard) and pulses (lentil)



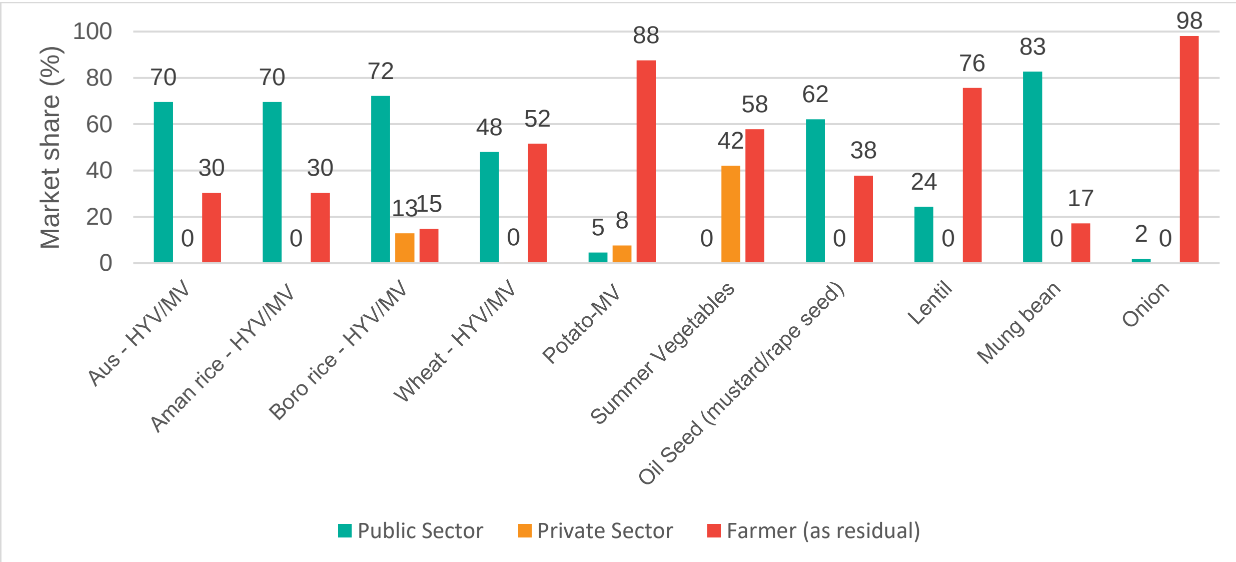
Source: BARI, BADC, and DAE, 2017/18

Seed market shares in 2017/18

Figure 3.48 illustrates the seed market shares in 2017/18. For cereal crops, the public sector dominated the market, accounting for approximately 70 percent of the supply of aus, aman, and boro HYV/MV seeds. The remaining market share was largely held by farmers, with the private sector contributing only about 13 percent of the boro rice seed market. In all other cereal crops, the private sector's presence was negligible. In wheat, the public sector contributed 48 percent of the market share, while farmers accounted for the remaining 52 percent.

For modern potato varieties (88 percent), summer vegetables (58 percent), lentil (76 percent), and onion (98 percent), farmers' seeds were the main contributors. Conversely, the public sector was the major supplier for oilseeds (62 percent) and mung bean (83 percent). The private sector's most notable contribution was in the summer vegetable seed market, where it accounted for 42 percent of the supply. Overall, private sector participation in the seed market remained low.

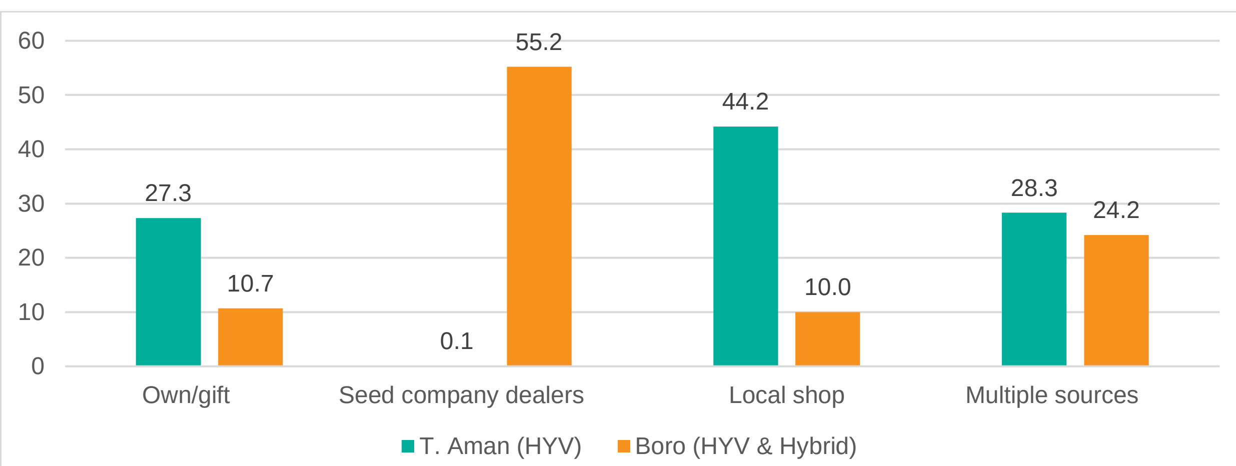
Figure 3.48: Market share of seed, 2017/18



Source: BARI, DAE, BADC, BWMRI, BRRI, BINA, private sector, 2017/18

Next, we examine seed sourcing at the household level using data from a nationally representative survey. Figure 3.49 shows the sources of seed for boro (HYV and hybrid) and t. aman (HYV) rice in 2018-19. A sharp contrast is evident in seed sourcing between these two crops. For boro (HYV and hybrid) rice, 55.2 percent of the seed came from seed company dealers, whereas only 0.1 percent of t. aman (HYV) seed was sourced from dealers. The primary sources of t. aman (HYV) seed were local shops (44.2 percent) and farmers' own seeds or seeds received as gifts (27.3 percent), while for boro (HYV and hybrid), these sources contributed only 10.0 percent and 10.7 percent, respectively.

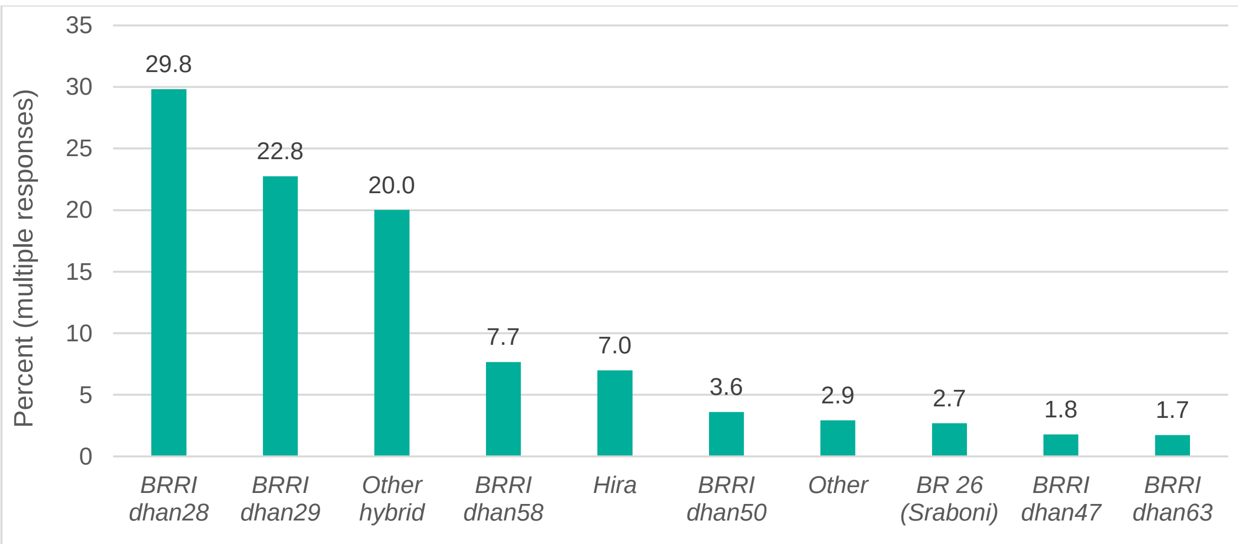
Figure 3.49: Sources of seed for rice cultivation: Boro (HYV and hybrid) and t. aman (HYV), 2018/19



Source: IFPRI's Bangladesh Integrated Household Survey (BIHS), 2018-19, national rural stratum

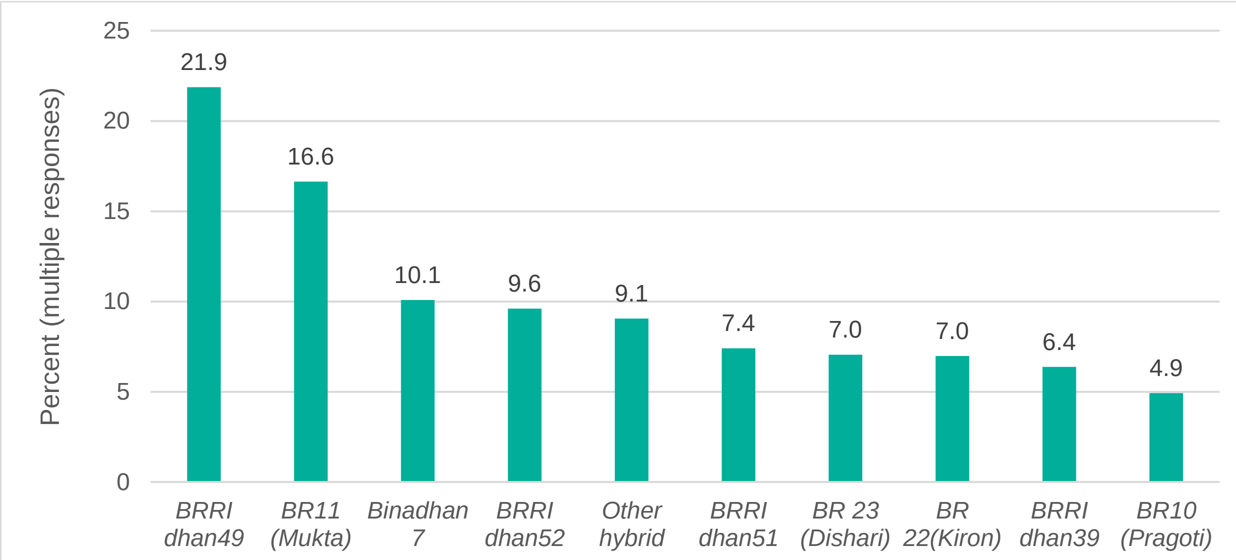
IFPRI conducted a seed dealer survey as part of the Bangladesh Integrated Household Survey (BIHS) in 2018/19. Figures 3.50 and 3.51 highlight the most popular varieties of boro and aman *rice* seeds sold in the preceding 12 months. Notably, more than half of the boro (HYV) seed sold by dealers in 2018-19 consisted of *BRRI Dhan 28* and *BRRI Dhan 29*, which were released approximately 30 years ago, in 1994. In contrast, the most in-demand t. aman rice varieties were *BRRI Dhan 49* (released in 2008) and *BR 11 (Mukta*), released in 1980. These findings underscore the importance of strengthening agricultural extension services in Bangladesh, particularly to promote the adoption of newer high-yielding rice varieties. These results align with those presented in Tables 3.13 and 3.14, showing the most popular rice varieties cultivated by farmers in Bangladesh.

Figure 3.50: Most popular varieties of boro rice seeds sold in last 12 months, 2018/19



Source: IFPRI's Seed Dealers' Survey component of Bangladesh Integrated Household Survey (BIHS), 2018/19

Figure 3.51: Most popular varieties of aman rice seeds sold in last 12 months, 2018/19



Source: IFPRI's Seed Dealers' Survey component of Bangladesh Integrated Household Survey (BIHS), 2018/19

Fertilizer

Fertilizers are essential for replenishing soil nutrients and ensuring optimal crop growth. Crops deplete soil nutrients over time, and fertilizers – whether organic or inorganic – play a pivotal role in maintaining soil fertility. The use of appropriate fertilizers improves both the quality and quantity of crop yields, allowing farmers to maximize production on limited land. Gruhn, Goletti, and Yudelman (2000) note that balanced and efficient fertilizer use is critical for achieving higher crop productivity, especially in nutrient-deficient soils, which are common in many developing regions (Gruhn, Goletti, and Yudelman 2000).

Evolution of the fertilizer marketing and distribution system in Bangladesh

The fertilizer marketing and distribution system in Bangladesh has undergone significant transformations since the establishment of the Bangladesh Agricultural Development Corporation (BADC) in October 1961. In the early years, particularly from 1962 to 1978, BADC played a crucial role in distributing fertilizers, with private dealers licensed to operate within restricted areas. A notable event during this period was the urea crisis of 1974, which highlighted the limitations of the existing system.

By the mid-1970s, the government began phasing out fertilizer subsidies, paving the way for further reforms. On December 1, 1978, the New Marketing System (NMS), also known as Fertilizer Distribution Improvement (FDI-1), was introduced. Between 1978 and 1983, BADC gradually withdrew from retail and wholesale markets at the thana (now upazila) level. By 1982, licensing requirements were removed, restrictions on movement were lifted, and in 1983, fertilizer prices at the farm and retail levels were deregulated.

The mid-1980s marked the emergence of a competitive fertilizer market. This process continued until the mid-1990s, as wholesaling and dealership were freed from BADC's control in 1985-1986. FDI-2, initiated between March 1987 and August 1994, focused on reducing BADC's role and strengthening private sector participation. The liberalization of fertilizer trade began in July 1987, leading to private traders being allowed to import fertilizers like TSP and MOP.

By the early 1990s, the private sector played a dominant role, with unrestricted imports from the global market and the complete deregulation of fertilizer marketing by December 1992. However, despite the progress, challenges such as recurring urea crises in 1989 and 1994-1995 led to partial reversals of reforms, and the re-introduction of fertilizer subsidies in 1996.

Further changes occurred in the 2000s, with subsidies for imported fertilizers introduced for the first time in 2005-2006. Urea shortages in 2005, 2007, and 2008 prompted the introduction of new systems, including the slip system in 2007 and the dealership policy of 2008, which expanded dealer appointments to union levels. The modified dealership system, introduced in 2009, introduced measures like the 'Farmers' Register' and 'Fertilizer Distribution Card' but was eventually replaced in 2010 with an open-market system for urea sales.

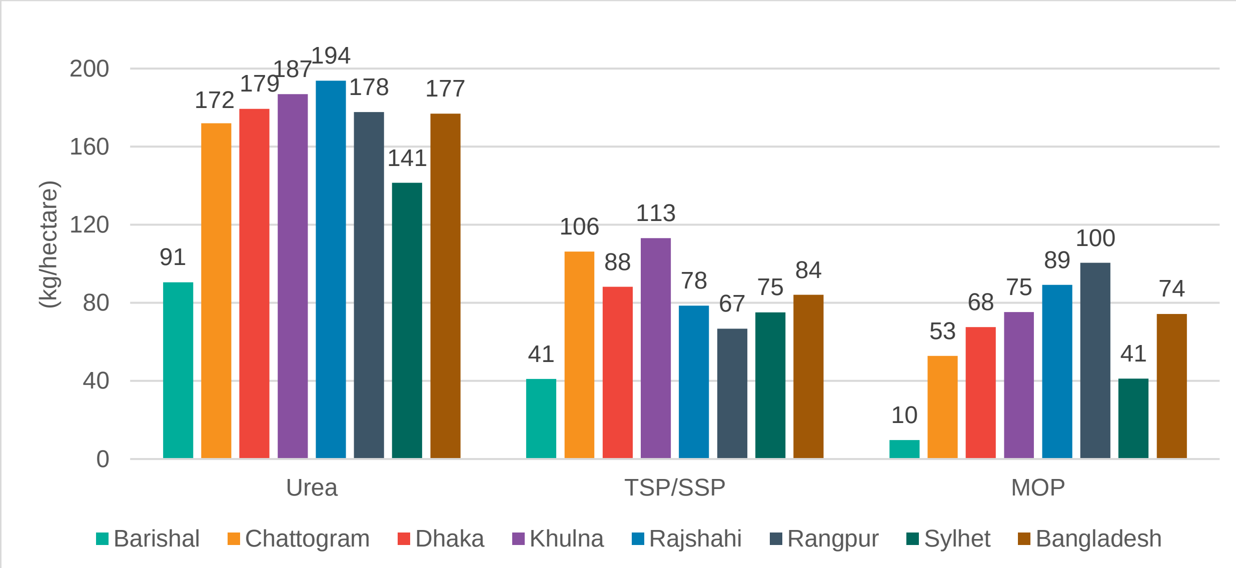
By 2012, the government heavily subsidized non-urea fertilizers, continuing its focus on ensuring accessibility for farmers while adapting to the evolving market dynamics ((Adapted from (Barkat et al. 2010; Mujeri et al. 2013; Islam and Mujeri 2021)).

Fertilizer uses by farmers

Figure 3.52 illustrates the amount of urea, triple super phosphate (TSP)/single super phosphate (SSP), and muriate of potash (MOP) fertilizers used per hectare in the seven administrative divisions[8] and in rural Bangladesh overall in 2018/19. In general, farmers used relatively higher amounts of urea compared to TSP/SSP and MOP in all divisions.

[8] BIHS 2018/19 collected data that were statistically representative of all administrative divisions in the country except for Mymensingh Division because it was not an official division in 2011/2012 when sampling originally took place.

Figure 3.52: Amounts of fertilizer use (kg/hectare), 2018/19



Source: IFPRI's Bangladesh Integrated Household Survey, 2018/19, national rural stratum

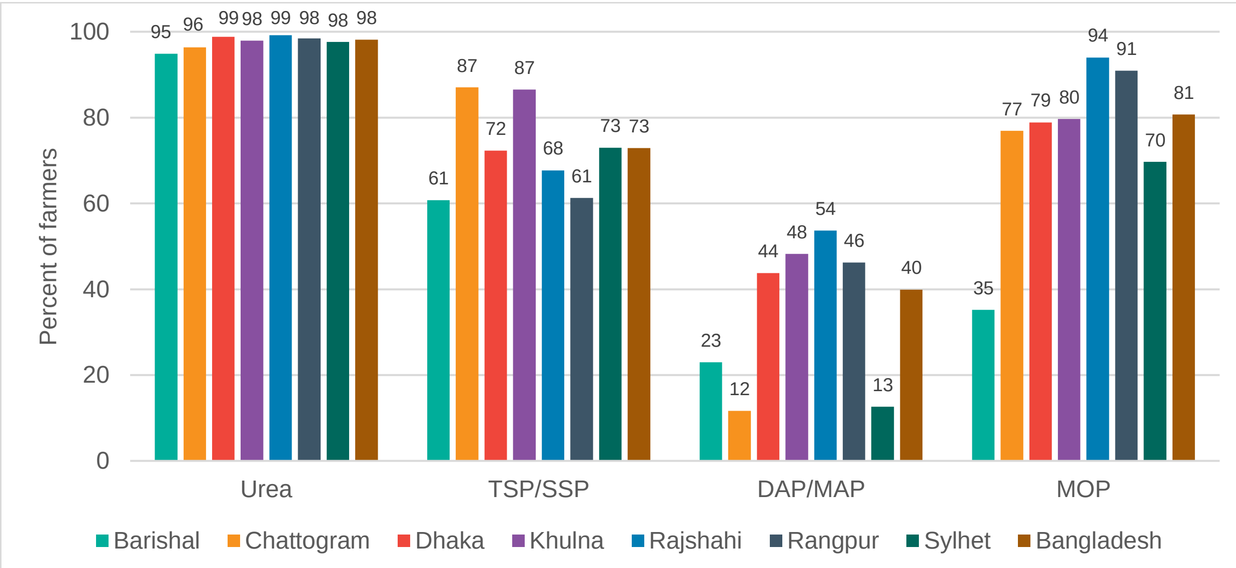
Figure 3.53 shows the percentage of farmers that used a diverse array of fertilizers in the seven administrative divisions and in Bangladesh in 2018/19. The most prevalent fertilizer used was urea, applied by virtually all farmers in these three regions (98 percent), followed by MOP and TSP)/SSP (81 percent and 73 percent, respectively).

The Bangladesh Agricultural Research Council (BARC) recommends fertilizer use for various crops and cropping patterns based on soil fertility information of different agroecological zones (AEZ). In Bangladesh, approximately 500 soil series have been identified (Rasheed 2008).

Although the government has prepared fertilizer recommendations for different environments, research shows that various factors affect how much fertilizer farmers use. Sunny et al. (2022) found that farmers' decisions on fertilizer use are influenced by the *perception* of soil fertility and soil water retention. Additionally, various studies found that access to agricultural extension services can affect fertilizer usage in Bangladesh: farmers who have access to extension and receive support or training on agricultural input use are better positioned to apply fertilizers properly.

Moreover, although farmers require credit to acquire fertilizer and complementary inputs and services, small, marginal, and landless farmers often lack sufficient access to formal credit markets (Zeller 2002; Zeller et al. 2001). Their inability to secure credit and store fertilizers also prevents them from benefiting from lower prices of fertilizer during the offseason, potentially resulting in the purchase of fertilizer at higher rates and, consequently, reduced usage. Research also shows that farmers' decisions regarding fertilizer use are influenced by geographic factors, such as land typology, soil fertility perception, soil water retention, knowledge from agricultural extension services or other sources like friends, family or neighbors, and other factors (Sunny et al. 2022). Local availability of fertilizer also affects the types used by farmers.

Figure 3.53: Percentage of farmers using various types of fertilizers, 2018/19



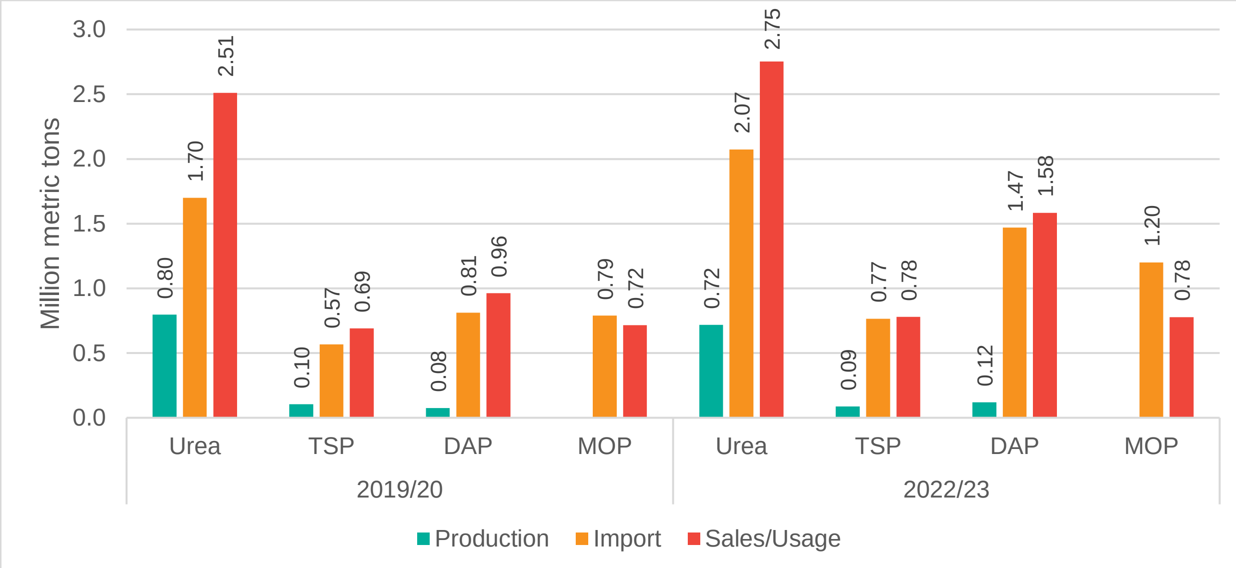
Source: IFPRI's Bangladesh Integrated Household Survey, 2018/19, national rural stratum

Fertilizer production and imports

Figure 3.54 shows fertilizer production and imports in Bangladesh in 2019/20 and 2022/23, i.e., prior to and since the Russia-Ukraine conflict. Urea is the most used fertilizer, constituting the highest supply in 2019/20 (2.5 million tons, of which 1.7 million tons were imported) and 2022/23 (2.8 million tons, of which 2.1 million tons were imported). Imports of both diammonium phosphate (DAP) and muriate of potash (MOP) have increased between the two periods. Around 1.5 million tons of DAP and 1.2 million tons of MOP were imported in 2022/23, compared to 0.8 million tons of DAP and 0.8 million tons of MOP in 2019/20.

Bangladesh is highly reliant on imported fertilizers. In 2022/23, domestic urea production accounted for 26 percent of the total supply, with the remaining 74 percent imported. Nearly all of the urea supplied (99 percent) was sold or used, with the rest held as stock. Similarly, only about 10 percent of the total TSP supply was produced domestically, while the remaining 90 percent was imported; approximately 90 percent of the TSP supplied was sold or used. Domestic production contributed around 8 percent of the DAP supply, with 92 percent imported; nearly all (99 percent) of this supply was sold or used. There was no domestic production of MOP, so demand was met entirely through imports. Unlike the other fertilizers, however, only 65 percent of the MOP supply was sold or used in 2022/23, with around 35 percent retained as stock in the supply chain (estimated from Figure 3.54).

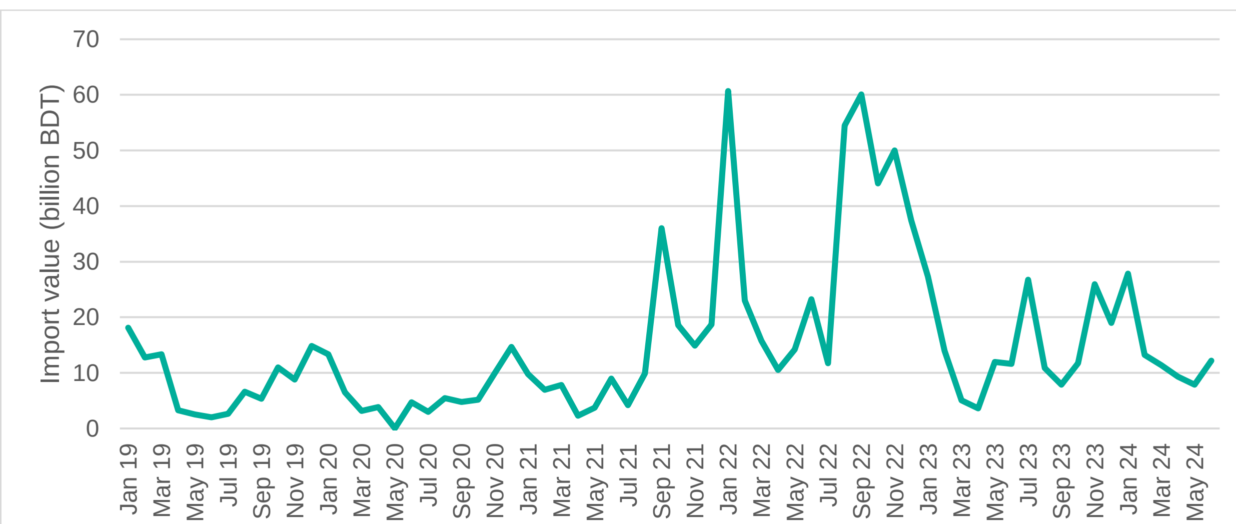
Figure 3.54: Fertilizer production and imports, 2019/20 and 2022/23



Source: Yearbook of Agricultural Statistics, 2023, Bangladesh Bureau of Statistics.

Figure 3.55 shows monthly values of fertilizer imports into Bangladesh from January 2019 to June 2024. Between January 2019 and August 2021, the monthly value of fertilizer imports averaged BDT 7.2 billion. However, fertilizer import values skyrocketed between September 2021 and December 2022, averaging BDT 30.8 billion over this period. Since then, import values have subsided, averaging BDT 14.3 billion between January 2023 and June 2024. Despite the increase in import value, the Bangladesh government continued fertilizer imports to maintain uninterrupted supply for farmers.

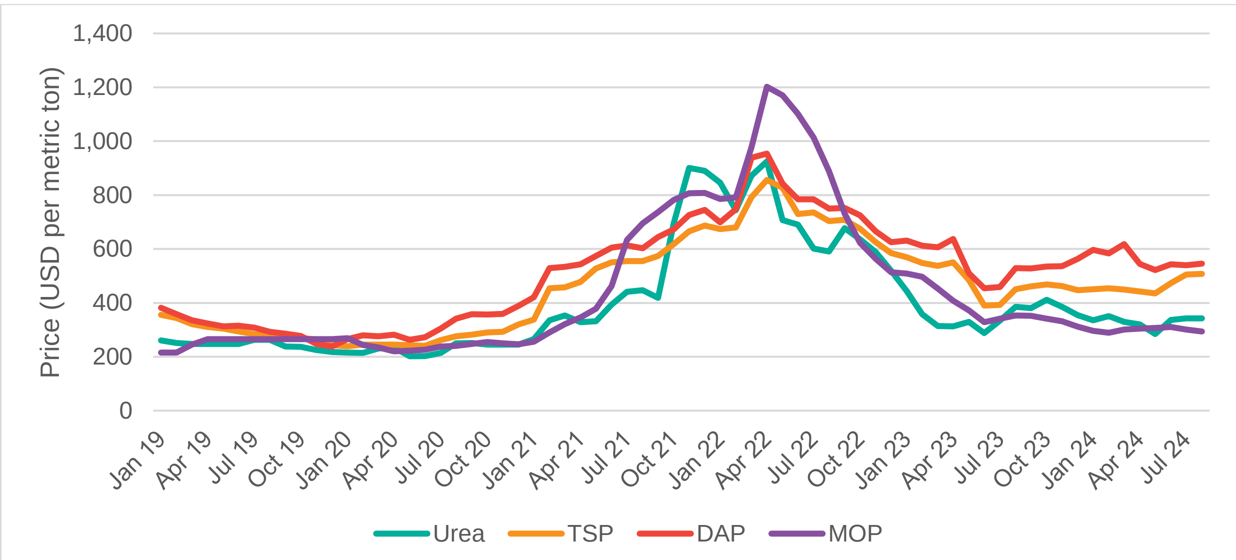
Figure 3.55: Monthly value of fertilizer imports into Bangladesh



Source: Monthly Economic Trends, several issues, Bangladesh Bank.

This spike in fertilizer import values was driven by a sharp increase in international prices just prior to and following the Russia-Ukraine conflict. Figure 3.56 shows monthly international prices for urea, TSP, DAP, and MOP between January 2019 and August 2024. Urea prices averaged US$238.3 per MT[9] between January 2019 and January 2021 but increased by more than 2.5-times to $599.1 per MT between February 2021 and January 2023. We observed similar trends for prices of TSP (from $282.1 to $636.8 per MT), DAP (from $313.9 to $695.3 per MT), and MOP (from $248.6 to $713.7 per MT) over the same period.

Figure 3.56: International prices of fertilizers, January 2019 to August 2024



Source: Pink Sheet (Commodity Price Data). World Bank. Updated September 4, 2024. Available online at: https://www.worldbank.org/en/research/commodity-markets.

Challenges in the fertilizer sector and policy recommendations

Fertilizer plays a critical role in Bangladesh's agricultural growth and food security. However, the sector faces significant challenges, including supply shortages, import dependency, and outdated production facilities.

The country requires approximately 6 million MT of fertilizers annually, with 80 percent of that amount being imported. Although the country produces urea domestically, it remains heavily reliant on imports for key fertilizers like TSP, DAP, and MOP. This dependence exposes Bangladesh to global price fluctuations and supply chain disruptions, particularly in light of the Russia-Ukraine conflict. The price of urea, for example, has surged from $238.3 per MT in 2021 to $599.1 per MT in 2023.

The Bangladesh Chemical Industries Corporation (BCIC) operates six urea fertilizer factories with a combined installed capacity of 2.3 million metric tons per year. However, actual production has significantly declined due to outdated machinery, inefficiencies, and a lack of

[9] All dollar amounts ($) referenced in this document refer to USD.

modernization. Currently, four of the six urea factories are closed, with two shut down due to gas shortages.

To enhance the sector, we recommend implementing the following policy measures:

- **Stabilize gas supply to urea fertilizer plants**
  The Ministry of Industries should establish a baseline gas supply for fertilizer plants, aligned with annual urea demand. A reliable gas supply would stabilize production and reduce the need for expensive imports.
- **Upgrade outdated production facilities**
  Modernize existing plants by introducing updated technologies and conducting energy efficiency audits. Regular overhauls should be implemented to ensure operational safety and prevent a further decline in production capacity.
- **Diversify import sources and build a strategic reserve**
  Reduce dependency on global markets by sourcing fertilizers from a broader range of countries. Additionally, the creation of a strategic fertilizer reserve could buffer the sector against future price volatility and supply disruptions.
- **Strengthen regulatory frameworks**
  Improve regulations governing fertilizer production and importation to ensure quality control. Regular inspections and strict enforcement of standards are necessary to prevent the sale of substandard fertilizers.
- **Introduce a voucher program for smallholder farmers**
  Increase transparency and efficiency in the subsidy system by introducing a voucher program targeted at smallholder farmers. This would ensure that subsidies reach those most in need.
- **Promote balanced fertilizer use and sustainable practices**
  Launch awareness campaigns through agricultural extension service to educate farmers on balanced fertilizer application and sustainable agricultural practices, promoting long-term soil health and productivity.
- **Penalize the sale of adulterated fertilizers**
  Introduce strict penalties for the sale of adulterated or low-quality fertilizers to protect farmers and ensure they receive value for their investments.

A comprehensive approach is essential to overcome the challenges in the fertilizer sector. By boosting domestic production, securing energy supplies, diversifying imports, and promoting sustainable farming practices, the country can enhance its agricultural resilience, reduce dependency on volatile global markets, and support long-term agricultural growth.

Irrigation

Bangladesh is rich in water resources, with abundant rainfall during the monsoon season and a substantial surface water inflow through its major rivers, contributing to a significant total water supply. However, aside from groundwater recharge, storing monsoon runoff for irrigation during the dry winter season is generally not feasible.

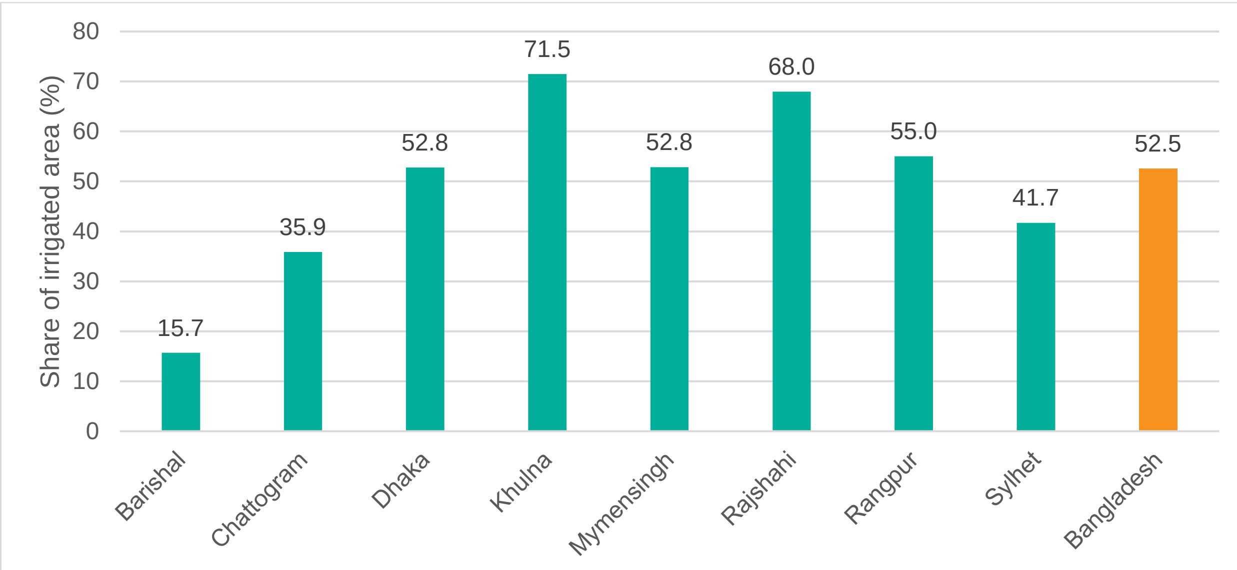
Irrigation is one of the most critical factors of agricultural production in Bangladesh. Irrigation plays three crucial roles in increasing foodgrain production in Bangladesh: (1) it enables farmers to grow an additional boro rice or wheat crop during the dry winter season, and thus increases cropping intensity and eases the land constraint; (2) complemented with fertilizers and modern high-yielding rice varieties, irrigation significantly raises rice yields in comparison to rain-fed rice cultivation; and (3) supplemental irrigation can take much of the risk out of the two predominantly rain-fed rice seasons—aus and aman (Ahmed and Sampath 1992).

Bangladesh uses both traditional and modern irrigation methods. Traditional methods include the *doon* (a water-lifting device), swing basket, and dug wells, while modern techniques involve low-lift pumps (LLP), deep tubewells (DTW), shallow tubewells (STW), and advanced canal gravity-flow irrigation systems. Of these, the *doon*, swing basket, and LLP utilize surface water, whereas dug wells, DTWs, and STWs rely on groundwater sources. Irrigation expansion efforts primarily focus on small-scale systems, particularly low-lift pumps and shallow tubewells.

Groundwater irrigation is generally more flexible than surface water irrigation, given that farmers tend to have more control over its use than surface water. Groundwater can be used in conjunction with surface water and often increases water use efficiency given that farmers bear the costs of groundwater extraction (Asaduzzaman et al. 2010).

Figure 3.57 presents irrigation coverage at the division-level, expressed as shares of irrigated area in gross cropped area and reported as percentages. In 2022/23, the division with the highest level of irrigation coverage was Khulna (71.5 percent), whereas Barishal had by far the lowest share of irrigated area in gross cropped area (15.7 percent). Salinity in both surface and groundwater is the main reason for the low level of irrigation coverage Barishal. In the coastal south, where intrusion of saline sea water occurs during high tides and storm surges, continuous crop production is hindered by soil and water salinity.

Figure 3.57: Share of gross cropped area irrigated, by division, 2022/23



Source: Authors' calculations using district-level data in Table 3.14. Yearbook of Agricultural Statistics, 2023, Bangladesh Bureau of Statistics.

Table 3.14 reports district-level shares of irrigated area in 2022/23. The two districts with the highest levels of irrigation coverage were both located in Khulna Division – Chuadanga (96.3 percent) and Kushtia (93.7 percent). Bhola (6.0 percent) and Patuakhali (7.6 percent) – both in Barishal Division – have the lowest levels of irrigation coverage.

Challenges in the irrigation system

Bangladesh faces significant challenges in water resource management. Seasonal water scarcity during the dry months and the over-extraction of groundwater in many regions are persistent issues. Managing water sustainably while balancing the competing demands of agriculture, industry, and domestic use remains a critical challenge.

The country is highly vulnerable to climate change impacts such as irregular rainfall, floods, and droughts, all of which affect water availability and irrigation. Additionally, rising sea levels and salinity intrusion into coastal areas are reducing the availability of freshwater for irrigation purposes.

Irrigation, especially using tubewells, is energy intensive. Farmers often face high electricity or fuel costs, which reduce the profitability of irrigated farming. Groundwater, while essential, presents its own set of challenges. Pumping groundwater is often more costly than surface water systems, requiring diesel or electricity and contributing to increased greenhouse gas (GHG) emissions.

Over-extraction of groundwater has depleted aquifers in some regions, posing long-term risks for water sustainability. Additionally, rapid irrigation expansion using groundwater has accelerated arsenic contamination in some areas (Bell et al. 2015).

The Public Food Distribution System

The Public Food Distribution System (PFDS) in Bangladesh has its origins in the aftermath of the Great Bengal Famine of 1943, causing the then colonial government to form a system through which rice and wheat could be distributed to poor households to ensure minimum food consumption. In recent years, especially following the 2007/08 global food crisis, the size of the PFDS has expanded, both in terms of the number of distribution channels as well as the volumes of rice and wheat distributed. The government procures foodgrains (rice and wheat) from domestic and international markets, stores the procured foodgrains in public *go-downs* (warehouses), and distributes them through different channels of the PFDS. The main objectives of the PFDS are to (1) make foodgrains available to poor households that would not otherwise have access to adequate food, (2) distribute food during emergency situations, such as natural disasters, (3) provide incentive prices to foodgrain producers to encourage domestic production, and (4) stabilize market prices to prevent excessive price rises.

<u>Foodgrain stocks</u>

Stocks of foodgrains (rice and wheat) constitute a component of food availability. Foodgrain stocks are maintained by both public and private sectors in Bangladesh.

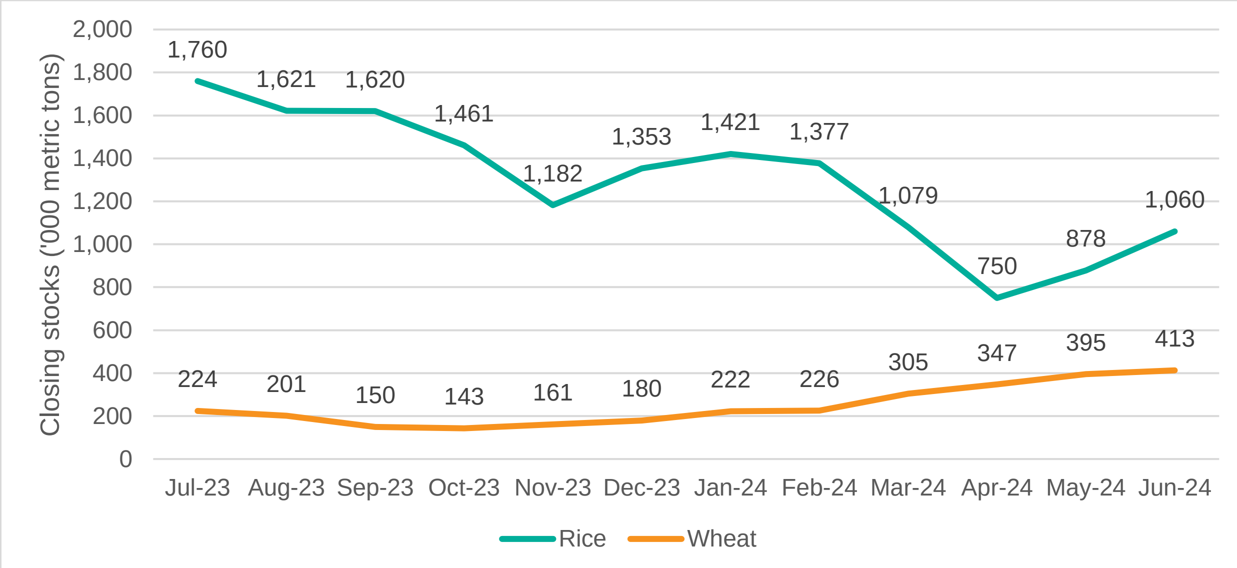
<u>Closing public stocks of rice and wheat</u>

It is important to look at the recent month-end closing stocks of rice and wheat held by PFDS. The Directorate General of Food and the Food Planning and Monitoring Unit (FPMU) calculate closing stocks as the sum of opening stocks, domestic procurement and public imports, less distribution and storage losses for a given month.

Figure 3.58 illustrates the PFDS month-ending closing stocks of rice and wheat for FY2023/24. Rice stocks were highest in July 2023 (at the height of boro procurement) at 1.8 million MT, and gradually declined through the year as distribution progressed. Stocks were at their lowest point in April 2024 at 750 thousand MT, coinciding with the onset of the lean season. Following this drop, rice stocks began to recover in May, reaching 1.1 million MT by June 2024 mainly from boro rice procurement.

Wheat stocks, on the other hand, exhibited a more gradual and consistent upward trend compared to rice. Starting at 224 thousand MT in July 2023, wheat stocks declined (with on-going distribution) until October 2023 (143 thousand MT) and then began to rise steadily, reaching 413 thousand MT by June 2024.

Figure 3.58: PFDS closing stocks of rice and wheat, 2023/24



Source: Directorate General of Food.

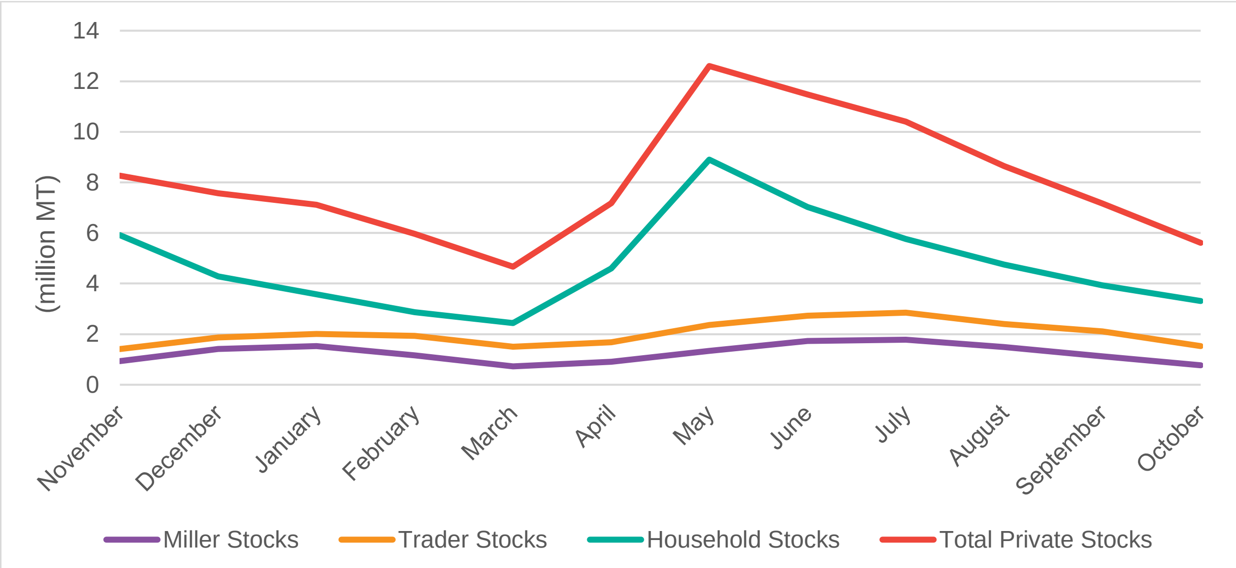
<u>Private sector rice stocks</u>

While the government of Bangladesh stores and distributes foodgrains to stabilize prices and smoothen consumption for the poor through PFDS operations, public procurement accounts for less than five percent of domestic production. Indeed, most stocks throughout the year are held by private sector actors, namely millers, traders, and the millions of farmers throughout the country.

To estimate the levels and patterns of private sector stockholding, IFPRI conducted a nationally representative survey of rice millers and traders in 2018 – the Bangladesh Millers' and Traders' Survey (MATS) – which was used to calculate monthly rice and paddy stocks between November 2016 and October 2017. Using miller and trader data from this survey and two rounds of household stock data (estimated from IFPRI's BIHS), the study provided estimates of total private stocks for 2016/17.

Figure 3.59 shows that in 2016/17, total private stocks of paddy and rice averaged 8.1 million MT (in rice-equivalent terms), or 25 percent of annual net availability. The share of private stocks held by households was 4.8 million MT (59 percent of total private stocks, and 15 percent of annual net availability), while millers and traders held the remaining 3.3 million MT (41 percent of total private stocks, 10 percent of annual net availability).

Figure 3.59: Disaggregated miller, trader, household and total private stocks, 2016/17



Source: From (Dorosh et al. 2021), using Bangladesh Millers' and Traders' Survey (MATS) 2018 data.

Note: In 2016/17, aman rice output was 13.7 million MT (40.4 percent of production), boro was 18 million MT (53.3 percent) and aus was 2.1 million MT (6.3 percent).

IFPRI study on PFDS rice procurement

In 2019, paddy prices in Bangladesh dropped due to a bumper boro rice harvest, which accounted for 54 percent of the total rice production in 2018/19, the highest share among the three rice seasons. Farmers expressed concerns that the government failed to provide price support when paddy prices fell below production costs. In response to a request from the Ministry of Agriculture, IFPRI conducted a study to assess the effectiveness of the government's direct paddy procurement system to help farmers cope with low harvest prices in the future. The study included surveys of boro farmers, rice millers, traders, and PFDS officials (Ahmed et al. 2022).

In 2019, the Directorate General of Food under the Ministry of Food procured 1.42 million MT of rice, representing 7.2 percent of the 2018/19 boro harvest. Of this, 81 percent came from rice millers, while the remaining 19 percent was procured directly from farmers in the form of paddy.

The findings revealed that rice millers benefited most from the procurement system, as they bought hybrid paddy from traders–25 percent cheaper than high-yielding variety (HYV) paddy – and sold milled rice to the government at BDT 36 per kg. Although hybrid rice made up only 18 percent of total boro production, it accounted for 94 percent of rice millers' sales to the government.

The IFPRI study proposed two policy options:

Direct paddy procurement from farmers: When harvest prices are low due to overproduction and do not cover farmers' costs, the government could procure the full targeted amount directly from farmers, boosting paddy prices. The study outlined detailed and practical modalities for such direct procurement. The study's demand-supply model estimated that, if this had been implemented during the 2019 boro season, market prices could have increased by 45 percent. Although this would still be below the BDT 26 per kg paddy procurement price, it would have been a substantial improvement over 2019 boro harvest prices. This option would benefit both participating and non-participating farmers by raising market prices. However, achieving the paddy harvest price of BDT 26 per kg would require 2.1 million MT of rice-equivalent paddy procurement, which exceeds the PFDS storage capacity of 1.93 million MT, necessitating additional storage infrastructure.

Open tender rice procurement: Under this option, the government would buy rice from the market through open tenders. The aim would solely be to build public foodgrain stock, without the dual goal of providing price support to farmers. This approach would transfer milling, handling, and transportation responsibilities to private traders. However, careful design is required for cost-effectiveness, considering factors like packaging, delivery, pricing, quality control, and payment schedules (R. Ahmed, Chowdhury, and Ahmed 1993).

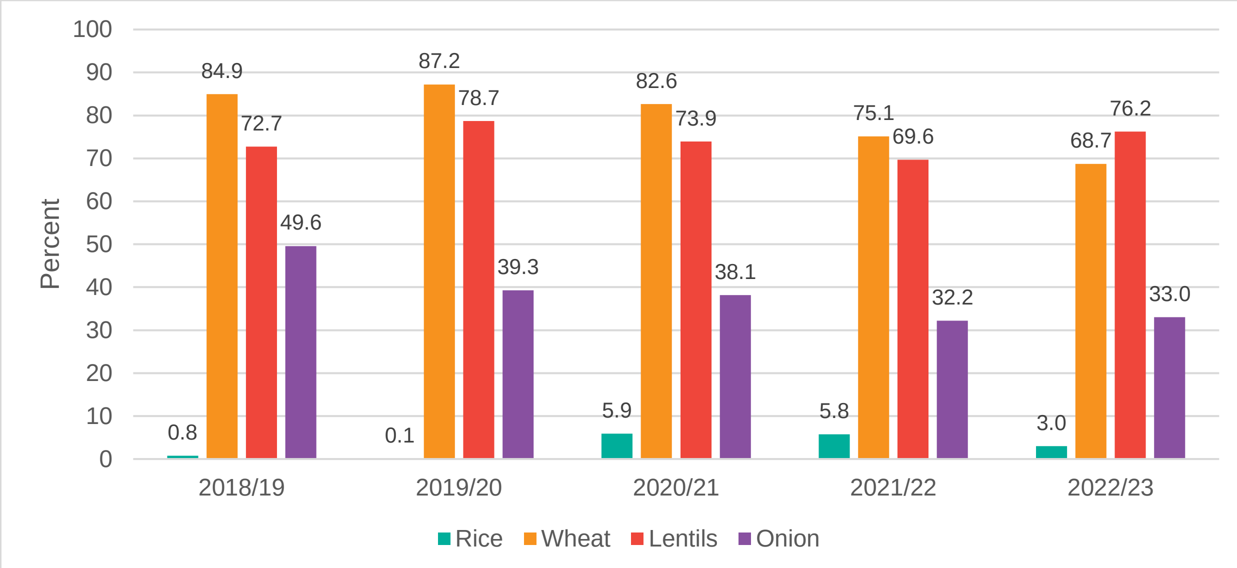
The IFPRI study outlined these two policy options, with the choice depending on whether the government's priority is to support farmers or replenish PFDS stocks. As a single policy instrument cannot effectively achieve both goals, the government must decide its primary objective. If farmer price support is prioritized, option #1 is preferable; if stock replenishment is the goal, option #2 is more suitable.

The Food Planning and Monitoring Committee (FPMC) of the government reviewed the IFPRI study, but the government continues to primarily procure rice from millers. For 2024, the boro procurement target is set at 1.7 million MT of rice and 0.5 million MT of paddy.

Import dependencies of major food commodities

While Bangladesh is self-sufficient in several food commodities, it is also import-dependent for a number of foods (Figure 3.60). In terms of shares of total supply (net domestic production plus imports), rice imports ranged from 0.1 percent to 5.9 percent between 2018/19 and 2022/23. On the other hand, Bangladesh is heavily dependent on imports for wheat (averaging 79.7 percent of supply), lentils (74.2 percent), and onions (38.4 percent).

Figure 3.60: Import shares of total supply of some major food commodities



Source: Authors' calculations using data from (1) Yearbook of Agricultural Statistics (several years), (2) FAO Food Balance Sheets, and (3) BBS Foreign Trade Statistics (several years).

Note: Total supply is the sum of net production (less seed, feed and waste) and imports. Using data from FAO's Food Balance Sheets, seed, feed and waste levels are estimated at 12 percent for rice, 3.6 percent for wheat, 16.5 percent for potatoes, 5.7 percent for lentils, and 7.1 percent for onions.

Aquaculture

The fisheries subsector contributed 21.7 percent to the agriculture GDP and 2.5 percent to the national GDP in 2022/23. However, the growth rate in the fisheries subsector has dropped from 4.1 percent in 2020/21 to 2.8 percent by 2022/23, likely due to reduced productivity growth owing to high feed cost and decreasing fish export trade.

According to the United Nations Food and Agriculture Organization's (FAO) *State of World Fisheries and Aquaculture* report, Bangladesh has ascended from third to second place globally in freshwater fish production, surpassing China, which has now fallen to third. In Bangladesh, aquatic foods are becoming increasingly important in addressing food security and nutrition challenges.

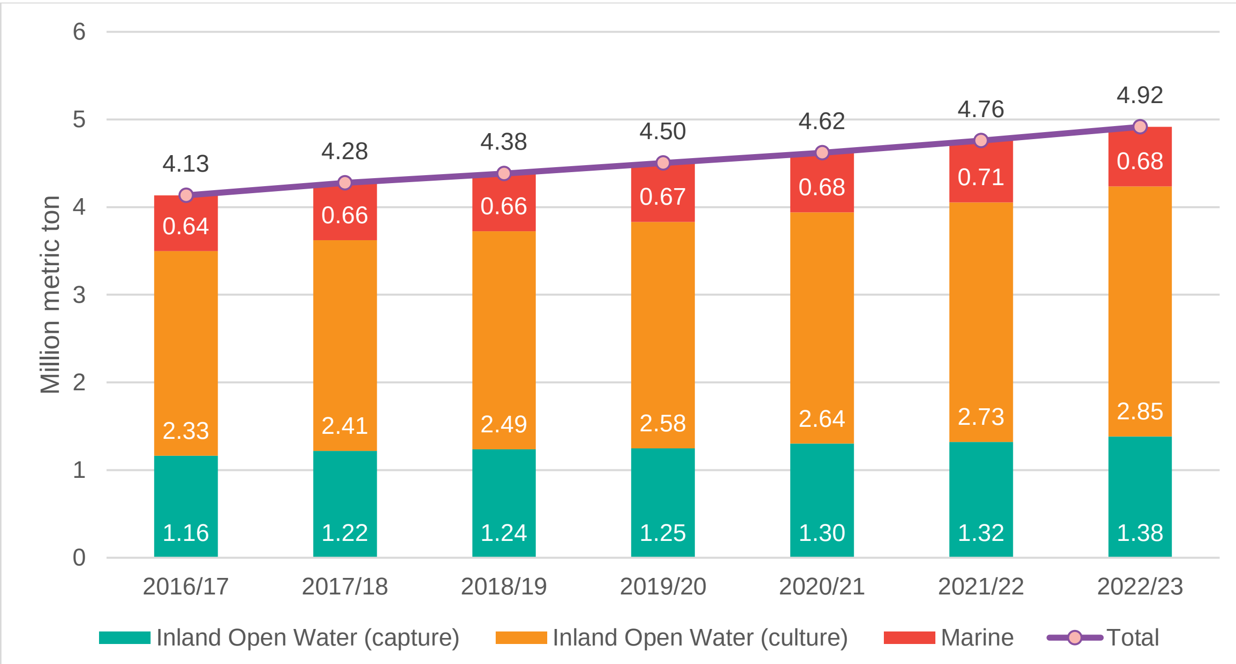
Bangladesh has made significant strides toward achieving self-sufficiency in fish production, driven by strategic development initiatives in the fisheries sector. In 2022/23, fish production reached 4.92 million MT – a 19 percent increase from the 4.13 million MT recorded in 2016/17 (Figure 3.61). This growth is particularly remarkable given that total fish production was just 0.75 million MT in 1983/84, marking more than a six-fold increase over the past 39 years.

Between 2016 and 2023, inland open water capture rose from 1.16 million MT to 1.38 million MT, while inland aquaculture production increased from 2.33 million MT to 2.85 million MT. Marine fish production also saw a modest rise, growing from 0.64 million MT to 0.68 million

MT, though growth has stagnated since 2017/18. These collective increases have significantly contributed to the overall expansion of fish production during this period.

This upward trend underscores Bangladesh's commitment to improving aquaculture practices and maximizing the potential of its extensive water resources, positioning the country toward greater self-reliance in its fish supply (Finance Division, Ministry of Finance 2024).

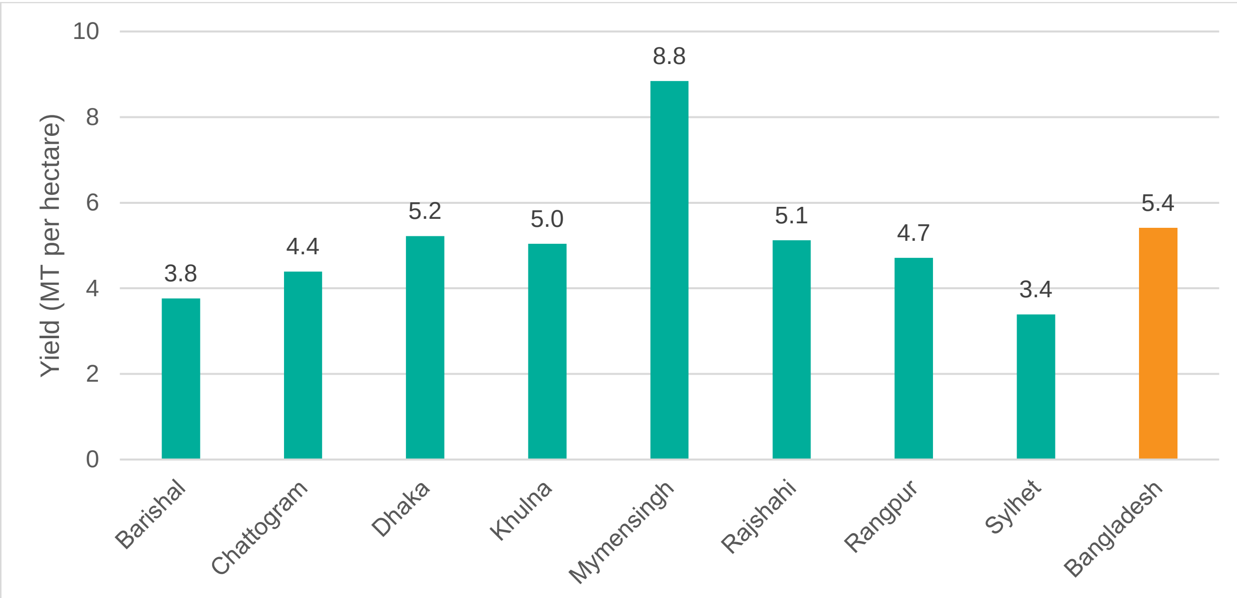
Figure 3.61: Fish production trends across various resources, 2016/17 to 2022/23



Source: Bangladesh Economic Review 2022 and 2024

The 2023 Yearbook of Agricultural Statistics published by BBS provides fish yields from ponds. Figure 3.62 shows annual fish yields from ponds in 2022/23 by division. Mymensingh Division had the highest annual yield rate (8.8 MT per hectare), whereas Sylhet ranked the lowest (3.4 MT per hectare).

Figure 3.62: Annual fish yields from ponds, by division, 2022/23

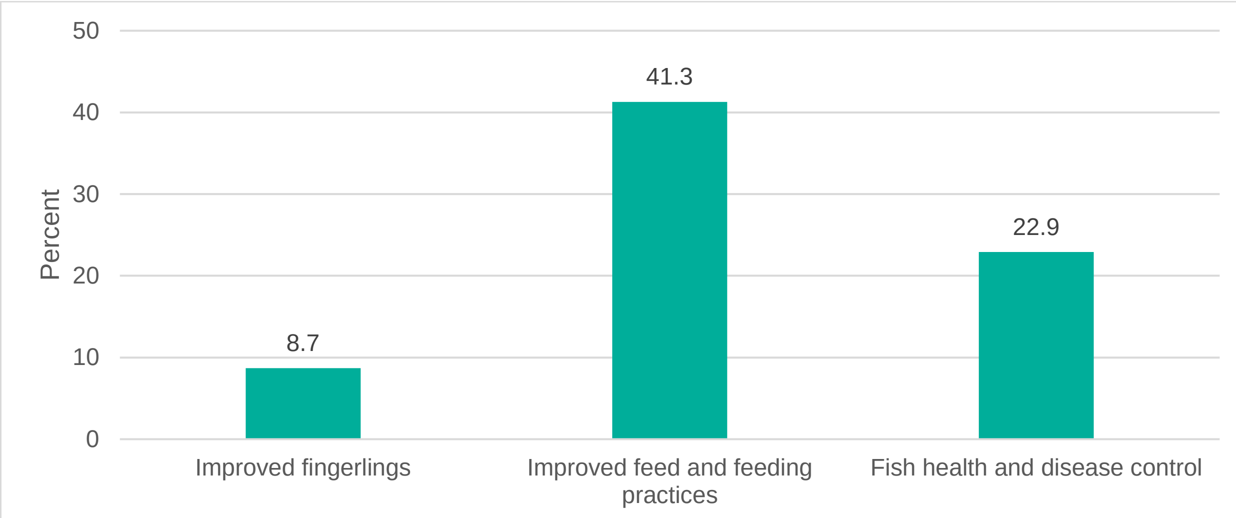


Source: Authors' calculations using district-level data in Table 3.16. Yearbook of Agricultural Statistics, 2023, Bangladesh Bureau of Statistics.

Table 3.16 provides district-level estimates of annual fishpond production in 2022/23. Ponds in Mymensingh were most productive where average fish yield was 11.0 MT per hectare. On the other hand, fishpond yields in the Hill Tracts districts were the lowest – Rangamati (2.4 MT per hectare), Bandarban (2.6 MT per hectare), and Khagrachhari (2.8 MT per hectare).

The Bangladesh Integrated Household Survey (BIHS) conducted in 2018/19 gathered data on aquaculture in Bangladesh. We analyzed the BIHS data to assess various aspects of fish production practices among farmers. Figure 3.63 illustrates the percentage of farmers who adopted selected improved management practices and technologies for fish production. Using high-quality, genetically improved fingerlings can significantly boost fish production by enhancing growth rates, survival rates, and resistance to environmental stress. However, only 8.7 percent of fish farmers used improved fingerlings in 2018/19. This low adoption rate suggests limited access to or awareness of the benefits associated with better-quality fingerlings. In contrast, around 41.3 percent of farmers adopted improved feeding techniques, indicating a higher level of knowledge uptake and resource utilization in this area. The adoption rate for fish health and disease control stands at 22.9 percent. Although disease management is critical for sustaining fish populations, this relatively low adoption rate suggests that fish health interventions are not widely practiced.

Figure 3.63: Percentage of fishpond farmers who applied selected improved management practices and technologies, 2018/19



Source: Authors' calculation using Bangladesh Integrated Household Survey 2018/19 data

Livestock

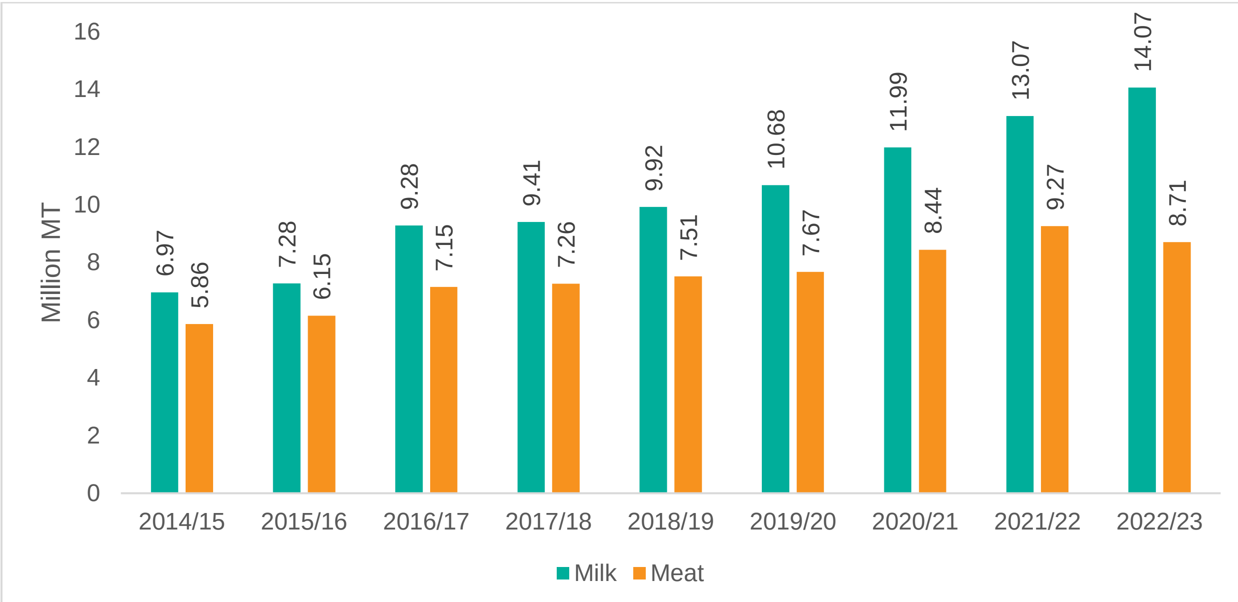
The livestock subsector experienced a growth rate of 3.2 percent in 2022/23. The contribution of the livestock subsector to agricultural GDP was 16.4 percent and to the country's GDP was 1.9 percent in the same year. The livestock subsector maintained steady growth, hovering around 3 percent from 2020/21 to 2022/23.

Figure 3.64 illustrates milk and meat production (in million MT) over a nine-year period, from 2014/15 to 2022/23. The data reveal a consistent year-on-year increase in milk production. Starting at 6.97 million MT in 2014/15, milk production more than doubled, reaching 14.07 million MT by 2022/23.

Notable growth occurred between 2015/16 and 2016/17, with a significant increase in production during this period. From 2014/15 to 2015/16, the rise was modest, adding approximately 0.31 million MT. However, between 2015/16 and 2016/17, there was a substantial jump of over 2.01 million MT.

Meat production also followed an upward trend, though at a slower pace compared to milk. Starting at 5.86 million MT in 2014/15, it gradually increased to 8.71 million MT by 2022/23. Unlike milk, meat production showed more gradual growth each year, with a slight decline observed between 2021/22 and 2022/23, indicating a recent dip in production (Finance Division, Ministry of Finance. 2022).

Figure 3.64: Milk and meat production trends in Bangladesh, 2014/15 to 2022/23



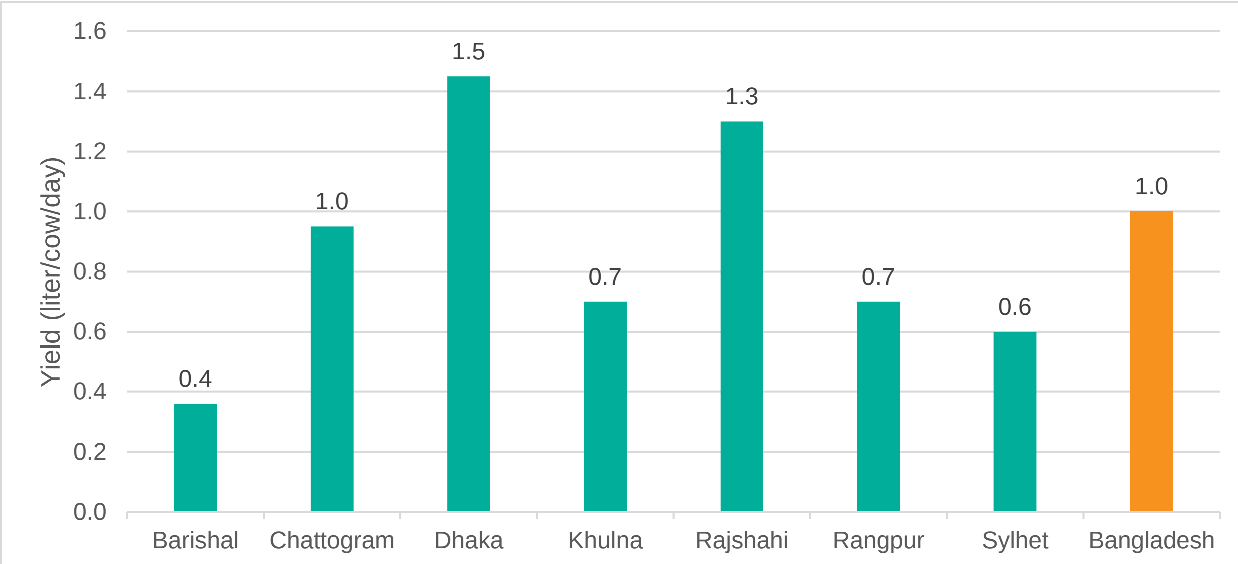
Source: Bangladesh Economic Review 2022 and 2024

Dairy milk production plays a vital role in enhancing food security by providing a stable source of essential nutrients, including protein, calcium, and vitamins. Milk and dairy products contribute to more diversified diets and improved nutrition. Additionally, dairy farming supports livelihoods by generating income for smallholder farmers and creating employment opportunities throughout the supply chain.

A study conducted by Bakhtiar and Hoddinott (2023), using the BIHS data found that ownership of dairy cows in Bangladesh increases the likelihood that a child 6-59 months consumes milk by 10.4 percentage points (Bakhtiar and Hoddinott 2023).

Although research suggests that dairy milk production improves household food security, the average dairy yield of milk per milking cow in Bangladesh remains very low. Figure 3.65 presents results from the 2018/19 BIHS data on dairy milk yields. The average milk yield per cow was just 1.0 liters per day, ranging from only 0.4 liters in Barishal Division to 1.5 liters in Dhaka Division. In India, the average milk yield of exotic cows is approximately 11.4 liters per day, while indigenous cows produce about 4.2 liters of milk per day (Statista 2024). This stark contrast highlights the need for improvements in dairy farming practices in Bangladesh to increase milk yields.

Figure 3.65: Dairy cow milk yields in Bangladesh by division, 2018/19



Source: Authors' calculation based on Bangladesh Integrated Household Survey 2018/19

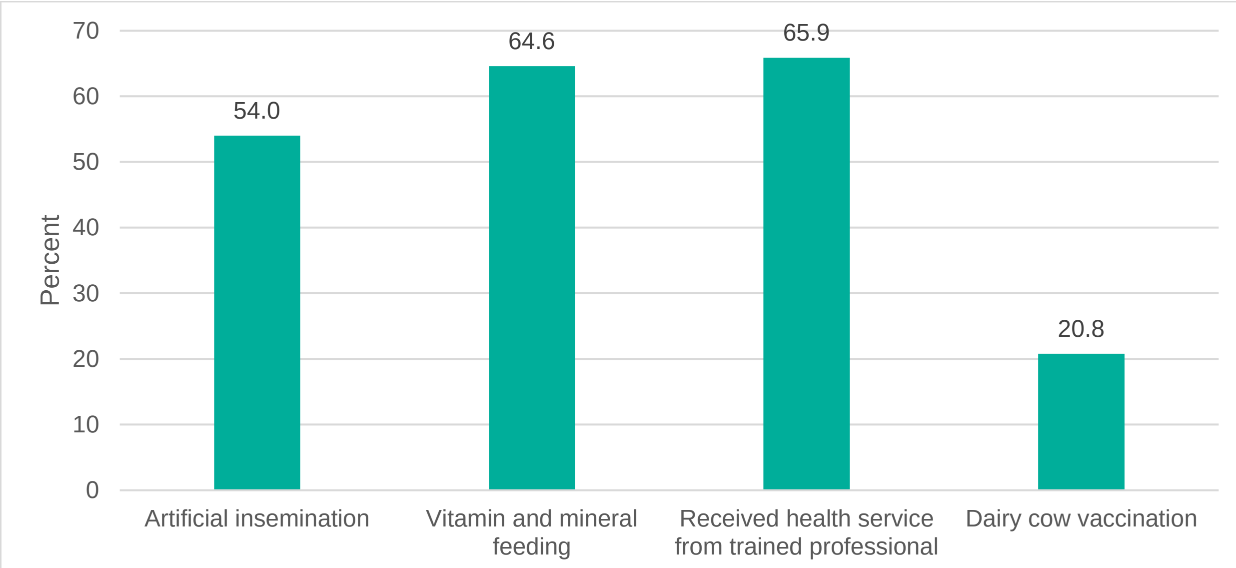
The analysis of IFPRI's nationally representative BIHS data reveals several key factors that can significantly enhance dairy milk production in Bangladesh (Figure 3.66). One factor is the use of artificial insemination, which improves herd genetics and leads to higher milk yields. In 2018/19, 50 percent of dairy farmers in the survey adopted this method.

Providing cows with supplemental vitamins and minerals is also critical for maintaining their health and optimizing milk output. Nutrient deficiencies negatively affect milk yield, reproduction, and immunity. Approximately 65 percent of farmers addressed these needs by enriching their cows' feed.

Access to veterinary health services from trained professionals ensures regular checkups, disease prevention, and timely treatment, all of which can contribute to better cow health and consistent milk production. Around 66 percent of farmers used these services.

Vaccinations play a vital role in protecting cows from infectious diseases that could devastate herds. However, despite the importance of vaccination, only about 20 percent of farmers vaccinated their cows, leaving a majority of herds vulnerable to preventable diseases.

Figure 3.66: Percentage of dairy farmers in Bangladesh who used selected management practices and technologies



Source: Authors' calculation based on Bangladesh Integrated Household Survey 2018/19

Access to services

Access to finance for Bangladesh's farming community

Access to finance remains a critical challenge for farmers in Bangladesh, particularly for marginal and smallholder farmers. Financial institutions, particularly banks, are often hesitant to lend to farmers due to perceived risks such as weather variability, volatile crop prices, and a lack of collateral or formal credit history. Consequently, many farmers turn to higher-cost credit sources such as MFIs and NGOs, and informal sources like local moneylenders or family and friends, typically facing high interest rates and less favorable repayment terms.

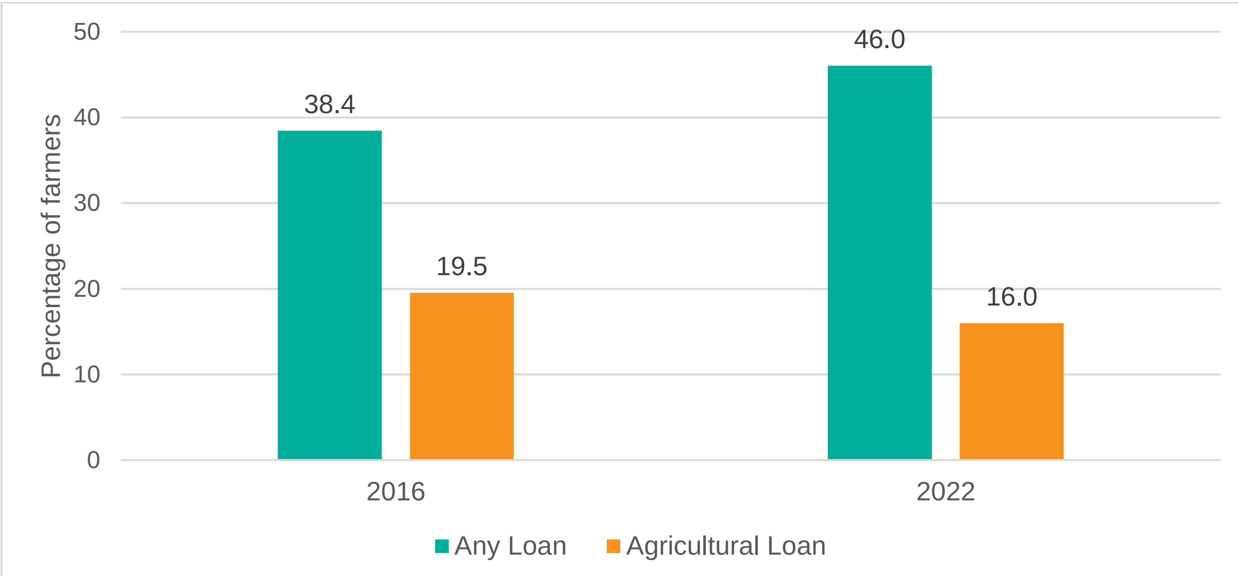
Access to credit is crucial for marginal and smallholder farmers, but trends show a shift away from agricultural loans. Figure 3.67 shows that from 2016 to 2022, the percentage of farming households taking out any form of loan[10] increased from 38.4 percent in 2016 to 46 percent, yet loans for agriculture fell from 19.5 percent to 16 percent. This indicates a shift in borrowing patterns, with fewer loans being directed toward agriculture despite an overall increase in borrowing.

Further analysis of the Household Income and Expenditure Surveys (HIES) shows that the percentage of marginal farmers accessing agricultural loans dropped from 16.5 percent in 2016 to 10.6 percent in 2022 (figure not shown). While smallholder farmers saw a slight decline in agricultural credit use, larger farms increased their borrowing due to better access to collateral and stronger relationships with financial institutions. Moreover, NGOs have become the

[10] In the Household Income and Expenditure Surveys (HIES) 2016 and 2022, loans are classified for several purposes – education, health, agriculture, business, housing, food purchase, marriage, and others.

dominant source of credit for farmers, rising from 41.2 percent in 2011/12 to 58 percent in 2018/19, while reliance on friends and relatives has slightly declined, underscoring the limitations of formal banks in meeting farmers' needs.

Figure 3.67: Percentage of farming households taking out loans



Source: Authors calculation using Household Income and Expenditure Surveys (HIES), 2016 and 2022.

The role of banks

Banks play a crucial role in rural finance, but their outreach to marginal and smallholder farmers has been limited. Bangladesh has two state-owned specialized agricultural finance institutions: the Bangladesh Krishi Bank (BKB) and Rajshahi Krishi Unnayan Bank (RAKUB), with BKB covering most regions and RAKUB focusing on Rajshahi and Rangpur divisions. Analysis of IFPRI's BIHS shows that in 2011/2012, 24.4 percent of medium and large farmers accessed loans from these banks, compared to only 7.7 percent of marginal and smallholder farmers. By 2018/2019, although the gap narrowed, just 6.1 percent of marginal farmers were able to secure loans. This ongoing disparity highlights that formal banks are not meeting the credit needs of smaller farms, likely due to collateral requirements, complex processes, and a lack of targeted financial products.

In 2020, the Bangladesh government introduced a BDT 50 billion ($590 million) stimulus package offering 4 percent interest loans to farmers and micro, small, and medium-sized enterprises (MSMEs) during the COVID-19 pandemic. However, banks struggled to reach farmers due to limited rural presence and high operational costs. While 60 percent of farmers were aware of the initiative, only 5 percent applied, and less than 1 percent received loans, with barriers like lack of knowledge (30 percent), fear of rejection (25 percent), and administrative hurdles (15 percent) hindering access. By the end of 2020, much of the stimulus remained unused, highlighting systemic issues in delivering financial support to farmers (Ahmed et al. 2020).

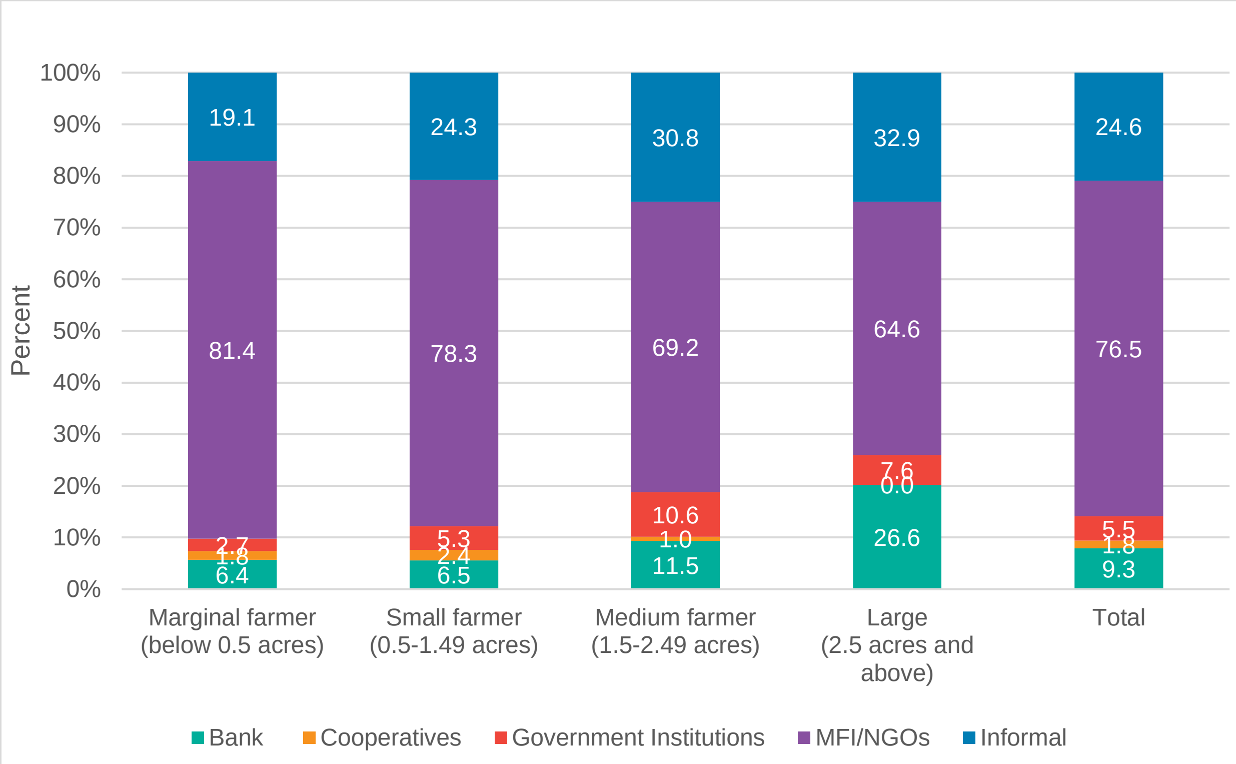
The role of microfinance institutions and NGOs

Microfinance institutions (MFIs) and NGOs play a key role in providing small loans to marginal and smallholder farmers, often using group lending models. In 2022, 81.4 percent of marginal farmers and 78.3 percent of smallholders depended on MFIs and NGOs for financing, while only 2.7 percent and 5.3 percent accessed bank loans, respectively, highlighting the limited reach of formal banks in rural areas (Figure 3.68). Though microfinance loans often carry higher interest rates, their faster disbursement and simpler documentation make them appealing to farmers. Continued reliance on informal credit sources underscores the inadequacy of formal credit channels in supporting productivity improvements.

The effective interest rate on agricultural credit provided by NGOs and MFIs is notably high, ranging from 30.5 percent to 42.8 percent (Ahmed 2007). These high borrowing costs place a significant burden on farmers, particularly smallholders, who rely on credit for inputs, equipment, and labor. Such elevated rates can undermine their profitability and long-term sustainability, often trapping them in cycles of debt and limiting their ability to improve agricultural productivity.

One way to address the issue of high borrowing costs is to expand access to more affordable credit through formal banking channels, which typically offer lower interest rates compared to MFIs and NGOs. However, a major concern remains that subsidized loans from government agricultural banks, intended to support poor farmers, often benefit relatively solvent farmers instead, leaving marginalized smallholders without access to these funds (Khan 2020).

Figure 3.68: Sources of agricultural loans by farm size, 2022



Source: Authors' calculations based on HIES 2022.

Note: Since a farm can utilize multiple sources of agricultural finance, the total may exceed 100 percent.

Challenges and reforms in accessing formal credit for agriculture

Smallholder farmers in Bangladesh face significant barriers to formal credit due to unclear land ownership documentation, lack of credit histories, limited financial literacy, and slow loan processes caused by inadequate banking outreach and staffing. One potential way to mitigate these risks is by partnering with networks that already have extensive farmer outreach, such as Syngenta, which has a strong retail presence, or ag-tech firms like iFarmer and WeGro. These intermediaries could offer reliable data on farmers with established transaction histories, potentially for a fee tied to loan performance, helping banks make more informed lending decisions. Despite the clear potential of these intermediaries, there are notable challenges. One of the key barriers is the lack of policy guidelines governing such partnerships, making it difficult to formalize collaborations between financial institutions, ag-tech firms, and agricultural input providers. Additionally, there is poor coordination between these intermediaries and government agencies or agricultural extension services. This disconnect limits the ability to create a cohesive system that can offer end-to-end support to farmers—from providing inputs and advice to accessing affordable credit. Without a clear regulatory framework and stronger collaboration with public institutions, the integration of these intermediaries into the agricultural finance landscape will remain underutilized.

For this model to work effectively, governments and financial regulators need to create enabling policies that encourage collaboration between banks, ag-tech firms, and agricultural input companies, while ensuring transparency and protection for farmers. Moreover, strengthening the coordination between these actors and public extension services can lead to a more holistic approach to agricultural financing, one that integrates credit, technical assistance, and market access, ultimately enhancing productivity and rural development.

Another potential solution to mitigate the risks associated with agricultural lending is the establishment of a loss-buffer fund for banks, non-bank financial institutions, and microfinance institutions. This model has proven effective in countries like South Korea and Myanmar. In Myanmar, for instance, Yoma Bank, with support from the Livelihoods and Food Security Trust Fund (LIFT), successfully implemented a hire-purchase loan scheme for agricultural machinery. The fund helped mitigate risks by partially insuring against bad loans, encouraging banks to increase lending for mechanization efforts (Yoma Bank 2016).

The lack of formal credit histories for many farmers hinders banks' risk assessment, but establishing a centralized system to track and share these histories across financial institutions could enhance access to formal credit, which is still a significant barrier. Reforms on both supply and demand sides are essential to improve access to agricultural credit; banks should adopt alternative collateral mechanisms and flexible loan terms while public-private partnerships develop tailored financial products. Enhancing financial literacy and expanding digital services will reduce transaction costs, and policies should focus on geographical targeting, especially in climate-vulnerable areas, to support farmers' productivity and livelihoods.

Agricultural extension

Development of agricultural extension services in Bangladesh occurred during the Green Revolution in the 1960s when the role of extension services became crucial for educating farmers about HYV rice cultivation. The system underwent reforms in the 1980s, aiming to boost agricultural productivity through the adoption of improved farming practices to ensure food security.

The Training and Visit (T&V) system, introduced with World Bank and FAO support in the 1970s and 1980s, became the cornerstone of Bangladesh's agricultural extension services. It aimed to increase farm productivity by delivering knowledge on better management practices, land preparation, and seed quality. However, it operated through a top-down approach, targeting groups of farmers through "contact farmers." This system proved ineffective due to its rigid structure, neglect of farmers' specific needs, and failure to involve marginal farmers.

A variety of governmental and non-governmental organizations (NGOs) participate in Bangladesh's agricultural extension services. The Department of Agricultural Extension (DAE) is the primary government body responsible for crop sector services, while specialized agencies like the Livestock Department and Fisheries Department, as well as private companies, contribute through their own systems. In recent decades, the private sector and NGOs have increasingly played roles in extension services, especially in disseminating knowledge and promoting agricultural products.

Recognizing the limitations of the T&V system, the DAE introduced the Revised Extension Approach (REA), which incorporated more decentralized, demand-driven, and participatory strategies. The REA emphasizes local-level decision-making, decentralization of responsibilities, and partnerships with NGOs and private entities. It tailors programs to local needs and agro-ecological conditions, engaging farmers in identifying their own requirements, designing relevant programs, and evaluating outcomes.

The REA approach focuses on five key principles: decentralization, targeting, responsiveness to farmer needs, using various extension methods, and promoting group work. This new method aims to address the shortcomings of the T&V system by being more responsive and inclusive, ensuring that marginal farmers' needs are met, and creating stronger linkages between research and development. It is designed to be more flexible and adaptive, with extension programs varying by region to account for different farming systems and economic activities.

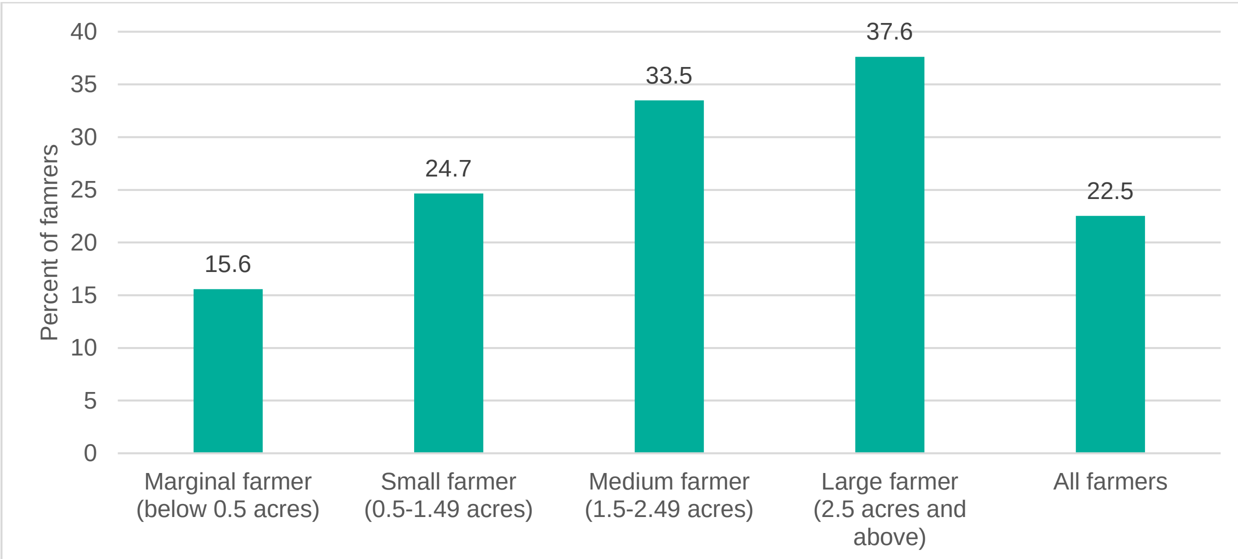
In summary, agricultural extension services in Bangladesh have shifted from a top-down, uniform model to a more decentralized and participatory system, involving a broader range of stakeholders, including NGOs, private companies, and local farmers. While challenges remain, particularly in reaching marginal and smallholder farmers, the new REA model shows promise in improving the relevance and effectiveness of extension services across the country (Saiful 2013).

While agricultural extension services are crucial for empowering farmers with the necessary skills and techniques to improve their agricultural practices, farmers often lack access to such support in Bangladesh. Farmers often rely on informal knowledge sharing, learning about new technologies and practices primarily from their peers rather than from extension officials (Hossain et al. 2003; Ahmed et al. 2011).

Enhancing agricultural extension services in Bangladesh requires a multi-faceted approach that combines human resource development, technological innovation, and institutional reform. By expanding coverage and improving the capacity of extension workers, the government can better support farmers in adopting sustainable practices and increasing productivity. Public-private partnerships and gender-inclusive programs are also essential to ensure all segments of the farming community benefit from these services.

Figure 3.69 shows the percentage of farmers who received agricultural extension services from the DAE, Ministry of Agriculture during the 12 months preceding the 2018/19 BIHS. The findings represent any form of contact with agricultural extension officials, including visits from agricultural extension officials to farm plots, if farmers visited an extension office, or a consultation over the telephone.

Figure 3.69: Percentage of farmers received agricultural extension service during the last 12 months, by farm size group, 2018/19



Source: IFPRI's Bangladesh Integrated Household Survey (BIHS), 2018/19, national rural stratum

Although marginal and small farmers constitute the largest share of farmers in Bangladesh, contact with agricultural extension officials among these two farm size groups is very low and considerably less than medium and large farmers. Overall, about 23 percent of farmers received extension services in 2018/19.

Agricultural mechanization

Agricultural mechanization has become increasingly crucial for boosting agricultural productivity and improving farmers' livelihoods. Over the past few decades, Bangladesh has progressed in agricultural mechanization to address challenges such as labor shortages and increasing agricultural wages. These developments mirror similar trends in other South Asian nations, where the expansion of custom-hiring services and government subsidies have played a key role in improving access to mechanization for farmers (Biggs and Justice 2015).

Rising real agricultural wage rates and declining labor force participation in the agricultural sector underscore the urgent need for continued mechanization in Bangladesh's agricultural sector. As employment in agriculture (as a share of the population) dropped from 48 percent in 2005 to 38 percent in 2022 (Karim et al. 2024), while wage rates have doubled during this period, the growing labor shortage makes manual farming less viable. These trends highlight the critical role of mechanization in ensuring productivity and reducing reliance on costly labor. Given these factors, agricultural mechanization should remain a top priority for the Bangladesh government to sustain food production and improve resource efficiency.

A recent IFPRI study highlights significant increases in agricultural machinery usage during the 2010s, largely driven by custom-hiring services and the rental market (Karim et al. 2024).

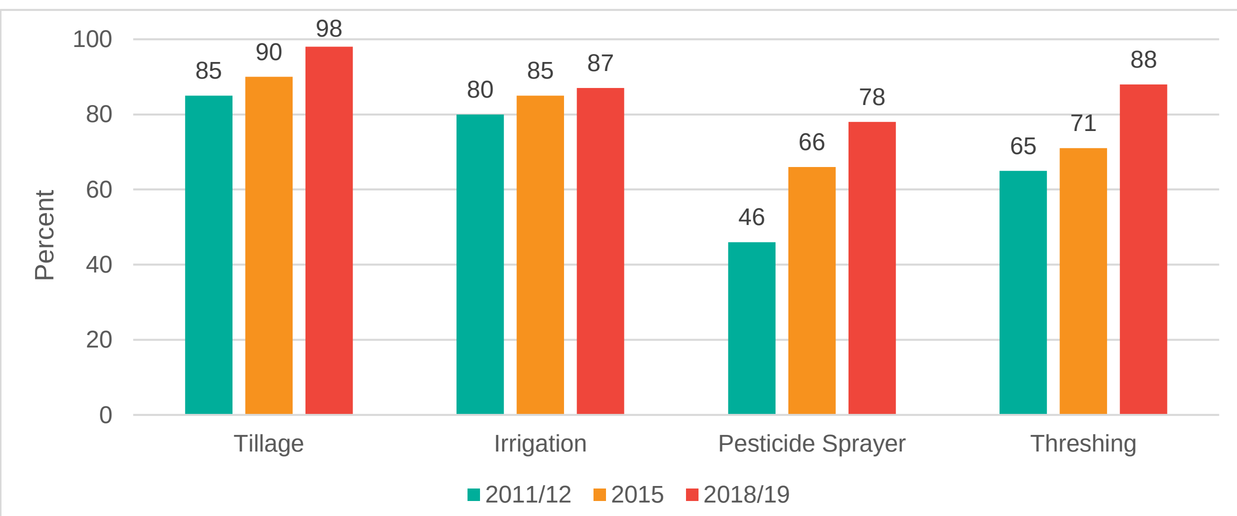
Key activities like irrigation and tillage were highly mechanized early in the decade, and the use of mechanized threshers grew rapidly throughout the 2010s. However, planting and harvesting remained predominantly labor-intensive, with minimal mechanization progress even by the decade's end.

Between 2011 and 2018, the use of agricultural machinery among rice farmers in Bangladesh grew substantially (Panel A of Figure 3.70). The adoption of machinery for activities such as tillage, irrigation, pesticide spraying, and threshing increased significantly. Land preparation became nearly fully mechanized, with around 85 percent of farms using power-tillers, while the use of four-wheel tractors remained lower. Irrigation machinery use also rose, reaching 87 percent in 2018, up from 80 percent in 2011 among boro rice-cultivating households. Pesticide spraying and threshing saw the most notable increases, nearly doubling during this period. Custom-hiring services played a pivotal role, with 98 percent of tractors and 95 percent of power-tillers rented, highlighting the importance of the rental market in facilitating machinery access for farmers.

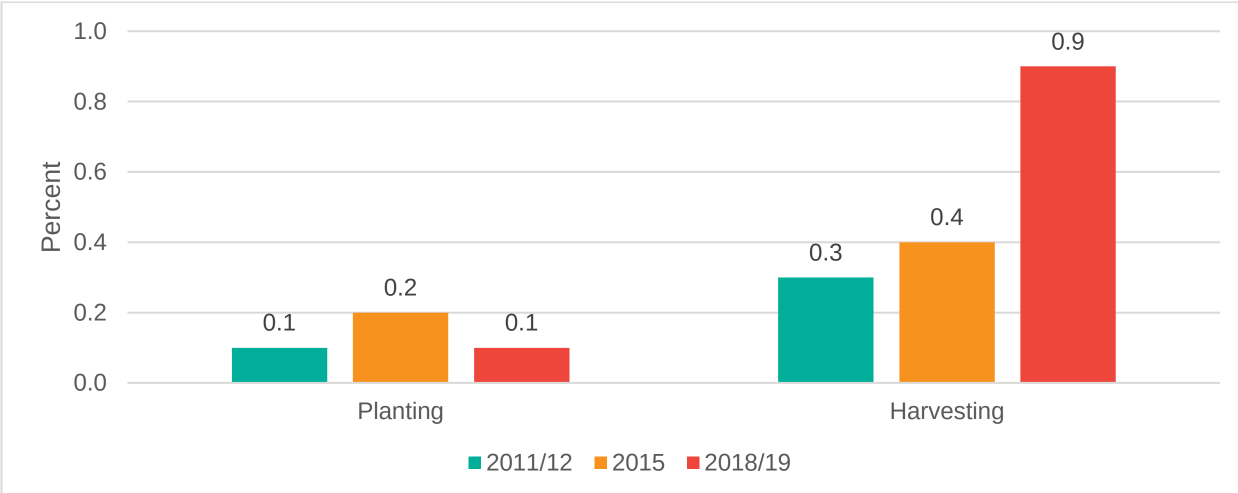
On the other hand, the adoption of machinery for planting and harvesting remained low, as of 2018 (Panel B of Figure 3.70). Planting machinery use was minimal and unchanged at around 0.1 percent in both 2011 and 2018. Harvesting machinery use also started low at 0.3 percent in 2011 but increased slightly to 0.9 percent by 2018, reflecting a slow move towards mechanization in these labor-intensive tasks. Consistently, planting and harvesting in paddy cultivation in 2018/19 were still heavily reliant on manual labor, requiring 11 and 13 labor days per acre, respectively – much higher than other tasks like tillage, irrigation, and threshing (Karim et al. 2024).

Figure 3.70: Percentage of rice farmers using agricultural machinery by task, 2011-2018

Panel A



Panel B



Source: Authors' calculations using BIHS 2011/12, 2015 and 2018/19, national rural stratum.

These labor-intensive processes pose a significant challenge for rice farmers, particularly as rural labor shortages and rising labor costs continue to pressure farm profitability. Mechanizing planting and harvesting could significantly reduce labor reliance, enhance efficiency, and ensure timely operations, which are crucial for maximizing yields in regions with narrow planting windows due to climatic factors. To address these issues, the Bangladesh government has introduced combine harvesters and rice transplanters at subsidized rates of 50 to 70 percent. As part of the latest phase of the subsidy program (2020-23), 9,539 combine harvesters and 694 rice transplanters have been distributed to accelerate mechanization in these critical tasks.

Salient policy issues related to agricultural mechanization:

- **Need for a competitive rental market:** The development of a competitive and accessible rental market is critical for smallholder farmers, who often find the high purchase and maintenance costs of agricultural machinery financially prohibitive. A robust rental market would enable these farmers to access machinery on a pay-per-use basis, alleviating the financial burden of ownership. However, despite the government's large subsidy program, the expansion of this market remains hindered by financial difficulties faced by MSPs and insufficient policy support. Enhancing policy frameworks and offering targeted financial assistance to MSPs could greatly expand the rental market, making mechanization more affordable and accessible for smallholders.

- **Barriers to accessing finance for mechanization:** Access to finance is a major barrier to agricultural mechanization in Bangladesh. Despite the provisions in the National Agricultural Mechanization Policy (NAMP) 2020 and the Agricultural Credit Policy 2023-24 for financing machinery purchases, these policies are often poorly implemented, limiting their effectiveness. Restrictions, such as preventing the transfer of ownership of subsidized machinery within three years, discourage financial institutions from offering loans since they cannot use the machinery as collateral. Additionally, the seasonal nature of income from machinery operations (e.g., harvesters) makes it difficult for farmers and MSPs to maintain consistent loan repayments. Financial institutions also hesitate to provide loans due to the lack of formal credit histories and asset documents for many farmers and MSPs.

- **Challenges in policy implementation:** The National Agricultural Mechanization Policy (NAMP) 2020 advocates for high subsidies on machinery across regions, emphasizing the importance of machine quality. However, the implementation of these subsidy programs has encountered challenges, particularly in targeting and execution. Misallocation of large, expensive machines like combine harvesters to areas that cannot fully utilize them has led to underutilization and financial inefficiencies. Additionally, in many instances poor-quality imported machinery breaks down, leading to high maintenance costs and reduced operational efficiency. Addressing these challenges requires a more refined subsidy allocation strategy, improved quality control for imported machinery, and the removal of restrictive clauses that limit financing options.
- **Insufficient skilled operators and maintenance services:** The shortage of skilled operators and qualified mechanics for maintaining advanced agricultural machinery is a significant barrier to effective mechanization. Farmers and MSPs face difficulties finding trained individuals who can operate and maintain equipment such as harvesters, threshers, and transplanters. This lack of expertise increases the risk of frequent machinery breakdowns due to improper use. Moreover, inadequate maintenance services exacerbate the issue, as the shortage of trained technicians leads to delays in repairs and increased costs. Targeted training programs are needed to build a skilled workforce capable of supporting the mechanization drive in agriculture.

CHAPTER 4 KEY FACTORS INFLUENCING FOOD ACCESS

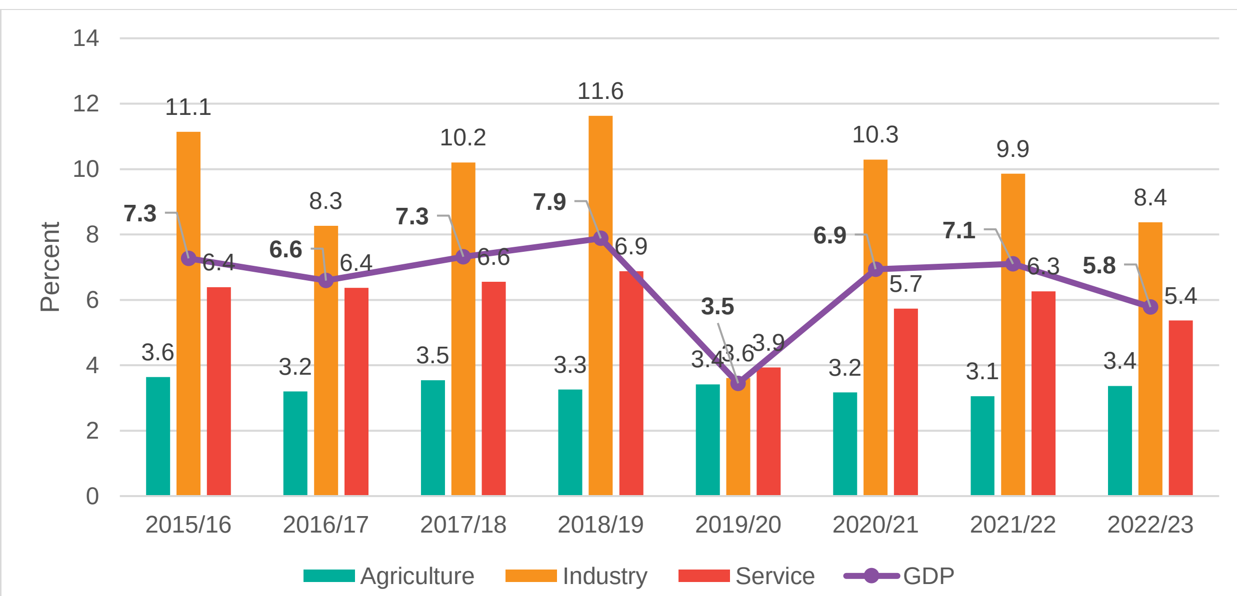
ECONOMIC GROWTH, POVERTY, AND INEQUALITY

Economic growth

Income is a key determinant of access to food. GDP is the standard measure of the value added created through the production of goods and services in a country during a certain period. Consequently, GDP also measures the income earned from that production.

Figure 4.1 shows broad sectoral GDP growth rates from 2015/16 to 2022/23 at constant prices. The average annual real GDP growth (adjusted for inflation) was 6.6 percent between 2015/16 and 2022/23. With 1.1 percent annual population growth, per capita GDP increased by 5.6 percent per year. Increased income has improved access to food. Overall real GDP growth peaked at 7.9 percent in 2018/19, but fell to 3.5 percent in 2019/20, reflecting the effects of the COVID-19 pandemic on the industry and service sectors of the economy. While the growth rate picked up after the pandemic to 7.1 percent in 2021/22, it fell again to 5.8 percent in 2022/23, partly due to import restrictions and rising raw material and energy costs (World Bank, n.d.). Notably, agricultural growth has remained relatively stagnant over this period.

Figure 4.1: Broad sectoral GDP growth at constant prices (Base: 2015/16=100)



Source: National Accounting Wing, Bangladesh Bureau of Statistics.

Growth elasticity of poverty reduction

The latest findings from the 2022 Household Income and Expenditure Survey (HIES), published by the Bangladesh Bureau of Statistics (BBS) in December 2023, reveal remarkable reductions in poverty. The official headcount rate for moderate poverty (the proportion of people living below the upper poverty line) decreased by 23.0 percent, from 24.3 percent in 2015/16 to 18.7 percent in 2021/22, while the headcount rate for extreme poverty (the proportion of people living below the lower poverty line) dropped by 56.6 percent, from 12.9 percent in 2015/16 to 5.6 percent in 2021/22. We evaluated the impact of Bangladesh's remarkable economic growth on poverty reduction by analyzing the growth elasticity of poverty reduction. This metric assesses the percentage reduction in poverty rates associated with a 1 percent change in average national income.

We calculated the annualized percentage change in both poverty rates and real income, from which growth elasticities of poverty are derived.[11] Per capita GDP in real terms, adjusted for inflation, served as the indicator for income. We used HIES data for analyzing poverty and inequality and statistical yearbooks published by BBS for per capita GDP. The analysis spans three distinct periods – 2016-2022, 2010-2016, and 2005-2010 – portraying the evolving relationship between economic growth and poverty reduction.

Estimates of growth elasticity of poverty in developing countries typically range from -1 to -4, with an average around -2. This implies that a 10 percent increase in per capita income is associated with a 20 percent decrease in poverty, underscoring the importance of economic growth in reducing poverty, particularly in developing countries.

However, the growth elasticity of moderate poverty in Bangladesh is notably lower and has been on a declining trend since 2005. Specifically, our calculation provides a growth elasticity of moderate poverty at -0.80 during 2016-2022. This implies that a 10 percent increase in per capita real income resulted in an 8 percent reduction in moderate poverty. The growth-poverty elasticities were -0.84 in 2010-2016 and -0.96 in 2005-2010, suggesting that the efficacy of economic growth in reducing moderate poverty is relatively low and has gradually diminished over the 17-year period in Bangladesh. Iqbal and Pabon (2018) find that the elasticity of poverty with respect to national income in Bangladesh has been declining rapidly over time, from -3.78 during 1995-2000 to -0.80 during 2010-2016 (Iqbal and Pabon 2018).

The growth elasticity of poverty is often linked with income distribution, typically assessed by the Gini coefficient, which can take any value between 0 and 1. A value of 0 signifies a perfectly equal distribution of income within a population and 1 represents perfect inequality, when one person in a population receives all the income and other people earn nothing. A more unequal income distribution tends to yield a smaller reduction in poverty for a given increase in per capita income.

[11] We estimated the growth elasticity of poverty as the ratio of annual rate of poverty reduction to annual GDP per capita growth rate. This is the *direct* impact of growth on poverty reduction, which does not consider the impact on poverty via a change in income distribution caused by growth. The *net elasticity* of poverty to growth can be approximated by the sum of the *direct* impact of growth and the *indirect* impact via income redistribution.

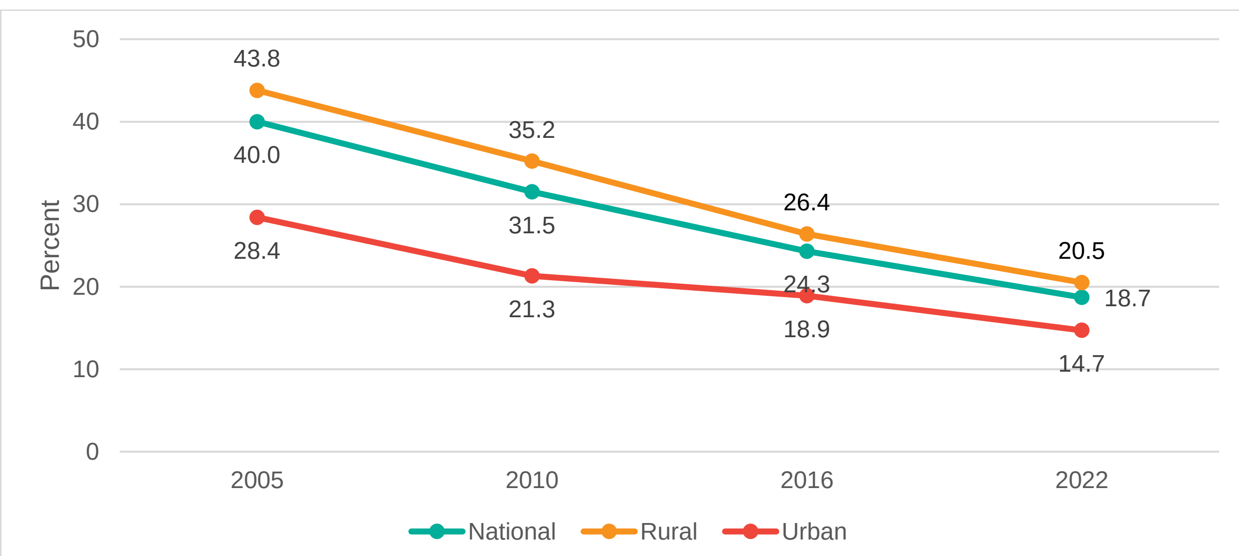
HIES data reveal a growing inequality in Bangladesh, evident in the national-level income Gini coefficient rising from 0.458 in 2010 to 0.482 in 2016 and further to 0.499 in 2022. The trend of increasing income inequality is also apparent from our estimates of the Palma ratio from HIES data, which measures the ratio of incomes between the wealthiest 10 percent and the poorest 40 percent of the population. In 2022, the richest 10 percent of the population enjoyed 40.9 percent of total national income, whereas the poorest 40 percent held 12.9 percent of total income in Bangladesh. The Palma ratio increased from 2.9 in 2016 to 3.2 in 2022. The increasing trend of inequality may explain the relatively limited effectiveness of economic growth in mitigating moderate poverty in Bangladesh.

In contrast, the growth elasticity of extreme poverty was -2.44 percent during 2016-2022, meaning that a 10 percent increase in per capita real income was associated with a substantial 24.4 percent reduction in extreme poverty. This means that economic growth has been particularly effective in alleviating extreme poverty during this period. The elasticity of extreme poverty was -1.0 percent in 2010-2016 and -1.4 percent in 2005-2010, suggesting relatively pro-extreme poor economic growth from 2016 to 2022.

Poverty

Bangladesh has made significant progress in reducing poverty since 1990, as successive rounds of HIES conducted by BBS have shown (Figure 4.2). Between 2005 and 2022, the percentage of people living below the upper poverty line decreased by 53 percent, from 40.0 percent to 18.7 percent. The percentage decline in poverty rate was higher in rural areas (53 percent) than urban areas (48 percent).

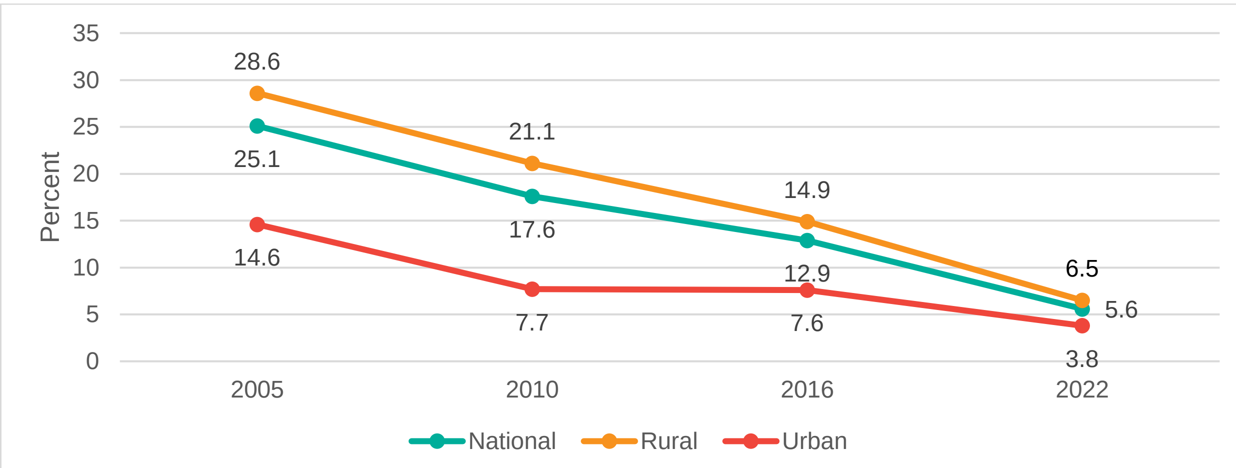
Figure 4.2: Poverty trends in Bangladesh by rural and urban areas, based on the upper poverty line (headcount rates)



Source: Report on Household Income and Expenditure Survey 2022

Figure 4.3 shows poverty trends in rural and urban areas, based on the lower poverty line. The percentage of population under the lower poverty line, which can be interpreted as the threshold for extreme poverty, declined tremendously by 78 percent. In 2022, only 5.6 percent of the population was extreme poor as compared to 25.1 percent in 2005. Extreme poverty rate declined by 77 percent in rural areas and 74 percent in urban areas. It is heartening to observe that the percentage decline in extreme poverty rate was much more than that in the poverty rate.

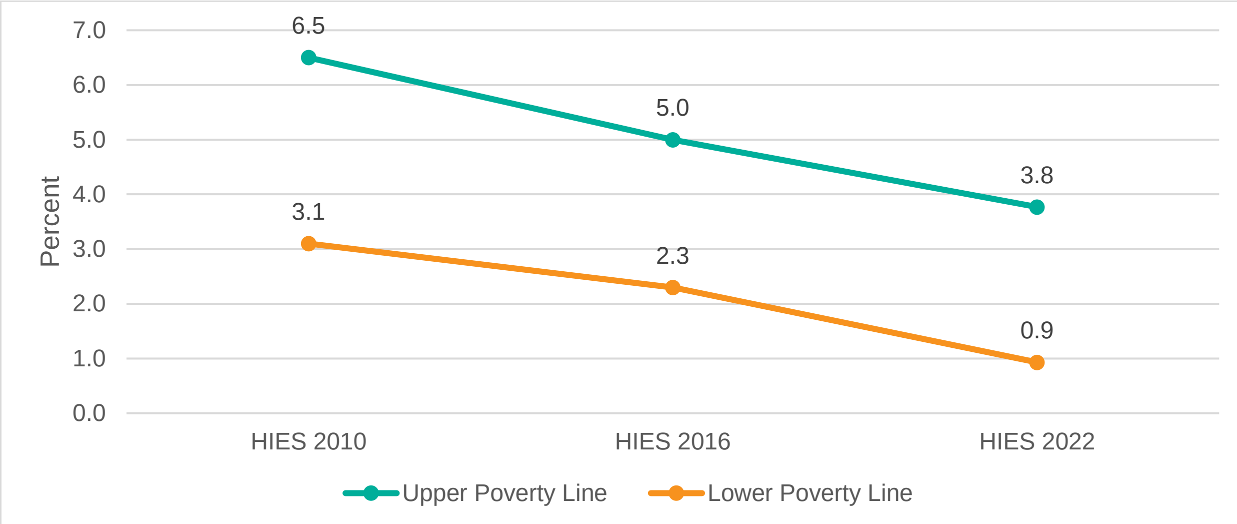
Figure 4.3: Poverty trends by rural and urban areas, based on the lower poverty line (headcount rates)



Source: Report on Household Income and Expenditure Survey 2022

The poverty gap measures the average distance of poor households from the poverty line. While the poverty headcount rate shows the percentage of people living below the poverty line, poverty depth (measured by poverty gap) reflects the average shortfall of income among the poor from the poverty line. Figure 4.4 shows the depth of poverty using the lower and upper poverty lines, both of which declined significantly between 2010 and 2022. The poverty gap using the upper poverty line reduced by 42 percent and the reduction was 71 percent using the lower poverty line.

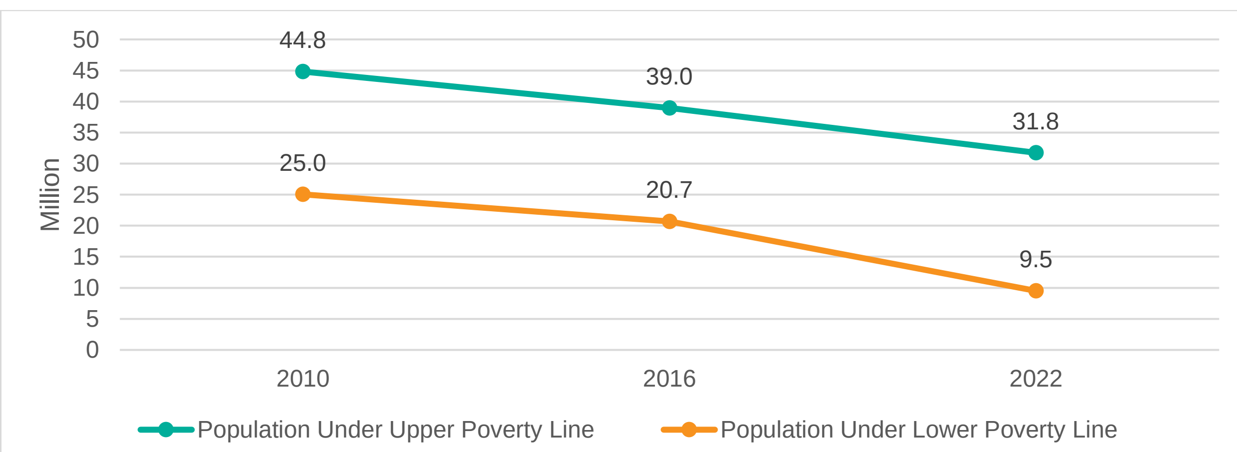
Figure 4.4: Poverty gap from 2010 to 2022, based on the upper and lower poverty lines



Source: Report on Household Income and Expenditure Survey 2022

Figure 4.5 illustrates the size of the population living below the upper and the lower poverty lines from 2010 to 2022. The fall in poverty headcount rates is large enough to significantly reduce the number of people in poverty or extreme poverty despite population growth. The size of the population below the upper poverty and the lower poverty line has declined by nearly 13.1 million and 15.5 million respectively. Despite these reductions, around 32 million people in Bangladesh are still poor (below the upper poverty line) and 9.5 million are extreme poor (below the lower poverty line).

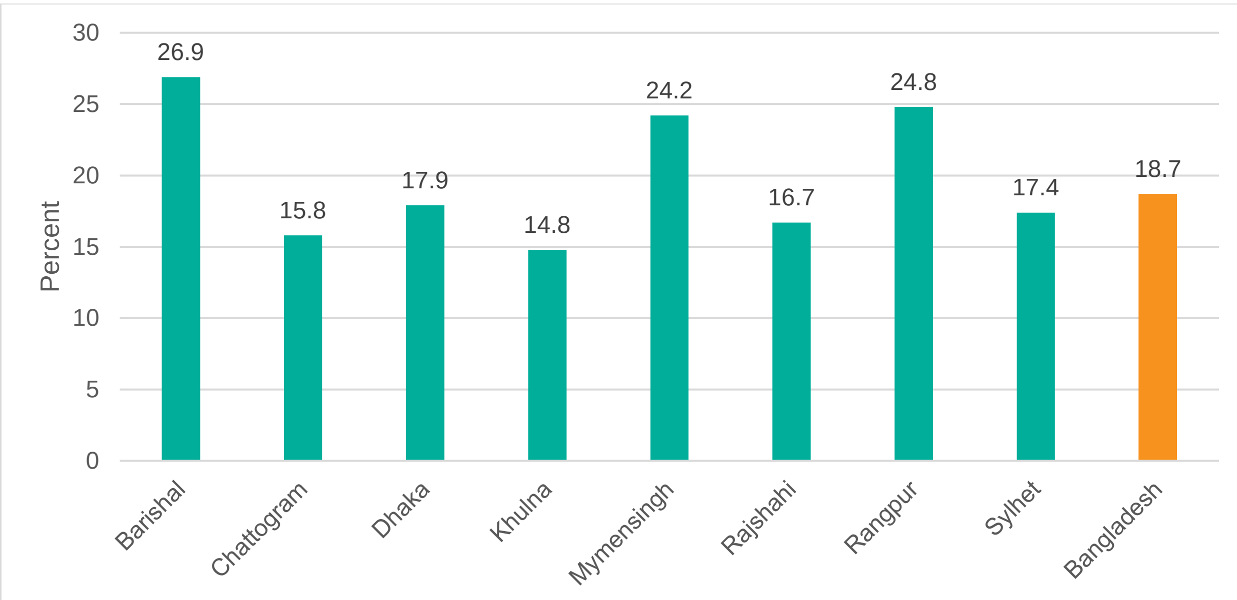
Figure 4.5: Population under the upper and the lower poverty lines from 2010 to 2022



Sources: 1) Report on Household Income and Expenditure Survey 2022; 2) Population and Housing Census 2011 Preliminary Results; 2) The Final Report of the 2022 Population and Housing Census provides the Post Enumeration Check (PEC) adjusted population figures released by the Bangladesh Bureau of Statistics (BBS 2023a).

Figure 4.6 shows the prevalence of poverty in 2022, measured by the headcount ratio using the upper poverty Line across different divisions. Barishal exhibits the highest poverty rate at 26.9 percent. Rangpur and Mymensingh follow closely with poverty rates of 24.8 percent and 24.2 percent, respectively. Khulna shows the lowest poverty rate at 14.8 percent, followed by Chattogram and Rajshahi Divisions.

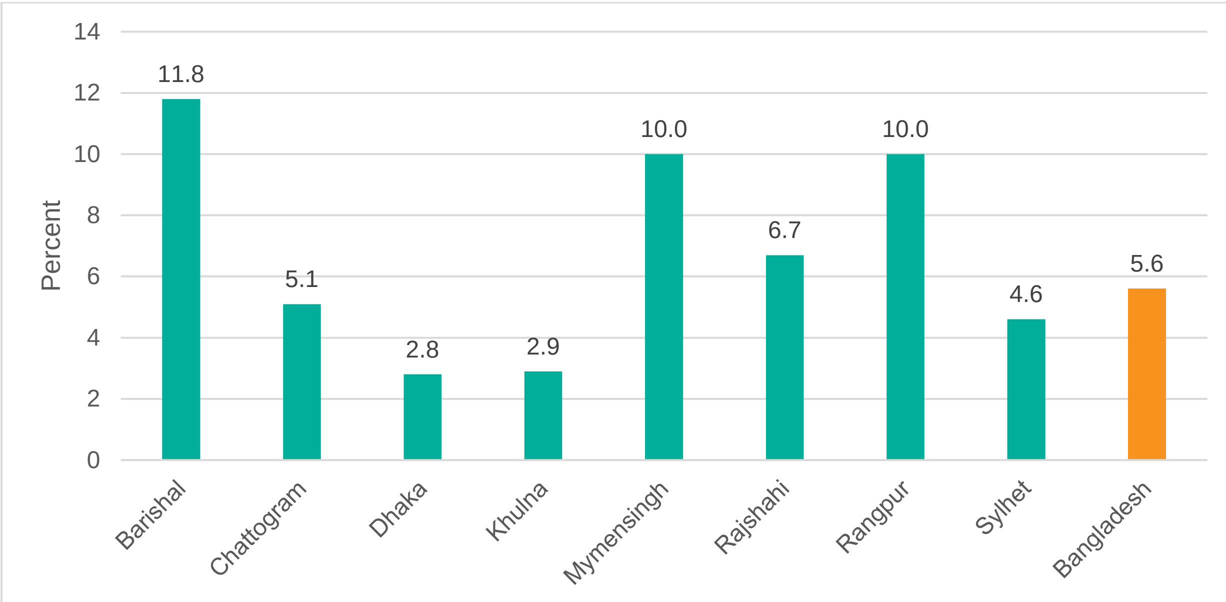
Figure 4.6: Prevalence of poverty headcount rates by division using the upper poverty line in 2022



Source: Report on Household Income and Expenditure Survey 2022

Figure 4.7 demonstrates the prevalence of extreme poverty in 2022 using the lower Poverty line across different divisions. Nationally, the poverty rate under the lower poverty line was 5.6 percent. Barishal had the highest rate at 11.8 percent, indicating significant economic challenges in the region. Both Mymensingh and Rangpur also showed higher poverty rates at 10.0 percent. Dhaka had the lowest poverty rate at 2.8 percent, followed closely by Khulna at 2.9 percent, suggesting better economic conditions in these divisions.

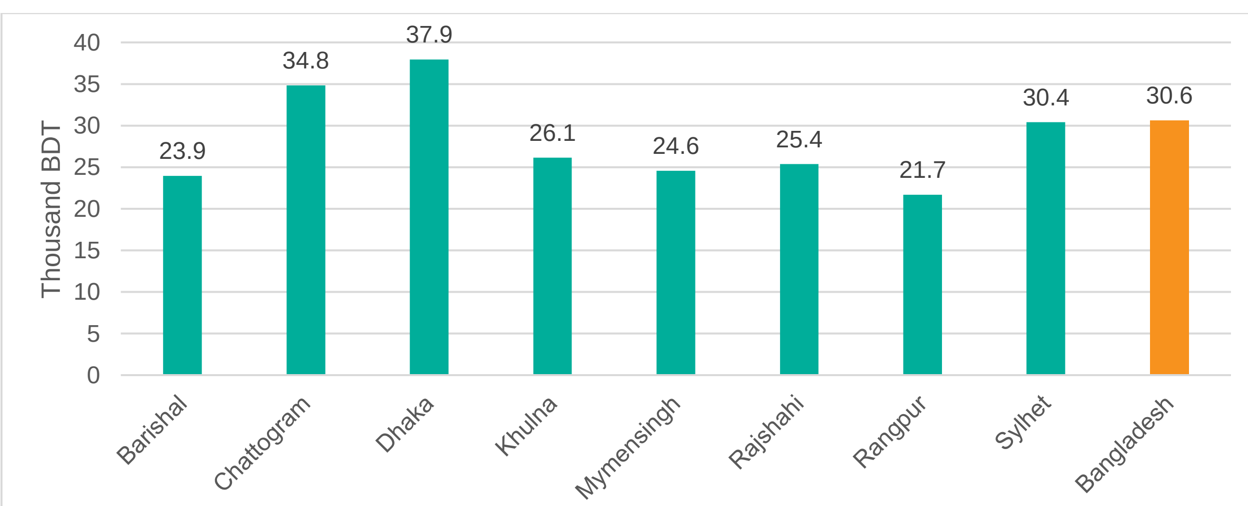
Figure 4.7: Prevalence of poverty headcount rates by division using the lower poverty line in 2022



Source: Report on Household Income and Expenditure Survey 2022

According to the 2022 Household Income and Expenditure Survey, Bangladesh's average monthly consumption expenditure was BDT 30.6 thousand (Figure 4.8). Dhaka Division had the highest average monthly household consumption expenditure, followed by Chattogram Division. Both of these divisions surpassed the national average monthly household consumption expenditure. These figures reflect the economic vibrancy of these metropolitan urban centers. Sylhet's average household consumption expenditure closely mirrors the national average, primarily bolstered by remittances from abroad.

Figure 4.8: Average monthly household consumption expenditure by division in 2022



Source: Report on Household Income and Expenditure Survey 2022.

Trends in real agricultural wages

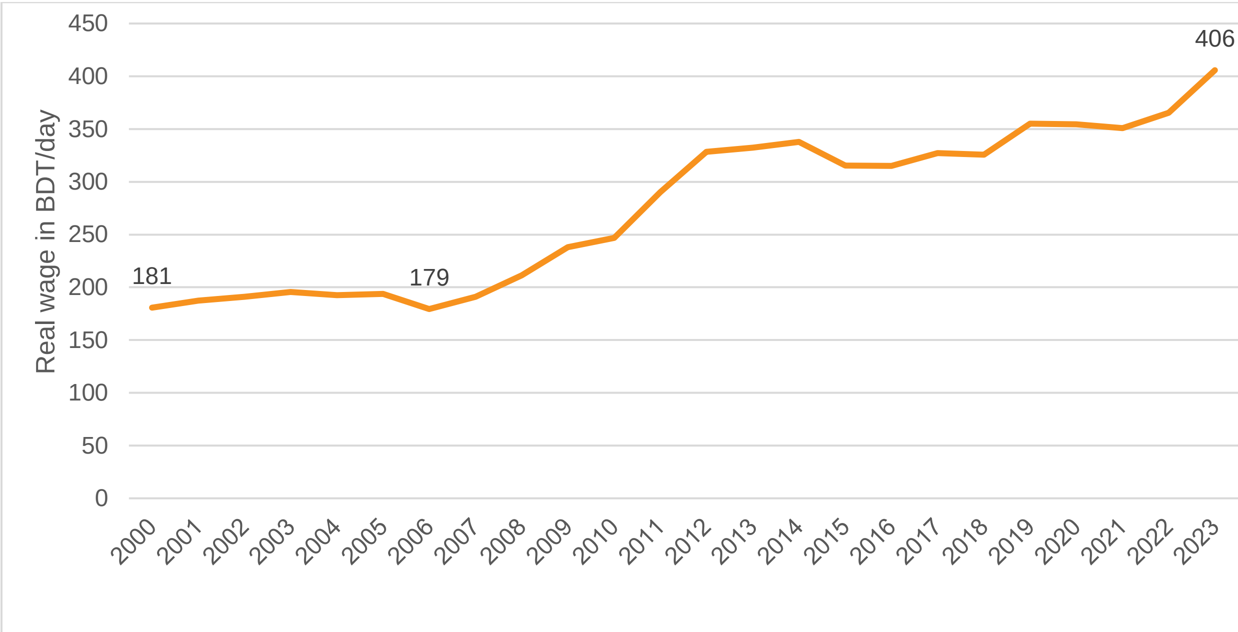
Figure 4.9 presents the trends in real agricultural wages (adjusted for inflation) in rural Bangladesh from 2000 to 2023. Rural real wages remained relatively stable before the mid-2000s. However, starting in 2006, wage growth accelerated significantly. An IFPRI study by Zhang et al. (2014) explored potential factors behind this sharp rise in real wages, suggesting that it may signal the emergence of a Lewis turning point in Bangladesh (Zhang et al. 2014).

W. Arthur Lewis, an economist renowned for his dual-sector model, proposed that developing economies are characterized by a traditional agricultural sector with surplus labor and a modern industrial sector with higher productivity. In the early stages of development, the industrial sector absorbs surplus labor from agriculture, promoting economic growth and structural transformation (Lewis 1954). Initially, the agricultural sector experiences low wages and productivity, while the urban manufacturing sector offers higher wages and demand for labor. Rural workers migrate to urban areas, and rural wages remain stagnant due to abundant labor supply. However, once the rural labor surplus is fully absorbed—often due to the emergence of non-farm sector—workers gain greater bargaining power, driving up rural wages.

Zhang et al. (2014) argue that neo-classical theories, where wages are determined by the marginal product of labor, cannot fully explain the wage increases. If market-clearing conditions hold, unemployed workers would drive wages down until full employment was achieved. Similarly, nutrition-based efficiency wage theory, originally proposed by Leibenstein (1957), suggests employers pay wages that ensure workers meet minimum calorie requirements for productivity (Leibenstein 1957). However, this cannot explain the sharp rise in real wages in Bangladesh since the mid-2000s. Therefore, Zhang et al. (2014) conclude that the Lewis (1954) theory of economic development best explains the trends in real wages in Bangladesh.

Rising real wages have significant policy implications. Increased job opportunities, higher wages, and more remittances have been key drivers of Bangladesh's remarkable poverty reduction over the past decade. These factors have had a greater impact on poverty alleviation than government transfers or the expansion of microfinance institutions. To sustain rising real wages and remain globally competitive, public investment in education and human capital development is critical. Additionally, as labor demand grows due to manufacturing expansion, agricultural mechanization—historically met with caution due to labor displacement concerns—should now be encouraged through policy initiatives to ensure long-term food security in Bangladesh.

Figure 4.9: Trends in real agricultural wages (Base: 2015/16=100)



Source: Source: Authors' calculations using agricultural wage rate data from the Yearbook of Agricultural Statistics, Bangladesh Bureau of Statistics (several years) and GDP deflator data (base: 2015/16 = 100) from the Statistical Yearbook (several years).

The relationship between rice prices and wage rates, particularly for unskilled day laborers, has a critical role in Bangladesh's food policy. For the ultrapoor in the country, wages are the primary source of income, with a large portion of that income being spent on rice. A study by IFPRI estimated that the poorest 20 percent of rural households allocated 48 percent of their total expenditure to rice (Ahmed et al. 2013). Our analysis, based on 2018/19 BIHS data, shows that rice constitutes 71 percent of the total calorie intake for the poorest 20 percent of rural households (Figure 5.7). Therefore, both wage rates and rice prices are essential factors for the well-being of the rural poor.

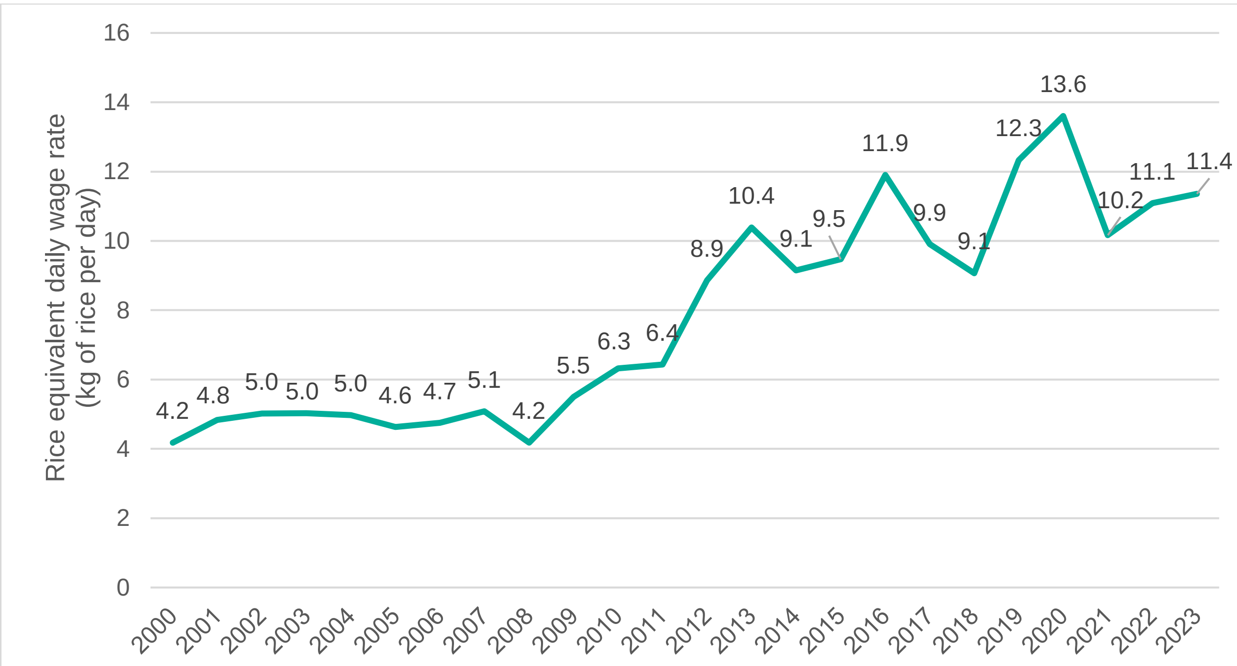
Figure 4.10 illustrates the trends in wages relative to rice prices from 2000 to 2023 in Bangladesh. Specifically, it compares the annual average daily wages of male agricultural laborers to the annual average retail price of coarse rice, showing how much rice these laborers could purchase with their wages. Coarse rice is used for this comparison as it is the cheapest variety and is commonly consumed by the poor.

From 2000 to 2007, the ratio of wages to rice prices remained relatively stable, with daily wages equivalent to approximately 5 kg of rice. However, during the global food crisis of 2008, rice prices in Bangladesh surged sharply. As a result, wage to the rice price ratio dropped and daily wages in rural areas were worth only about 4 kg of rice. A steady upward trend in the rice-equivalent value of daily wages began in 2009 and continued through 2013. By 2013, the purchasing power of rural daily wages had increased to the equivalent of about 10 kg of rice per day. By 2020, this had further risen to about 14 kg of rice. However, since

2021, the rice-equivalent wage has declined, averaging around 11 kg of rice per day through 2023.

Over the period from 2000 to 2023, the average annual growth rate of male agricultural wages was 9.38 percent, while the retail price of coarse rice grew at an average annual rate of 4.92 percent. This indicates that wage growth nearly doubled the rate of rice price growth, leading to a significant improvement in the purchasing power of agricultural laborers. This rise in wages likely contributed to an overall improvement in their welfare.

Figure 4.10: Trends in wages relative rice prices, 2000 to 2023



Source: (1) Wage rates: Monthly Statistical Bulletin, several years, Bangladesh Bureau of Statistics. (2) Rice prices: Yearbook of Agricultural Statistics, several years, Bangladesh Bureau of Statistics.

FOOD PRICES

The prices of major food commodities determine households' capability to consume adequate quantities of foods to maintain healthy livelihoods. Bangladesh has seen sharp increases in prices of both food and non-food items in recent years due to high inflation rates following the Russia-Ukraine conflict and its subsequent impacts on global supply chains. This section discusses trends in inflation rates and prices of select commodities.

Trends in inflation

The monthly average inflation rate, measured as the year-on-year change in the Consumer Price Index (CPI), increased from 5.4 percent in July 2021 to 9.9 percent in September 2024 (Figure 4.11). Several issues that fueled inflation in 2022/23, such as high global energy prices, supply disruptions and local currency depreciation persisted in 2023/24.

In July 2024, food inflation reached a record high of 14.1 percent, driven largely by major disruptions in the food supply chain. This surge occurred amid a nationwide student-led movement that disrupted logistics, transportation, and food distribution networks. Protests, strikes, and roadblocks severely restricted the flow of goods, creating bottlenecks and reducing the availability of essential food items in retail markets. As a result, food prices soared, exacerbating inflationary pressures.

The growing public discontent culminated in the then government's fall on August 5. Following the government's collapse, activists curtailed local extortion activities, which had previously added costs for traders and distributors. With these pressures lifted in August, retail food prices began to decrease, easing inflation as supply chains normalized. However, by September, while food inflation continued to decline, the reduction was modest as prices of foods like eggs and vegetables started to rise again.

Figure 4.11: National inflation rates (Base: 2021/22, year-on-year, July 2021-September 2024)

Source: Bangladesh Bureau of Statistics (BBS). Monthly series on Consumer Price Index (several issues).

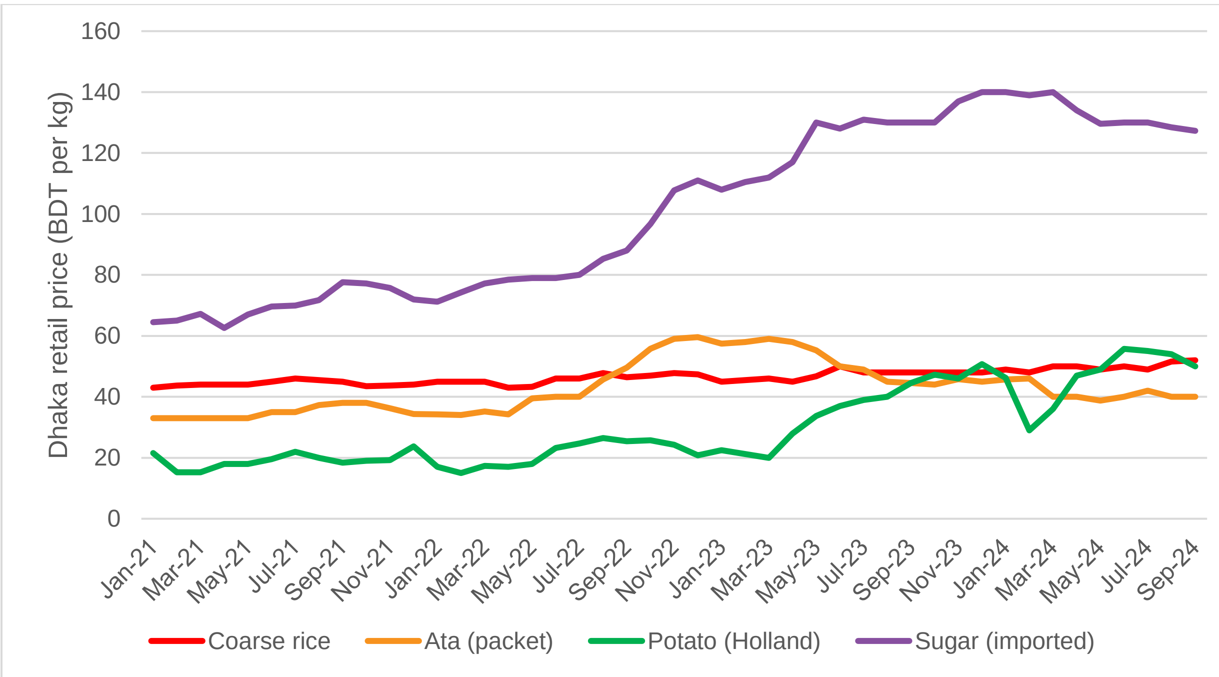
Retail prices of key food commodities

We next look at recent trends in nominal retail prices for some commonly consumed food items, as price is the ultimate determining factor influencing individual and household consumption decisions. Figures 4.12 to 4.15 illustrate the monthly average retail prices for various foods in Dhaka city markets from January 2021 to September 2024.

The price of coarse rice gradually rose from BDT 43 per kg in January 2021 to BDT 52 per kg in September 2024. Meanwhile, the ongoing Russia-Ukraine conflict and disruptions to wheat imports led to a sharp increase in the price of *ata* (whole-wheat flour) from BDT 40 per kg in

July 2022 to BDT 60 per kg by December 2022, before dropping back to BDT 40 per kg in September 2024. Potato prices remained relatively stable from January 2021 to March 2023 but have since risen, reaching BDT 50 per kg in September 2024. A seasonal price drop in February and March 2024 is attributed to the harvest period, which typically lowers prices during these months. Sugar prices surged from BDT 65 per kg in January 2021 to BDT 140 per kg by March 2024, followed by a decrease to BDT 127 per kg in September 2024 (Figure 4.12).

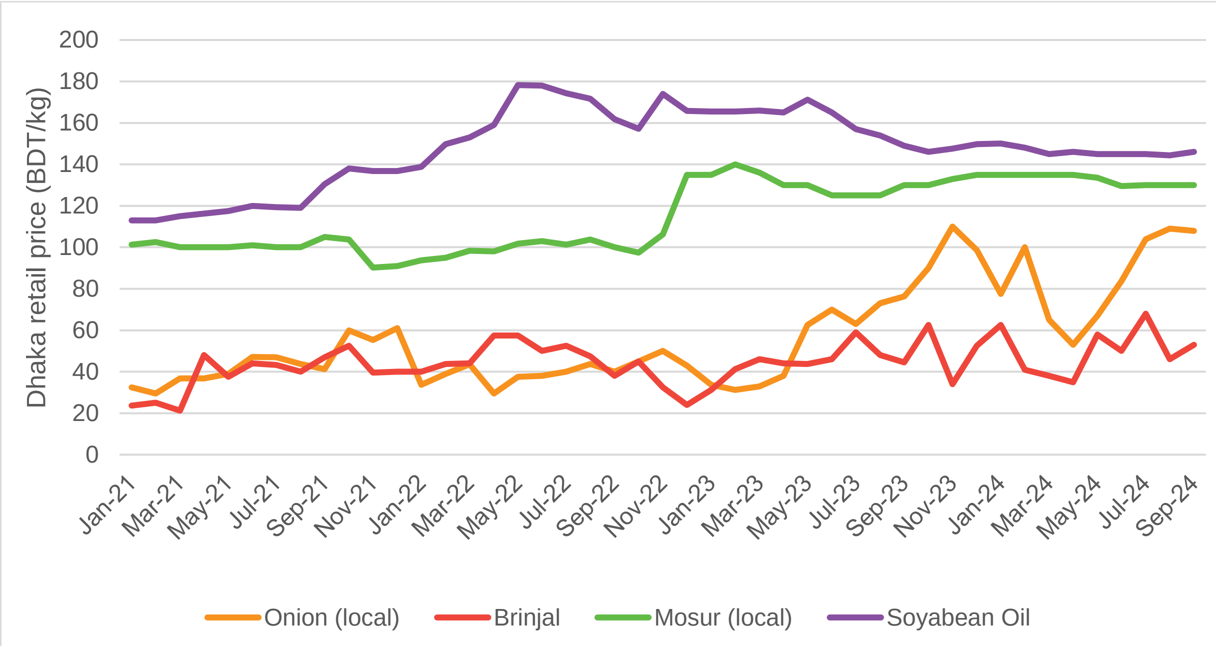
Figure 4.12: Monthly Dhaka retail prices of coarse rice, *ata*, potatoes, and sugar



Source: Department of Agricultural Marketing (DAM), Ministry of Agriculture.

Compared to other commodities, retail prices of brinjal have remained relatively stable, with only seasonal fluctuations between January 2021 and September 2024. In contrast, prices of most import-dependent commodities have shown significant increases over this period. Onion prices, for instance, have surged since May 2023; prices in April 2023 were BDT 38 per kg but rose sharply to BDT 108 per kg by September 2024. The price of lentil (masur) pulses also spiked to BDT 135 per kg in December 2022 and remained close to this level, recorded at BDT 130 per kg in September 2024. Soybean oil, one of the earliest commodities affected by supply disruptions due to the Russia-Ukraine conflict, peaked at BDT 178 per kg in May and June 2022. Since then, prices have been gradually declining, reaching BDT 146 per kg in September 2024 (Figure 4.13).

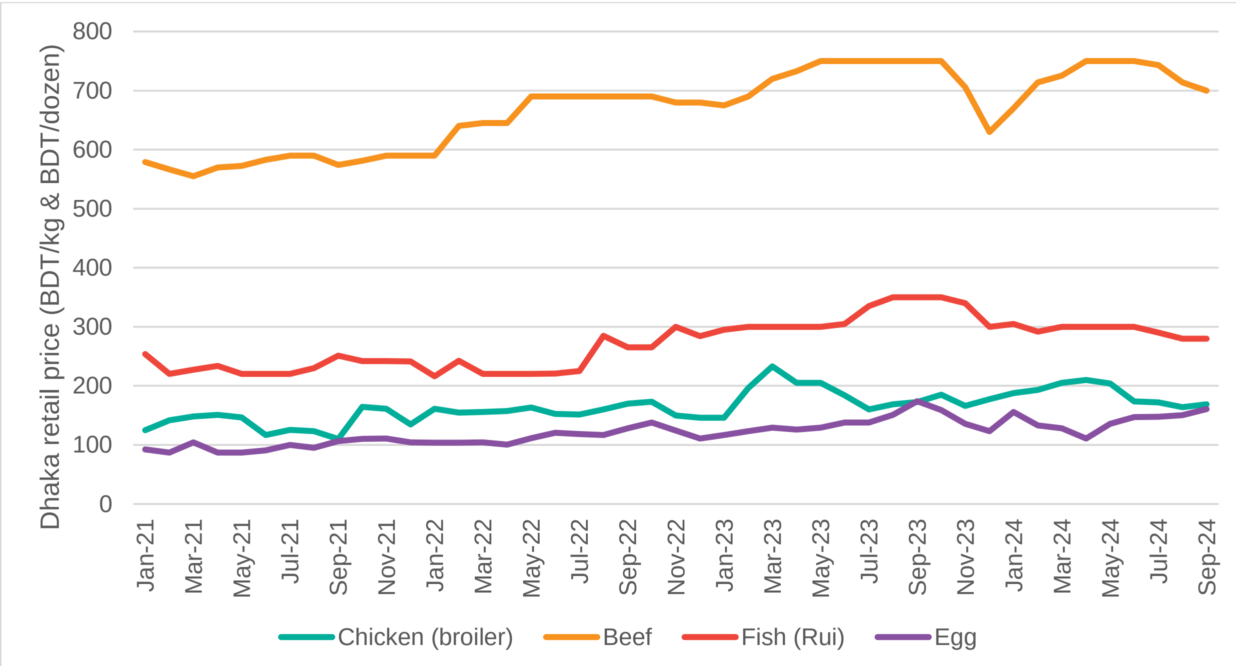
Figure 4.13: Monthly Dhaka retail prices of lentils (mosur), onion, brinjal (eggplant), and soybean oil



Source: Department of Agricultural Marketing (DAM), Ministry of Agriculture.

Retail prices for animal-source foods were quite stable until 2022, when feed supply disruptions drove up costs. Chicken price peaked at BDT 233 per kg in March 2023 (up from BDT 146 per kg in January 2022) but dropped to BDT 169 per kg by September 2024. Rui fish prices rose to BDT 300 per kg in November 2022, peaked at BDT 350 per kg in August 2023, and fell to BDT 280 per kg by August 2024. Beef prices, which surged to BDT 690 per kg in May 2022, remained high at BDT 714 per kg as of August 2024. Egg prices fluctuated significantly, more than doubling from BDT 92 per dozen in January 2021 to BDT 174 per dozen in September 2023, later adjusting to BDT 161 per dozen by September 2024. This reflects a volatile market driven by supply chain issues, production costs, and demand shifts (Figure 4.14).

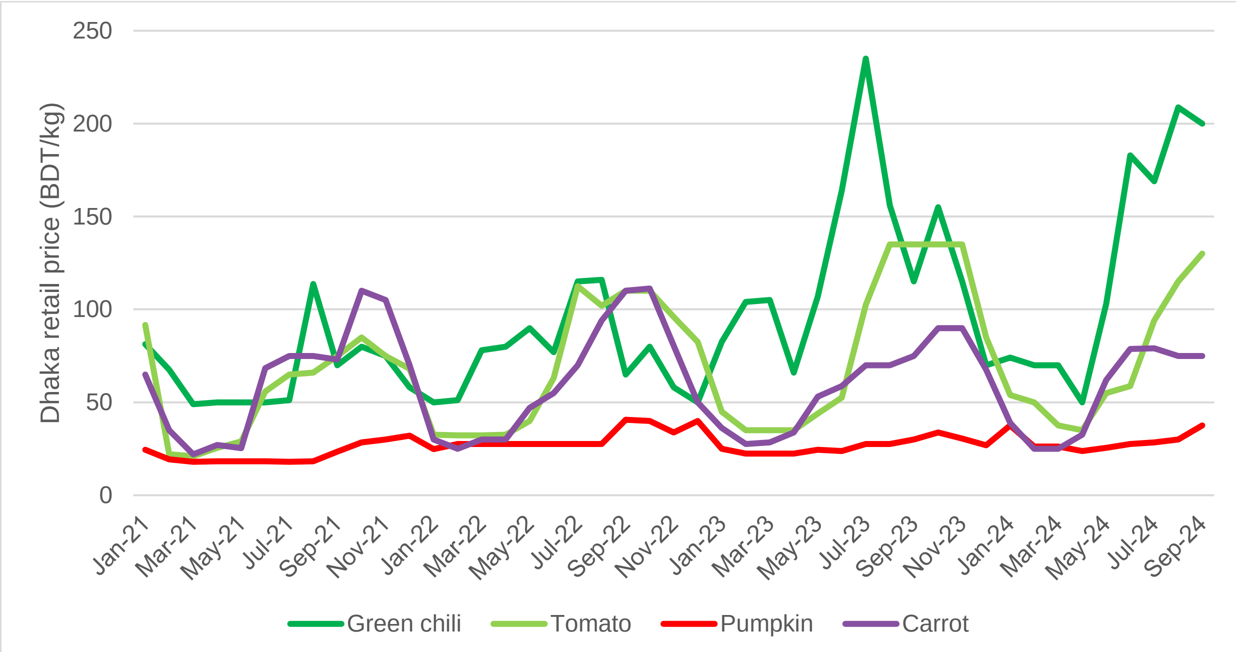
Figure 4.14: Monthly Dhaka retail prices of chicken, beef, fish, and egg



Source: Department of Agricultural Marketing (DAM), Ministry of Agriculture.

Figure 4.15 shows retail prices for green chilis, tomatoes, pumpkins, and carrots over the years, largely reflecting seasonal trends but also accentuated by some notable spikes. Green chili prices were stable until mid-2023, then surged to BDT 235 per kg in July 2023 before settling at BDT 200 per kg in September 2024. Tomato prices were steady until mid-2022, peaking at BDT 135 per kg in August 2023, and leveling at that price by September 2024. Pumpkin prices stayed consistent between BDT 18 and 41 per kg, reaching BDT 38 per kg by September 2024. Carrot prices largely reflected seasonal trends, peaking at BDT 110 per kg in October 2021, and stabilizing at BDT 75 per kg by September 2024.

Figure 4.15: Monthly Dhaka retail prices of green chili, tomato, pumpkin, and carrot



Source: Department of Agricultural Marketing (DAM), Ministry of Agriculture.

Government interventions to prevent food price hikes

Government interventions that focus on enhancing food supply through productivity-boosting technological advancements in agriculture tend to be more effective in preventing food price hikes than enforcing price ceilings. Imposing food price ceilings can create market imbalances by artificially reducing prices, which may inadvertently increase demand while reducing supply, thus exacerbating shortages and ultimately harming consumers.

A more sustainable solution involves addressing inefficiencies throughout the food value chain, especially when there is a considerable gap between production costs and retail prices. To resolve these issues, the government should foster a supportive policy environment that aims to:

- **Improve food storage facilities**: Develop and promote temperature-controlled storage systems to minimize food loss, especially for perishable goods like fruits and vegetables. Enhanced storage capabilities can prevent wastage, stabilize supply, and maintain price levels during periods of scarcity.
- **Adopt modern food packaging and handling practices**: Encourage the use of advanced packaging technologies to reduce losses during transit. Improved packaging will not only extend the shelf life of perishable goods but also decrease spoilage during distribution, ensuring more efficient food delivery.

- **Upgrade transportation infrastructure**: Invest in and incentivize the use of food-efficient transportation systems. This includes upgrading cold chain logistics and ensuring faster, more reliable transport to reduce delays and minimize spoilage during delivery.
- **Expand the Open Market Sale (OMS) program:** Scale up the distribution of essential foods such as rice, wheat flour, and cooking oil at subsidized prices to help stabilize market prices, especially during seasonal price hikes in March-April and September-October. Prioritize distribution in low-income urban areas by trucks to effectively reach the poorest.

In the short term, the government may also consider temporary relief measures to contain food price hike, such as:

- **Reduction or elimination of import tariffs**: Reducing or waiving import duties on essential food items could help stabilize supply during times of domestic shortages.

- **Exemption from value-added tax (VAT)**: Temporarily exempting food sales from VAT can reduce consumer prices, making food more affordable while supply-side improvements are being implemented.

Key recommendations:

- **Focus on long-term solutions**: Prioritize productivity-enhancing technologies over short-term market controls, such as price ceilings.

- **Address value chain inefficiencies**: Develop policies aimed at improving storage, packaging, and transportation to reduce food loss and stabilize prices.

- **Expand the OMS program in urban areas:** Scale up the distribution of essential foods such as rice, wheat flour, and cooking oil at subsidized prices.

- **Consider temporary relief measures**: Use short-term policies like tax relief and reduced tariffs to alleviate immediate food supply challenges without distorting the market.

By combining long-term technological investments with targeted short-term measures, the government can create a more resilient food supply chain and mitigate price volatility without causing market distortions.

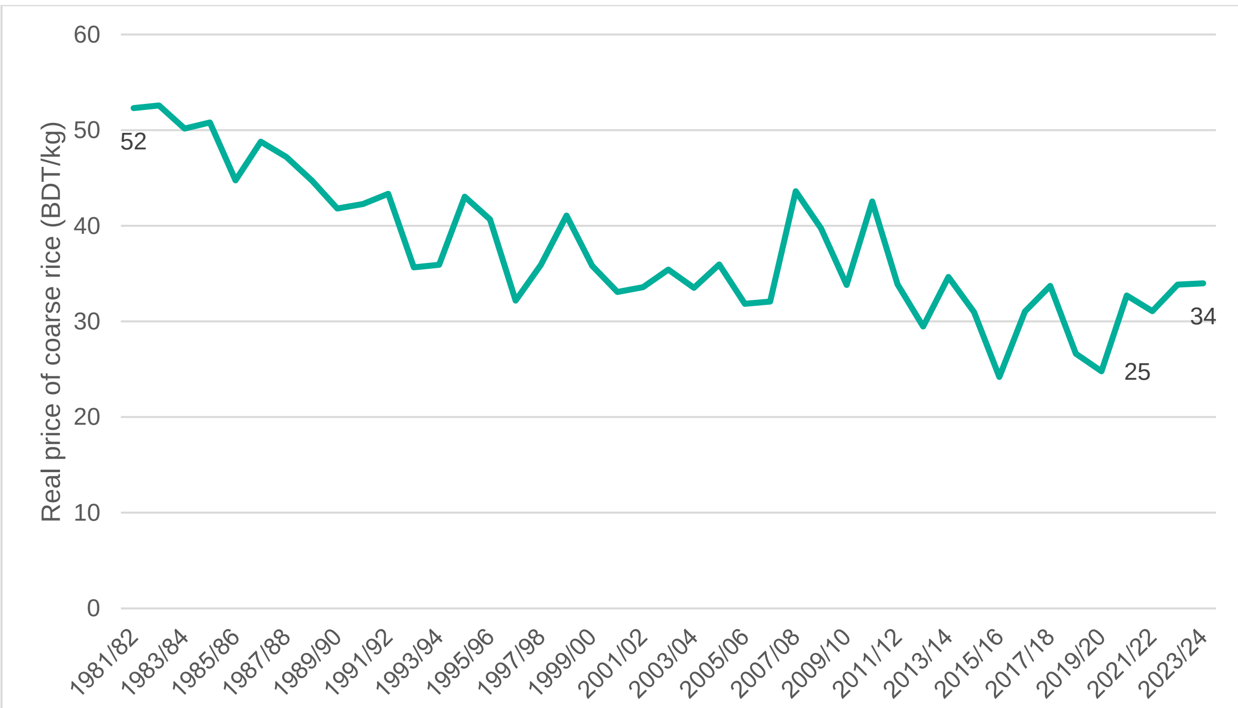
Trends in real prices of rice

Figure 4.16 illustrates the long-term trends in annual real wholesale prices (adjusted for inflation) of coarse rice from 1981/82 to 2023/24, measured in BDT per kg. The overall trend reveals a significant decline in real rice prices, with notable exceptions between 2007 and 2011, when prices spiked. Between 1981/82 and 2019/20, the real price of rice dropped by

52 percent, from BDT 52 per kg to BDT 25 per kg over 38 years. In parallel, rice yields increased 2.5 times, from 1.3 MT per hectare in 1981/82 to 3.2 MT per hectare in 2019/20, largely driven by yield-enhancing technological advancements in rice production.

Our analysis, based on 2018/19 BIHS data, indicates that rice constitutes 71 percent of the total caloric intake for the poorest 20 percent of rural households. However, many of these households still struggle to afford enough rice to meet their energy needs. Therefore, it is crucial to sustain the technological and institutional innovations that have contributed to this price reduction.

Figure 4.16: National average real wholesale price of coarse rice (Base: 2015/16 = 100)



Source: Authors' calculations using wholesale price data from the Department of Agricultural Marketing (DAM) and GDP deflator data from the Statistical Yearbook (several years).

Seasonality of rice prices in Bangladesh

An IFPRI study examined the seasonality of rice prices in the late 1970s, 1980s, and 1990s, finding a significant decline in the seasonal price spread during the 1980s and 1990s (Dorosh and Shahabuddin 2002). In this analysis, we compare the seasonality of rice prices from the late 1970s and early 1990s to those in the early 2020s to observe changes in the pattern over the past three decades.

We analyzed the average monthly price of coarse rice over three periods: 1977–1979, 1991–1993, and 2021–2023. The wholesale price index for coarse rice was calculated as the average monthly percentage of a twelve-month moving average.

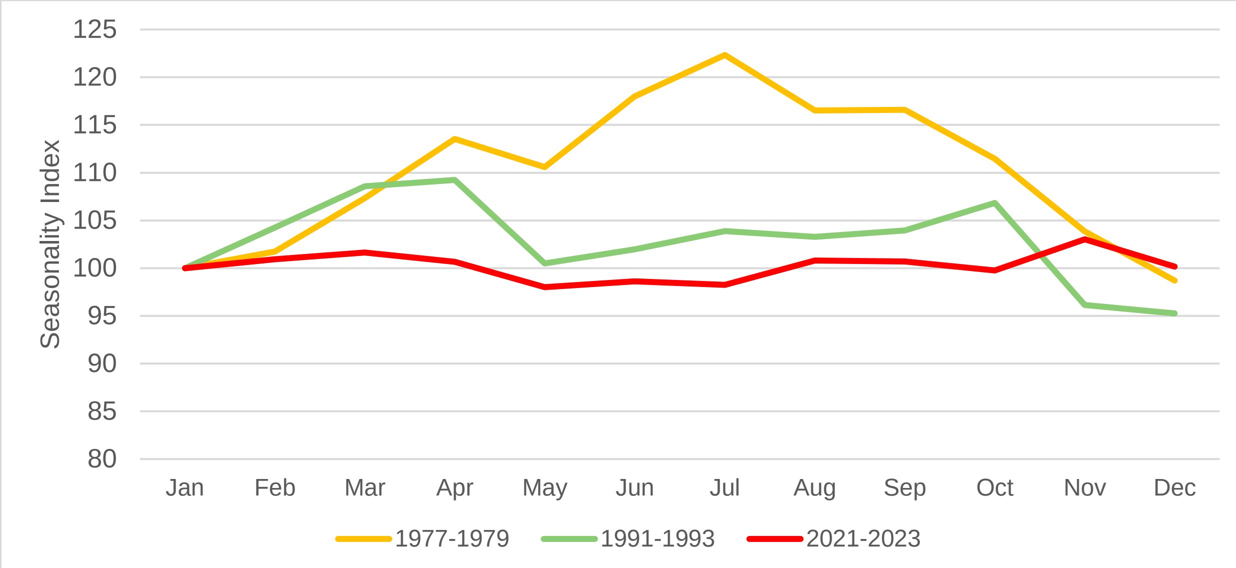
Figure 4.17 presents the rice price seasonality index for the late 1970s, early 1990s, and early 2020s. The first period (1977–1979) coincided with the introduction of the Green Revolution's seed-fertilizer-irrigation technology. In 1978, Bangladesh's total rice production was 12.97 million MT, with aman rice contributing 58 percent, aus rice 24 percent, and boro rice 17 percent. During this period, rice prices peaked in July, just before the aus harvest, and gradually declined through December. The price spread between the seasonal peak and trough was 24 percent.

During the second period (1991–1993), the adoption of Green Revolution technologies accelerated significantly. By 1992, total rice production had increased to 18.27 million MT. Aman rice remained the largest contributor at 51 percent, while the share of boro rice grew to 37 percent, and aus rice accounted for 12 percent. A key development during this time was the emergence of two distinct seasonal price peaks: one in April, before the boro harvest, and another in October, before the aman harvest. The price fluctuation between peaks and troughs narrowed to 15 percent, reducing the overall magnitude of seasonal price variations.

Over the past three decades, the third period (2021–2023) saw a remarkable rise in rice production, increasing from 18.34 million MT in 1993 to 38.15 million MT in 2023. Boro rice became the dominant crop, contributing 53 percent to total production, while aman and aus rice contributed 39 percent and 8 percent, respectively. By this period, the seasonality of rice prices had significantly diminished, with only a minor price peak in November and a slight drop in May, coinciding with the boro harvest. The peak-to-trough price spread shrank to just 5 percent.

The substantial increase in boro rice production and more even distribution of rice harvests and market arrivals of rice have fundamentally transformed the pattern of rice price seasonality in Bangladesh. For consumers, this reduction in price volatility has enabled smoother consumption year-round, alleviating seasonal nutritional stress, especially among the poor.

Figure 4.17: Seasonality of coarse rice price (12-month moving average)



Source: Authors' estimates using data from Department of Agricultural Marketing (DAM), various years

Rice price transmission in Bangladesh

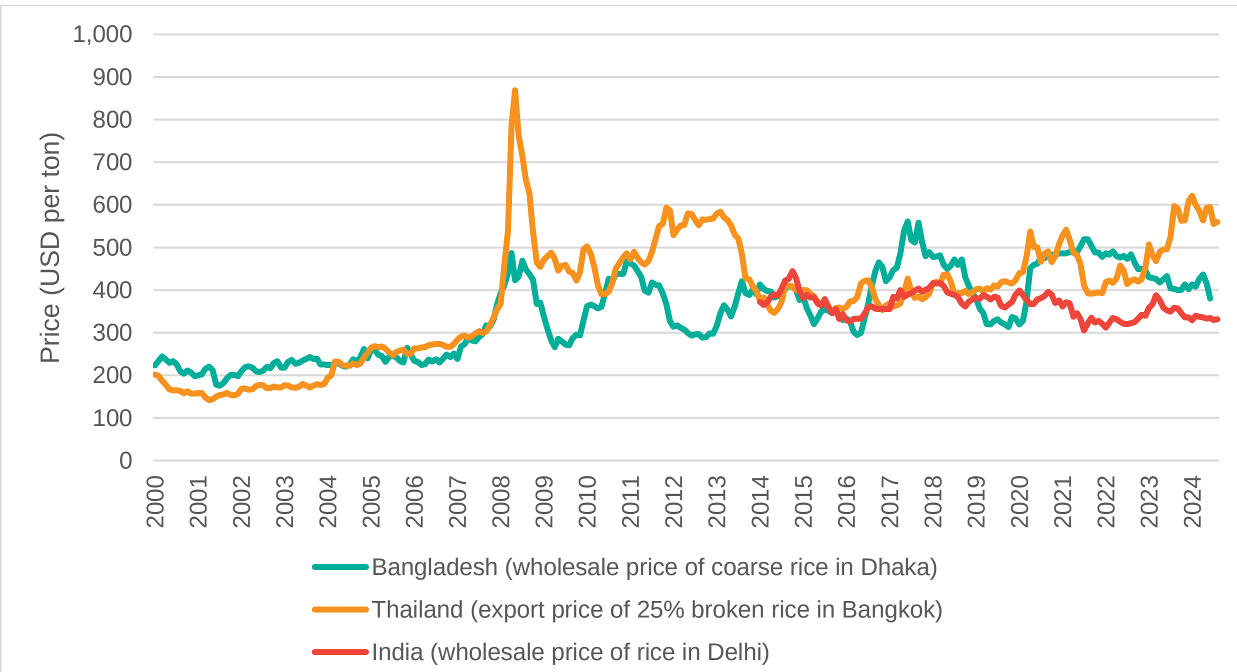
It is important to understand whether there is transmission of volatility in international markets to domestic prices of rice, as such volatility could have deleterious effects on welfare for the poorest and most vulnerable. Volatility transmission tends to occur more frequently in countries with substantial trade volumes relative to their domestic requirements; that is, for countries that are closely integrated with international markets and have minimal trade barriers (Ceballos et al. 2017). For Bangladesh, Robles (2010) reported a relatively high price transmission elasticity for rice (0.43), implying that a 10 percent growth rate increase in international prices could result in a 4.3 percent increase in the growth rate of the domestic price of rice (Robles 2010).

In recent years, however, Bangladesh has remained mostly insulated, primarily relying on domestic production for its rice consumption requirements. The country has adopted a rigid trade regime over much of the past decade, with a 25 percent regulatory duty on imports in place aimed at protecting domestic producer prices.[12] This regulatory duty is only lifted occasionally (for no more than a few months at a time) upon the issuance of changes to existing government Statutory Regulatory Orders (SRO). In general, a more flexible trade regime is desirable, such that the country can meet supply requirements when domestic price hikes surpass international prices. Should there be a price shock in one region of the country, it is likely that prices would rise in rice markets across the country, as rice markets in Bangladesh are highly co-integrated—Murshid and Yunus (2018) reported elasticity coefficients for domestic markets close to unity (Murshid and Yunus 2018).

[12] Regulatory duty (RD) is additional to other existing tax rates in the tariff structure, notably customs duty, value added tax (VAT), advance income tax (AIT), and supplementary duty (SD). The total tax incidence (TTI) on rice imports can be as high as 66 percent.

In Figure 4.18, we examined the long-term co-movement of Bangladeshi rice prices with international prices, updated from Minot et al. (2024), to see if recent price trends are at all driven by the situation in international markets. Monthly Dhaka wholesale coarse rice prices moved closely together with international prices (Thailand, 25 percent broken rice) between 2000 and 2007/08. Both Dhaka and Thai rice prices spiked during the 2007/08 global food price crisis, albeit to a lesser degree in Bangladesh. Between 2008 and 2013, prices in local and international markets appear to have diverged, with peaks and troughs in opposing directions for several periods. Prices moved relatively closer together after 2013, but again appear to be moving in separate directions since then. Bangladesh experienced high rice prices relative to both Thai and India prices between 2016/17 and 2018/19. Flash floods in the Haor regions in 2017 resulted in a production shortfall for the boro crop, which may explain the price hike over that period. Since December 2021, we note an uptick in Thai prices but an overall downward trend in Dhaka prices.

Figure 4.18: Rice prices in Bangladesh, Thailand, and India



Source: Updated from Minot et al. (2024), using data from the Food Price Monitoring and Analysis (FPMA) Tool, FAO, 2024.

Note: Delhi wholesale rice prices are only available from January 2014 onwards.

SOCIAL PROTECTION

Bangladesh has extensive experience supporting the poor through various social safety nets and protection programs. Since the 1970s, the country's social protection efforts have developed through continuous innovation and experimentation. A substantial portion of the national budget is dedicated to these initiatives. Table 4.1 provides a summary of the major social safety net programs in Bangladesh in 2023/24, which includes program descriptions, size of benefits, budget allocations, and implementing agencies.

Box 1 summarizes characteristics of key safety net programs by classifying the programs into six categories.

Box 1: Characteristics of key safety net programs

***Public works programs**:* Work for Money (WFM)**,** Food for Work (FFW) and Test Relief (TR) programs distribute foodgrains (rice and wheat) as wage payment to both male and female workers in labor-intensive public works programs. In these programs, usually 8 KG of rice or equivalent amount of cash is paid for 7 hours of work. In 2008, the Employment Generation for Hard Core Poor was introduced, which was later known as Employment Generation Program for the Poorest (EGPP). All these programs require participants to do physical work for building and maintaining rural infrastructure. They are generally self-targeted because the poor are typically the only people willing to take on onerous, low-paying jobs requiring manual labor.

***Training programs**:* The Vulnerable Group Development (VGD) program exclusively targets poor women and provides a monthly food ration of 30 kg of fortified rice or wheat for 24 months. VGD was one of the largest social safety net initiatives in Bangladesh, aimed at improving the livelihoods of ultra-poor women. It has been renamed as 'Vulnerable Women Benefit' (VWB) program in 2022-23. Although VGD was introduced as a relief program in 1975, it evolved over time to integrate food security with development objectives. The development package includes training on income-generating activities; awareness-raising for social, legal, health, and nutrition issues; and basic literacy and innumeracy.

***Education programs**:* The Food for Education (FFE) program, established in the early 1990s, distributed monthly foodgrain rations to poor households if they sent their children to primary schools. Due to governance concerns FFE was terminated in 2002 and has been replaced by the cash-based Primary Education Stipend program (PESP) which has emerged as one the largest safety nets programs in Bangladesh. The School Feeding (SF) program distributes micronutrient-fortified energy biscuits to primary school children. Under the Secondary Education Stipend Program (SESP), unmarried girls across all income groups and boys belonging to poor families receive stipends in rural areas.

Relief programs: These programs are designed as a mechanism for mitigating the consequences of disasters like floods, cyclones, and other natural calamities. Currently, there are two notable programs: Vulnerable Group Feeding (VGF) and Gratuitous Relief (GR) programs. Usually, 10 to 30 kg rice per household per month is distributed under VGF. Unlike most other programs, these programs have no pre-set criteria or conditionality for participation. They are relief programs that try to help the poor cope during times of natural disaster and smooth their consumption.

Programs for disadvantaged groups: These programs are essentially unconditional cash transfers and include the Old-Age Allowance Scheme; Allowance for Widowed, Deserted, and Destitute Women; Housing Support for Homeless People; and Allowance for the Financially Insolvent Disabled.

Subsidized priced food programs: Open Market Sales (OMS) program was introduced in 1992 to maintain food security and price stability for essential food commodities. Currently, rice is sold at BDT 30 per kg, while wheat flour is priced at BDT 27.5 per kg. Low income and vulnerable households and fixed income earners are the usual beneficiaries of this program. Food Friendly Program (FFP), launched in 2016, has also emerged as an important program which provide 30 kg of rice for 5 months to ultra poor households in the months of March to April and September to November for smoothening their food consumption in the situation of seasonal income loss.

Source: Authors' compilation

In Bangladesh, social protection or safety net initiatives are referred to as social security programs. Figure 4.19 illustrates the budget shares for 28 major programs (out of 115), which accounted for about 91 percent of the total budget in 2023/24. The top five programs received about 58 percent of the total budget. Among these, the pension program for government employees and their families is the largest, representing 22 percent of the 2023/24 budget.

Despite the substantial share of the budget allocated to the top five programs, they serve only 6.2 percent of total beneficiaries, as shown in Figure 4.20. This highlights a significant disparity in budget allocation within the existing social protection system in Bangladesh.

Revamping Bangladesh's social safety nets for enhanced performance

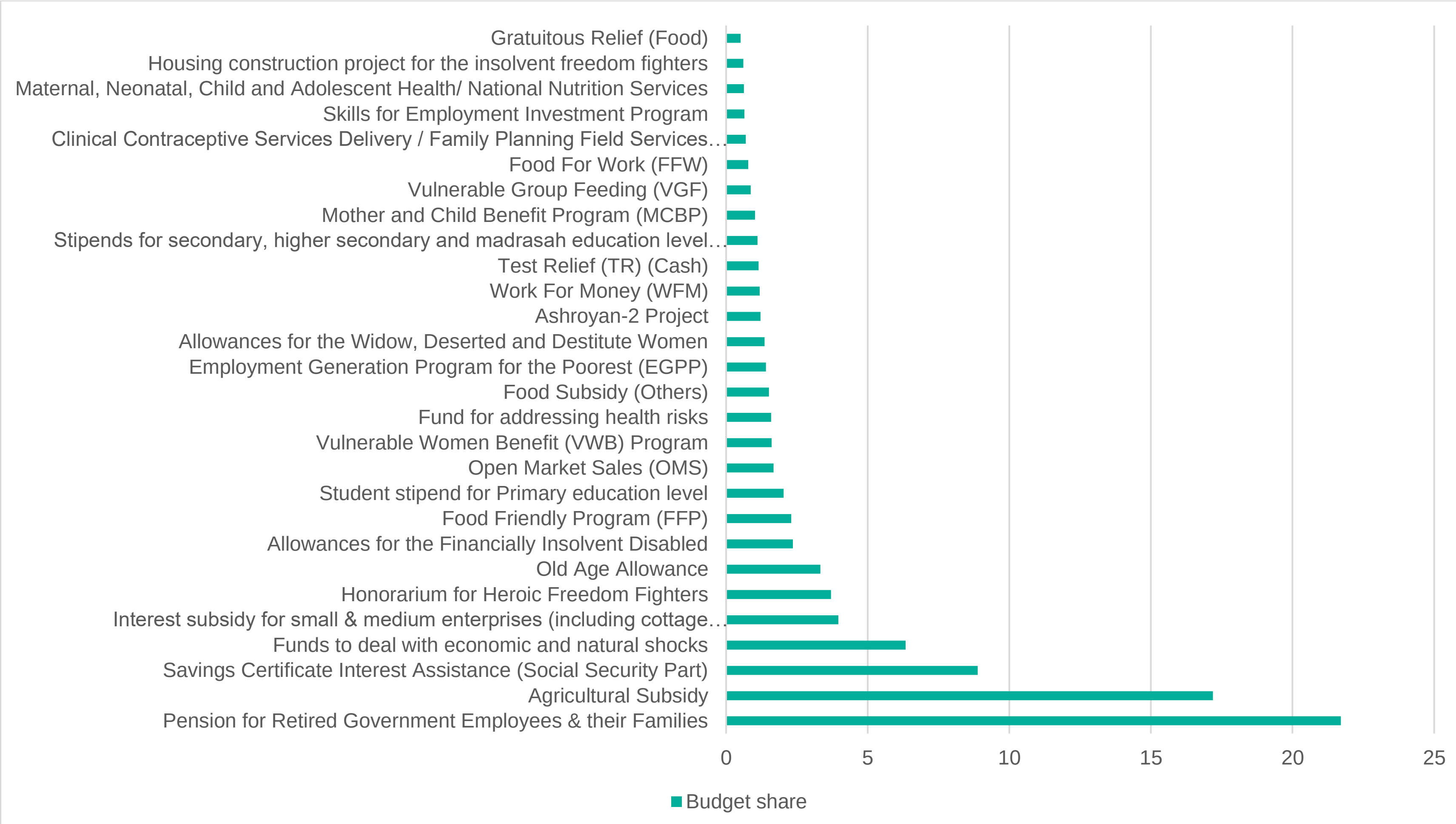
Bangladesh has vast experience supporting the poor through social safety net (SSN) programs, many of which are designed to benefit women. The government allocates a significant portion of its budget to these SSN programs. In fiscal year 2015/16 (FY2016), for example, the government spent $4.7 billion on SSNs – about 13.6 percent of the total budget and 2.1 percent of the country's GDP. By FY2024, the allocation had surged to $11.8 billion, representing 16.6 percent of the national budget and 2.5 percent of GDP (Ministry of Finance).

However, despite this investment, the SSN system faces critical challenges. Many programs suffer from limited coverage and insufficient funding. Targeting errors, both in terms of excluding those in need and including those who are not, are widespread across most programs (Coudouel, Sabbih, and Ahmed 2021). A significant share of the SSN budget, 21.7 percent in FY2024, was allocated to the government employee pension program, which primarily benefits the nonpoor. In FY2024, there were 115 SSN programs in total, with the top 10 (excluding government employee pensions) absorbing 66 percent of the budget. This leaves resources stretched thin for the remaining programs, diluting the benefits for participants. Most of these programs have limited coverage, are uncoordinated, and are not adequately funded.

Relatively small benefits limit the impacts of many SSN programs in Bangladesh. With a focus on increasing coverage, the benefits provided by many programs have stagnated or remain very low – most benefits represent 1 to 3 percent of total household income for the poor or extreme poor (World Bank 2021).

To enhance the effectiveness of the SSN system in uplifting the poor, there is a pressing need to improve targeting, increase benefit amounts, and scale up successful programs while phasing out inefficient ones. By improving targeting and reducing benefit leakage, SSN coverage for poor households can be expanded even within the current budget. A comprehensive review of SSN evaluations in Bangladesh has helped us identify the most effective programs. We assessed targeting performance using data from IFPRI's Bangladesh Integrated Household Survey (BIHS), which is nationally representative of rural Bangladesh. Chapter 8 presents our conclusions and recommendations for enhancing the performance of the SSN system.

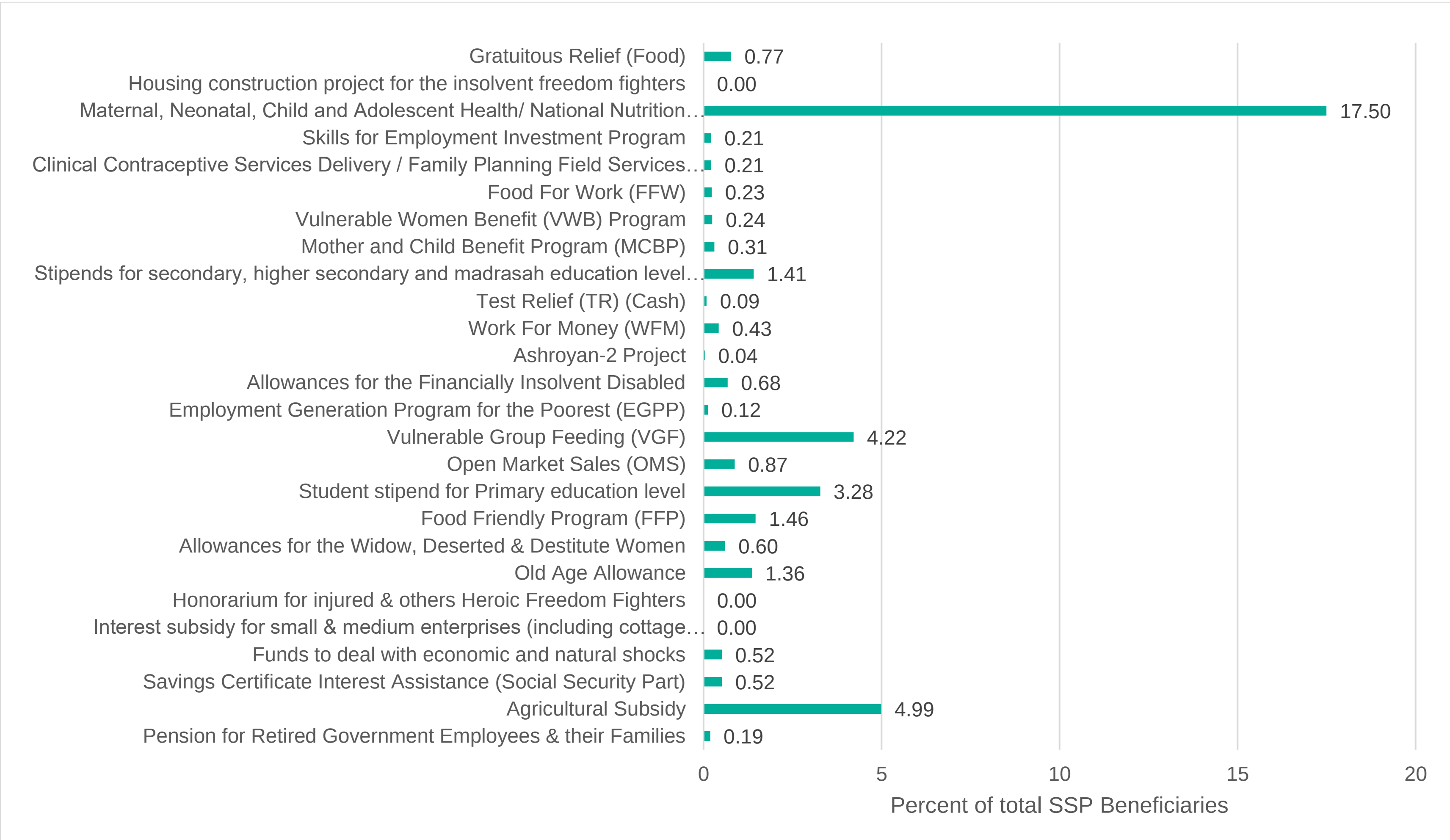
Figure 4.19: Budget shares of major social security programs (SSPs) (% of FY2023/24 SSP budget)



Source: Authors' estimates using data extracted from Ministry of Finance, Government of Bangladesh 2023/24

Note: The VGD program has been renamed as 'Vulnerable Women Benefit' (VWB) program

Figure 4.20: Distribution of beneficiaries of social security programs (SSPs), 2023/24



Source: Authors' estimates using data extracted from Ministry of Finance, Government of Bangladesh 2023/24

Note: The VGD program has been renamed the 'Vulnerable Women Benefit' (VWB) program

Methods of targeting safety net programs

A well-targeted social safety net intervention improves the real income and food security of the neediest without providing those benefits to members of society who do not need them. Targeting benefits to those most in need is an obvious way of reducing the costs of a program.

There are several options for targeting a safety net protection program to the needy and excluding the well-off. These targeting options fall under two broad categories: (1) indirect or self-targeting, and (2) direct administrative targeting.

Self-targeting occurs when program benefits are available to all, but the program is specially designed so that mainly the poor choose to participate. Self-targeting has a number of advantages. First, it minimizes the cost of administration because no large bureaucracy is needed to determine eligibility. Second, self-targeting does not require any information on individuals' income levels to determine eligibility. In most developing countries, it is very difficult to collect accurate data on incomes. Third, self-targeting is one of the most politically acceptable methods of targeting because participation is based on the choice of the individual rather than the government bureaucracy.

There are several self-targeting methods that may substantially reduce the administrative costs of targeted food interventions, which include:

- **Commodities that target the poor:** An effective tool for targeting is to select an "inferior food" for distribution. An inferior food is one that has a negative income elasticity of demand. In other words, it is consumed by the poor but not preferred by wealthy. Knowledge of food consumption patterns of the poor and the non-poor is essential to commodity targeting. Strongly self-targeted foods are, however, difficult to find. In Bangladesh, coarse rice is usually distributed in food-based safety nets. Since the price of coarse rice is significantly lower than fine rice price, low-income people choose to buy coarse rice.
- **Programs using work requirements:** The workfare programs such as food- and cash-for-work program are typically self-targeted—because of the nature of the work requirement, only the poor tend to participate in the program.
- **Programs that target regions:** Geographic targeting allows program managers to limit interventions to specific, distressed areas of the country or areas where mostly poor households live such as urban slum dwellers.
- **Programs that target seasons:** It may be possible to target interventions during seasons when nutritional stress is particularly high. Operating a program only during the lean seasons lowers program costs considerably, provided start-up and shutdown are not too costly.

The above targeting methods are not necessarily mutually exclusive; rather, a combination might produce more effective results.

Even when self-targeting instruments effectively reach the neediest, administrative targeting often plays a complementary role. Administrative targeting involves identifying poor and vulnerable populations, which presents a major challenge for program designers. The key difficulty lies in developing an accurate, cost-effective system to reliably identify those in need. This task becomes even more complex in contexts where income mobility is significant, with households frequently moving in and out of poverty. Therefore, periodic reassessments are necessary to ensure that targeting remains accurate and appropriate over time.

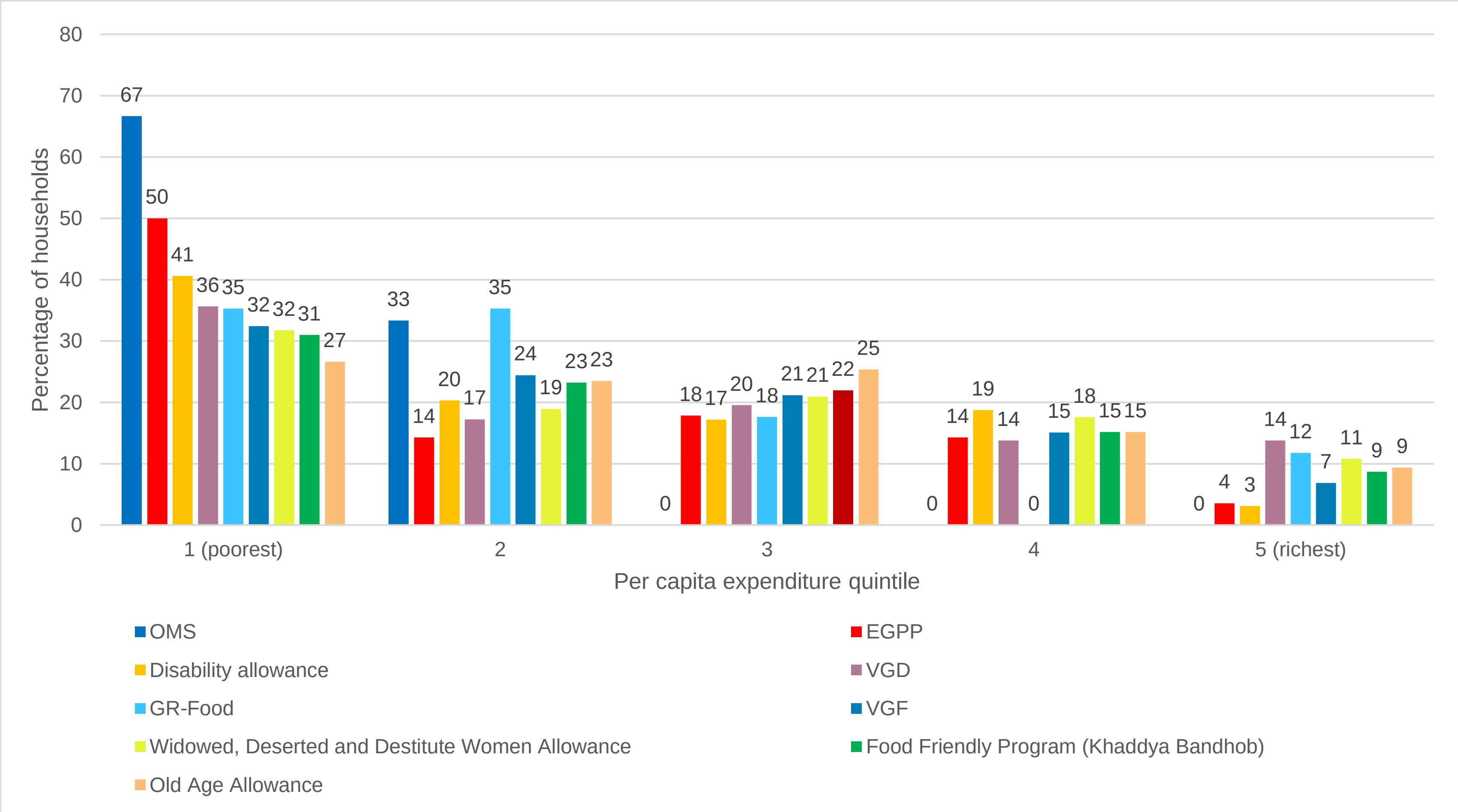
It is expected that some poor will be incorrectly identified as nonpoor, and some nonpoor will be incorrectly identified as poor. The first type of misidentification is termed as an "error of exclusion," and the second type, as an "error of inclusion." Any action to decrease the first type of error will normally increase the second type of error, and vice versa (Grosh 1994).

Targeting effectiveness of major safety net programs in Bangladesh

Figure 4.21 shows the pattern of distribution of total safety net participants of major programs by income groups in rural Bangladesh in 2018/19. The Open Market Sales (OMS) and Employment Generation Program for the Poorest (EGPP) targets the poorest most effectively, followed by Allowances for the Widowed, Deserted and Destitute Women program (AWDDW) and VGD program. Among the BIHS sampled households, all OMS beneficiary households, 64 percent EGPP beneficiaries, and 61 percent of Allowances for the Widowed, Deserted and Destitute Women program beneficiary households belonged to the poorest 40 percent group.

The OMS program features a self-targeting component. Although it is technically open to all, participation is much higher among the poor compared to the non-poor. Beneficiaries seeking subsidized food often endure long waits in queues for the OMS truck. However, the associated stigmatization can be significant. EGPP involves physical labor, primarily earth-moving tasks, performed by both male and female beneficiaries. The heavy physical work requirement of the EGPP makes the program strongly self-targeted. However, a major limitation of workfare programs is that the demographically vulnerable — including children, the elderly, and those who are disabled or chronically ill — are often not able to perform the intense physical labor involved in cash- or food-based public works programs. The patterns show that the AWDDW and the VGD programs targeted the poor fairly well. The AWDDW is an unconditional cash transfer program to improve the livelihoods of socially disadvantaged poor women who are widow or deserted by husband. The VGD program has a two-year cycle, and each beneficiary woman is entitled to receive 30 kg of rice per month.

Figure 4.21: Targeting effectiveness of major safety net programs in Bangladesh, 2018/19



Source: Authors' estimates using data from IFPRI's Bangladesh Integrated Household Survey (BIHS), 2018/2019, national rural stratum

Note: EGPP=Employment Generation Program for the Poorest. GR-Food=Gratuitous Relief (Food). OMS=Open Market Sales. VGD=Vulnerable Group Development. VGF=Vulnerable Group Feeding.

Developing indicators for effective targeting

Proxy means testing (PMT) is used in many developing countries to identify the poor for targeted social safety net programs. PMT uses multivariate regression to predict income or consumption expenditure that correlate certain proxies, such as assets and household characteristics. Points are assigned to selected indicators, and eligibility for program benefits can be determined based on a total score, as a proxy for household income (Ahmed and Bouis 2002; Grosh and Glinskaya 1997). Sharif (2009) built a safety net targeting system for Bangladesh based on PMT (Sharif 2009).

Prediction by any model, however, is never exact; therefore, errors are expected. Indeed, results from a growing number of countries around the world show that exclusion errors generated by proxy means tests are very high. In Cambodia, around 56 percent of households living in poverty were excluded by the PMT targeting mechanism (World Bank 2011). An AusAID study assessed the accuracy of PMT regression in Bangladesh, Indonesia, Rwanda, and Sri Lanka, which found that PMT has high in-built errors. Exclusion and inclusion errors vary between 44 percent and 55 percent when 20 percent of the population is covered, and between 57 percent and 71 percent when 10 percent is covered (AusAID 2011). A study assessing the effectiveness of PMT targeting methodology brought together international evidence to show that it is both inaccurate and arbitrary. The authors contend that, by design, PMTs only weakly predict a household's level of poverty (Kidd, Gelders, and Bailey-Athias 2017).

Several reasons explain inaccuracies in the PMT targeting. Underlying them is that regressions rarely explain more than half of the variation in consumption expenditure between households (Coady, Grosh, and Hoddinott 2004).

The Bangladesh Bureau of Statistics (BBS) initiated efforts to create a Bangladesh Household Database using the PMT approach. However, recognizing the limitations of relying solely on PMT, the National Social Security Strategy (NSSS) report recommends a more comprehensive approach. This approach involves combining the PMT with support from local governments and NGOs to more effectively identify the poor and vulnerable populations in Bangladesh (GED 2015).

Instead of relying on predicted income or consumption expenditure following a regression-based PMT approach, household welfare status can be analyzed using actual household consumption expenditure data from nationally representative household surveys for developing indicators for targeting the poor.

Notably, upon request from the Ministry of Women and Children Affairs (MoWCA) and the World Food Programme (WFP) in Bangladesh, IFPRI conducted studies aimed at identifying evidence-based indicators to enhance the targeting accuracy of the Vulnerable Group Development (VGD) program and the and the Improved Maternity and Lactating Mother Allowance (IMLMA) program, currently known as the Mother and Child Benefit (MCB) program.

IFPRI used the Bangladesh Integrated Household Survey (BIHS) data representative of rural Bangladesh. The prosed indicators are strongly correlated with income, easily observable, verifiable, and straightforward to collect. MoWCA has since adopted the IFPRI-proposed targeting criteria for both programs (Ahmed 2018a, 2018b).

MoWCA and WFP further requested IFPRI to develop indicators for targeting the urban poor through the Vulnerable Women's Benefit (VWB) program in Bangladesh. Since BIHS data have been collected only in rural areas, IFPRI used consumption expenditure data from the urban sample of the 2016 Household Income and Expenditure Survey (HIES) conducted by the Bangladesh Bureau of Statistics (BBS) for developing targeting indicators for urban areas (Ahmed and Bakhtiar 2022).

IFPRI's analysis used the household consumption expenditure as a proxy for income. Consumption expenditure data are more widely used for measuring poverty than income data because of the difficulty in accurately measuring income. According to Deaton (2008), expenditure data are less prone to error, easier to recall, and more stable over time than income data (Deaton 2008).

The study disaggregated data from the 2016 HIES sample households into per capita expenditure quintile groups where the first quintile represents the poorest 20 percent of all households in the income distribution, and the fifth quintile represents the richest 20 percent of all households.

In Bangladesh, the determinants of poverty in rural and urban settings are quite different. Given this context, and based on analysis using 2016 HIES data, we identified seven indicators that are highly correlated with poverty, are observable, and verifiable. Among the set of indicators analyzed using the data, these are the most promising for the four metropolitan areas and the eight other urban areas in the HIES urban sample of households. The seven selection criteria belong to four categories: Occupation, assets, dwelling characteristics, and Living Location. Urban households would be eligible to participate in the VWB program if they satisfy at least 2 out of the seven targeting criteria.

IFPRI carried out an ex-ante evaluation of the levels of accuracy of identifying poor and nonpoor. The results suggest that the seven indicators correctly identify 85 percent of the urban poor. Conversely, the indicators misidentify 15 percent of the actual urban poor as nonpoor.

Although the rate of exclusion error for the proposed set of targeting indicators is quite small, we have recommended making concerted efforts to ensure that the truly poor—who might be misidentified as nonpoor by the proposed targeting indicators—are not excluded from the VWB program. First, the VWB program and its eligibility criteria for participation should be announced well at the community level. Next, a transparent grievance redress mechanism should be in place so women who believe that they deserve to be included in the program can appeal to the VWB program selection committee.

As the socioeconomic status of households and broader contextual factors gradually change over time, the proposed set of beneficiary selection criteria should be reviewed at regular intervals (e.g., every 7-8 years) to determine whether any revisions are required.

Cash versus food transfers

Bangladesh has both food- and cash-based safety nets. Although the largest programs tend to be food-based, cash transfers have become increasingly important. The debate over whether cash transfers are more effective than food transfers continue, but momentum seems to be building in favor of cash transfers, especially among development partners (Ahmed et al. 2009). The National Social Security Strategy (NSSS) emphasizes shifting the system from food-based support to cash assistance (GED 2015).

A number of conceptual issues arise in assessing the appropriateness of cash transfers and in-kind transfers. In theory, cash is preferable to in-kind transfers because it is economically more efficient (Tabor 2002). It does not distort individual consumption or production choice at the margin (Subbarao et al. 1997). Cash transfers provide recipients with freedom of choice and give them a higher level of satisfaction at any given level of income than does food or another type of in-kind transfer.

The degree to which the food (or other in-kind) transfer influences actual household consumption behavior hinges on whether the food assistance is inframarginal (in other words, the ration is less than what would normally be consumed without the transfer). Economic theory holds that if the food (or other in-kind) transfer is inframarginal, the transfer will result in the same additional food purchases as would a cash transfer of equal value. In this case, the in-kind transfer has only the income effect (as in the case of any cash transfer), and the price incentive effect at the margin is lost.

The in-kind transfer is extramarginal if the transfer (for example, food ration) received is greater than the amount the recipient household would have consumed without the ration. In this case, the transfer may have two effects—an income effect and a substitution effect. The pure price effect of the ration is captured through the substitution effect. The net effect, which also includes the income effect, may lead to an increase in the consumption of the ration commodity, as well as increased consumption of complementary products and reduced consumption of substitutes (Kennedy and Alderman 1987).

The primary disadvantage of distributing food is that the transfer costs are substantial. There are administrative costs of food procurement, storage, transportation, and distribution of food (Rogers 1988).

For cash transfers, the real value to the beneficiaries may erode with inflation, but the government's nominal budget is fixed and predictable. If benefits and real budgets are to keep pace with inflation, the government must make explicit decisions to raise benefit levels. In contrast, for food transfers, the real value of benefits to consumers is constant, but the cost to the government rises with rising price of the food commodity (Grosh 1994).

The transition from food-based to cash-based social safety nets in Bangladesh presents operational challenges. The country's food policy operations are primarily implemented through the Public Food Distribution System (PFDS), which manages the supply and distribution of foodgrains (rice and wheat). To accommodate new stocks and to maintain stock quality, PFDS must regularly rotate its inventory. A key role of PFDS is to support various safety net programs by supplying foodgrains. The food-based safety nests are the major outlets of PFDS stocks. In 2023/24, total foodgrain distribution reached 6.63 million MT, with seven food-based safety nets accounting for 87 percent of this distribution.

Transfer Modality Research Initiative

IFPRI developed the Transfer Modality Research Initiative (TMRI), a two-year cluster randomized controlled trial (RCT) designed to assess the most effective form of safety net transfers—cash or food—for ultra-poor women in rural Bangladesh. The study also explored whether combining these transfers with nutrition behavior change communication (BCC) would enhance their impact.

TMRI was conducted in two regions of rural Bangladesh: five upazilas in the northwest (Rangpur Division) and five upazilas in the coastal southern region (Barishal and Khulna Divisions). The study targeted ultra-poor women with children aged 0-24 months. In the "Cash" arm, participants received a monthly transfer of BDT 1,500, while those in the "Food" arm were provided a monthly food ration consisting of 30 kg of rice, 2 kg of lentils (*mosur* pulse), and 2 liters of micronutrient-fortified cooking oil. The quantities were selected to match the initial value of the food ration to the cash transfer. The transfer amount represented roughly one-fifth of the average monthly consumption expenditure of participating households at the start of the intervention.

The nutrition BCC component was intensive, involving weekly group sessions designed to improve nutrition-related behaviors. The UN WFP implemented TMRI from May 2012 to April 2014.

IFPRI’s evaluation revealed significant impacts of the TMRI:

- **Improved child nutritional status:** Cash transfers combined with nutrition BCC led to a 7.8 percentage point reduction in stunting prevalence over two years (2012–2014), a decrease three times higher than the national reduction rate during the same period. No other treatment groups showed significant impacts on anthropometric outcomes. This improvement was linked to enhanced diets, particularly increased consumption of animal-source foods in the cash plus BCC group (Ahmed, Hoddinott, and Roy 2024).

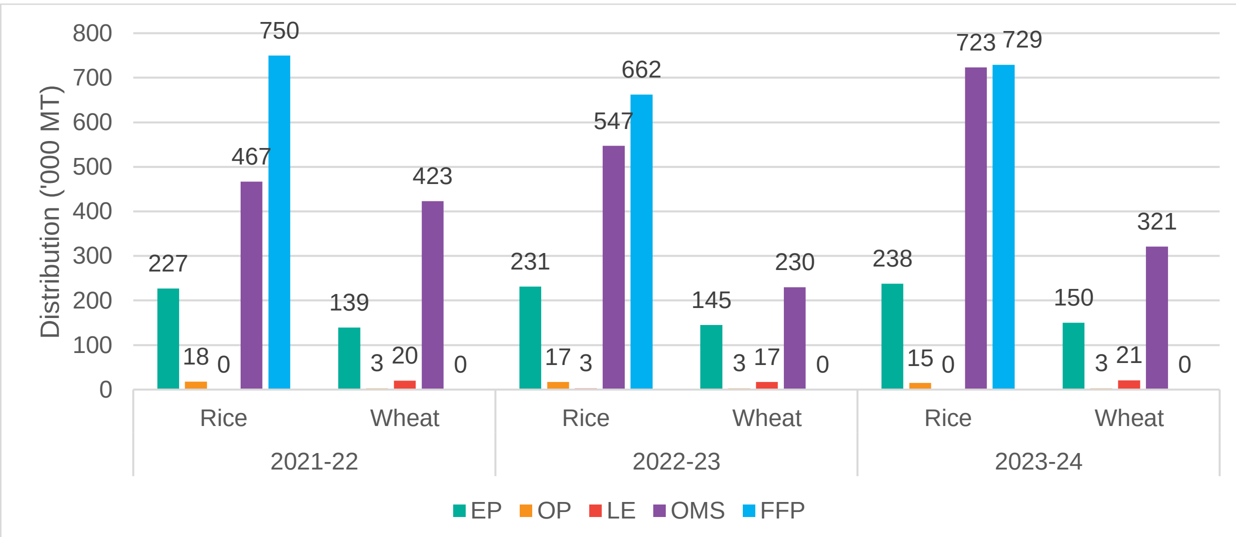
- **Enhanced consumption and assets:** Adding nutrition BCC to either cash or food transfers resulted in larger gains in both consumption and asset accumulation. The analysis suggests that BCC drove these effects by encouraging income generation through investments in livelihoods (Ahmed et al. 2024).
- **Reduced intimate partner violence (IPV):** Six to ten months after the program, women who received transfers combined with BCC experienced 26 percent less IPV compared to the control group. Evidence indicates that the sustained effects of BCC on women's "threat points," men's social costs of violence, and household well-being contributed to this outcome (Roy et al. 2018).
- **Post-program resilience:** TMRI's impacts were assessed at three post-program points: before the COVID-19 pandemic (2018), during the pandemic (2021), and after its immediate effects (2022). The intervention demonstrated protective effects on household food security, particularly in the cash plus BCC group, which showed increased resilience due to investments in productive assets like livestock. In contrast, the cash-only and food-only groups did not exhibit sustained improvements in food security after the intervention (Ahmed et al. 2024).
- **Sustainable poverty reduction:** There is increasing interest in assessing the long-term impact of social protection programs on poverty reduction, particularly after transfers conclude. IFPRI re-surveyed TMRI households in 2018, four years after the intervention ended. The results demonstrate that combining either cash or food transfers with nutrition BCC led to a sustainable reduction in poverty (Ahmed et al. 2020).

PUBLIC FOOD DISTRIBUTION SYSTEM (PFDS)

The PFDS operates through 16 distribution channels that broadly fall into two groups: nine monetized (sale) and seven non-monetized (free distribution) channels. Each channel implicitly represents some target groups. Monetized channels sell foodgrain at subsidized prices and consist of the following: Essential Priorities (for the armed forces, police, rapid action battalion (RAB), etc.), Other Priorities (for government employees, jail and hospital inmates, students' hostels, etc.), Large Employers (for industrial and tea garden workers), and Open Market Sales (OMS) and Food Friendly (*Khaddya Bandhob*) program (FFP) for the poor. The non-monetized channels serve the poor through various food-based safety net programs. While the monetized channels are managed by the Ministry of Food, the non-monetized channels involve various ministries, including the Ministry of Disaster Management and Relief, the Ministry of Women and Children Affairs, the Ministry of Primary and Mass Education, and the Ministry of Local Government, Rural Development, and Cooperatives.

Figure 4.22 shows rice and wheat distribution through monetized PFDS channels between 2021/22 and 2023/24. There was an increase in rice distribution through the OMS channel, from 467 thousand MT in 2021/22 to 723 thousand MT in 2023/24. The largest rice distribution program was the FFP, although FFP distributions were lower (662 thousand MT) in 2022/23 compared to the two other years. Wheat distribution, on the other hand, fluctuated. Wheat in OMS dropped significantly in 2022/23 but recovered somewhat in 2023/24. The Essential Priorities (EP) channel showed steady distribution for both rice and wheat over the period.

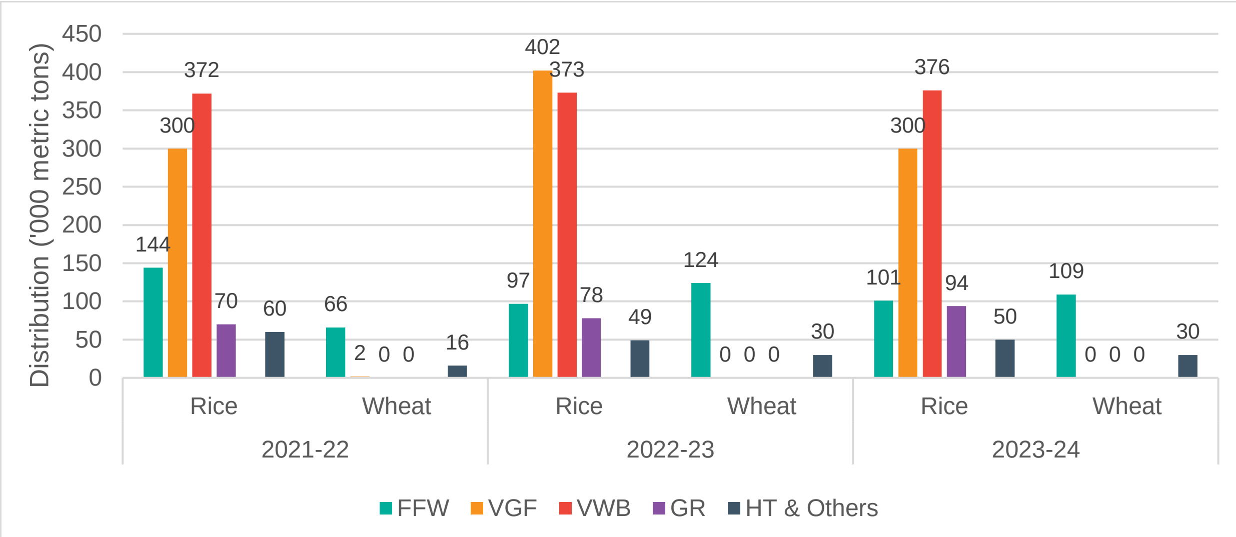
Figure 4.22: Distribution of foodgrains through monetized channels, 2021/22 to 2023/24



Source: Directorate General of Food, Ministry of Food.

Figure 4.23 shows data on non-monetized distribution. Rice distribution remained relatively stable, with small increases in VWB and GR channels, while Food for Work (FFW) declined before a slight recovery. Wheat distribution, though limited to fewer channels, increased significantly in the FFW and other channels in 2022/23 but slightly declined in 2023/24. Notably, no wheat was distributed through VGF, VWB, or GR.

Figure 4.23: Distribution of foodgrains through non-monetized channels, 2021/22 to 2023/24

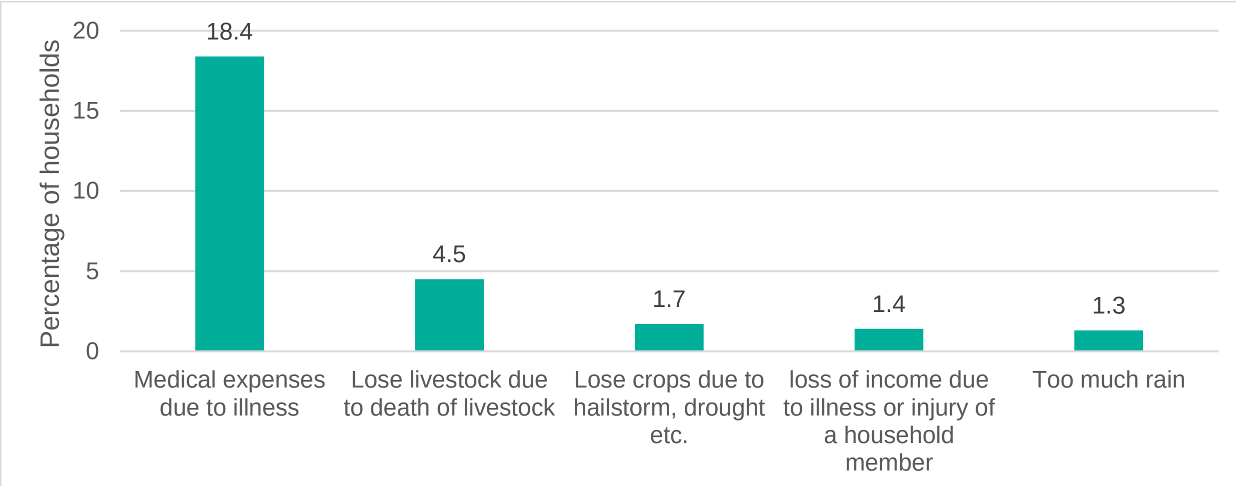


Source: Directorate General of Food, Ministry of Food.

SHOCKS IN RURAL BANGLADESH

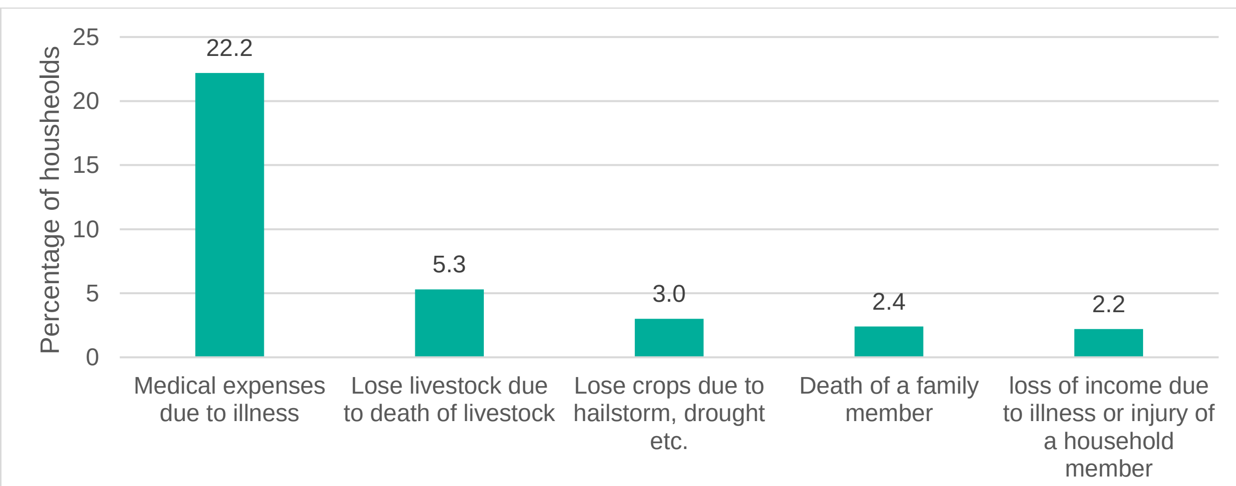
Households in rural Bangladesh are highly vulnerable to various shocks, including natural disasters, economic downturns, and agricultural losses, which significantly disrupt their livelihoods, leading to food insecurity and financial instability. Figures 4.24 and 4.25 show the top five shocks faced in 12 months and 5 years prior to 2018/19 BIHS interviews that have severely affected households in rural Bangladesh, respectively. The shocks include both idiosyncratic or random shocks that affects specific individuals or households (such as illness, death, loss of employment, violence and accidents) and covariate or systematic shocks such as floods, storms etc. that strike the entire community. Overall, medical expenses due to illness represented the leading shock faced in the last 12 months and 5 years that severely affected households. Additionally, the loss of livestock and crops has also been prominent, affecting households in both recent and past years.

Figure 4.24: Top five shocks faced in the last 12 months that have severely affected households



Source: IFPRI's Bangladesh Integrated Household Survey, 2018/19, national rural stratum (IFPRI 2020)

Figure 4.25: Top five shocks faced in the last 5 years that have severely affected households



Source: IFPRI's Bangladesh Integrated Household Survey, 2018/19, national rural stratum

EMPLOYMENT

The notion of skill development is so critical to economic advancement that some economists and social scientists assert, "For long-term economic development, only skills matter." This perspective underscores the fundamental role that a skilled workforce plays in driving productivity, innovation, and sustained growth.

Economic development is fundamentally driven by sustained growth, which in turn depends on the productivity-enhancing skills of a country's labor force. While policymakers often prioritize short-term economic challenges, the long-term prosperity of a nation is closely tied to its rate of economic growth. This growth is directly linked to the economically relevant skills within the population, which are primarily developed through education and vocational training (Hanushek 2017).

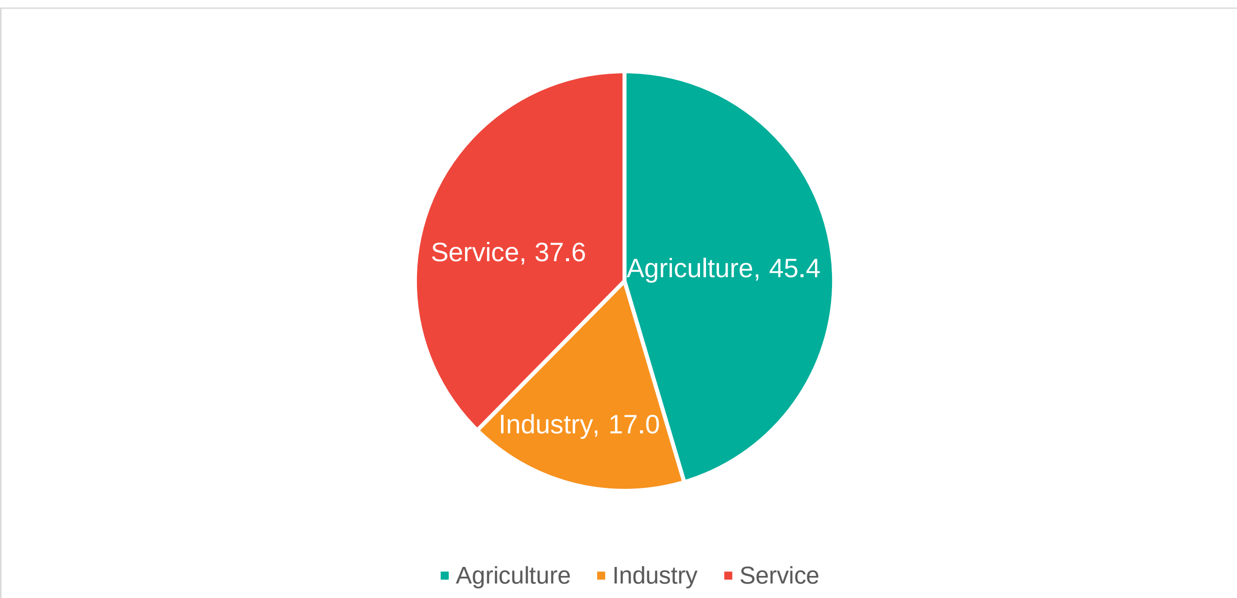
Rahman and Al-Hasan (2019) provide empirical evidence supporting the positive impact of training on labor market outcomes (Rahman and Al-Hasan 2019). Using binary dependent variable regression models, they demonstrate that individuals who are trained are 49.0 percent points more likely to participate in the labor force than those who are not. Furthermore, their analysis, based on quantile treatment effect models, shows that at the median, trained individuals earn about 7.0 percent more than their untrained counterparts. This highlights the critical role of skill development, not only in fostering employment but also in improving income distribution and economic mobility.

Thus, investing in human capital through targeted training programs is essential for ensuring inclusive growth and long-term economic resilience.

Youth employment

Employment by broad sector is illustrated in Figure 4.26. The figure shows that a significant 45.4 percent of the total employed population works in agriculture, followed by 37.6 percent in the service sector, and 17.0 percent in the industry sector.

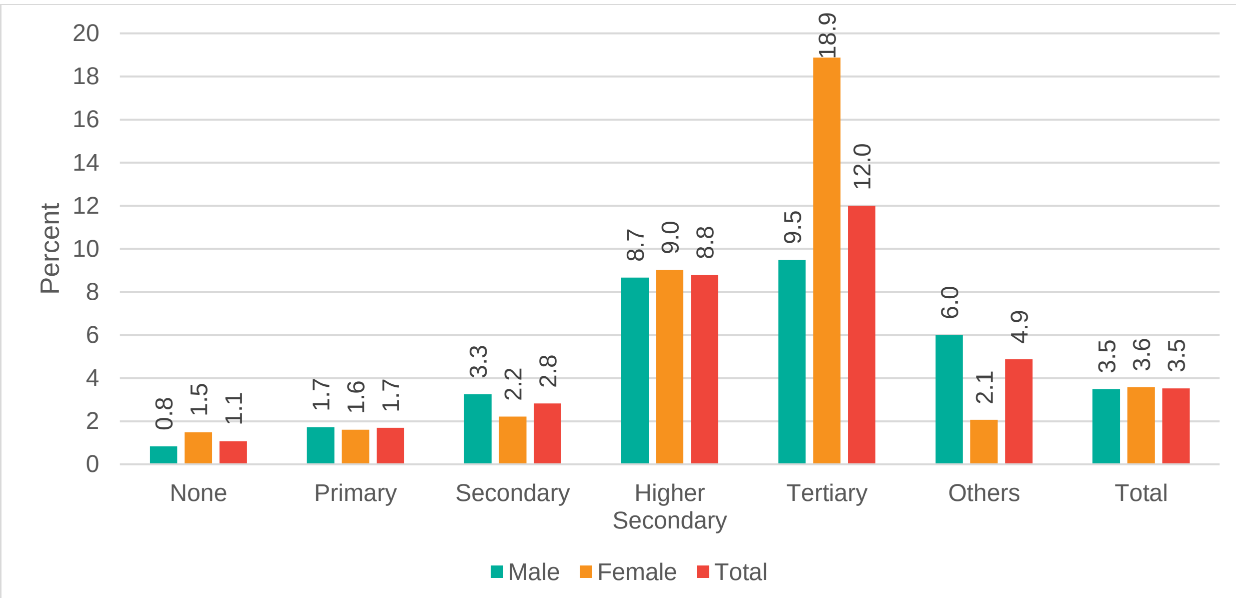
Figure 4.26: Distribution of employed people by economic sectors (percent)



Source: Report of Labor Force Survey 2022 (BBS 2023c).

Figure 4.27 shows the unemployment rates across different levels of education by sex. Individuals with no formal education have the lowest unemployment rates, with men at 0.8 percent and women at 1.5 percent. As the level of education increases, unemployment rates rise, particularly for those with higher secondary and tertiary (bachelor's degree and higher) education. The most striking difference is observed among individuals with tertiary education, where the unemployment rate for women spikes to 18.9 percent, compared to 9.5 percent for men. This suggests that while higher education is generally associated with better job opportunities, in this context, it correlates with higher unemployment, especially for women.

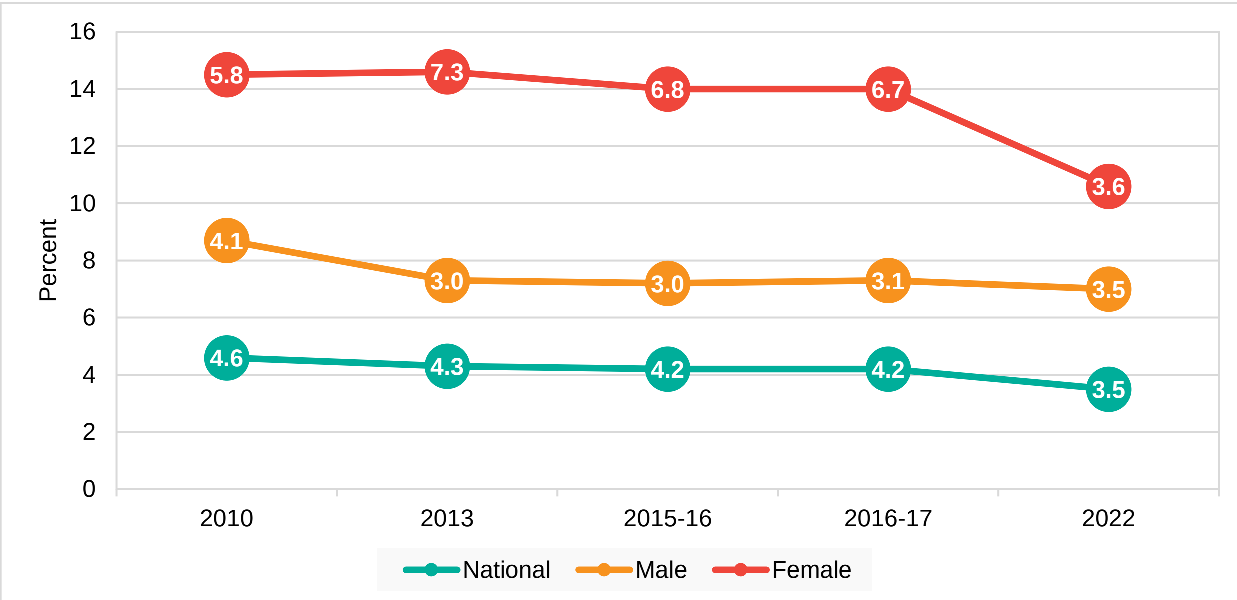
Figure 4.27: Unemployment rate by level of education and sex



Source: Report of Labor Force Survey 2022 (BBS 2023c).

Figure 4.28 depicts the unemployment rate trends from 2010 to 2022. In 2010, the overall unemployment rate stood at 4.6 percent, with male unemployment at 4.1 percent and female unemployment significantly higher at 5.8 percent. By 2022, the total unemployment rate had decreased to 3.53 percent, with male unemployment at 3.51 percent and female unemployment at 3.57 percent.

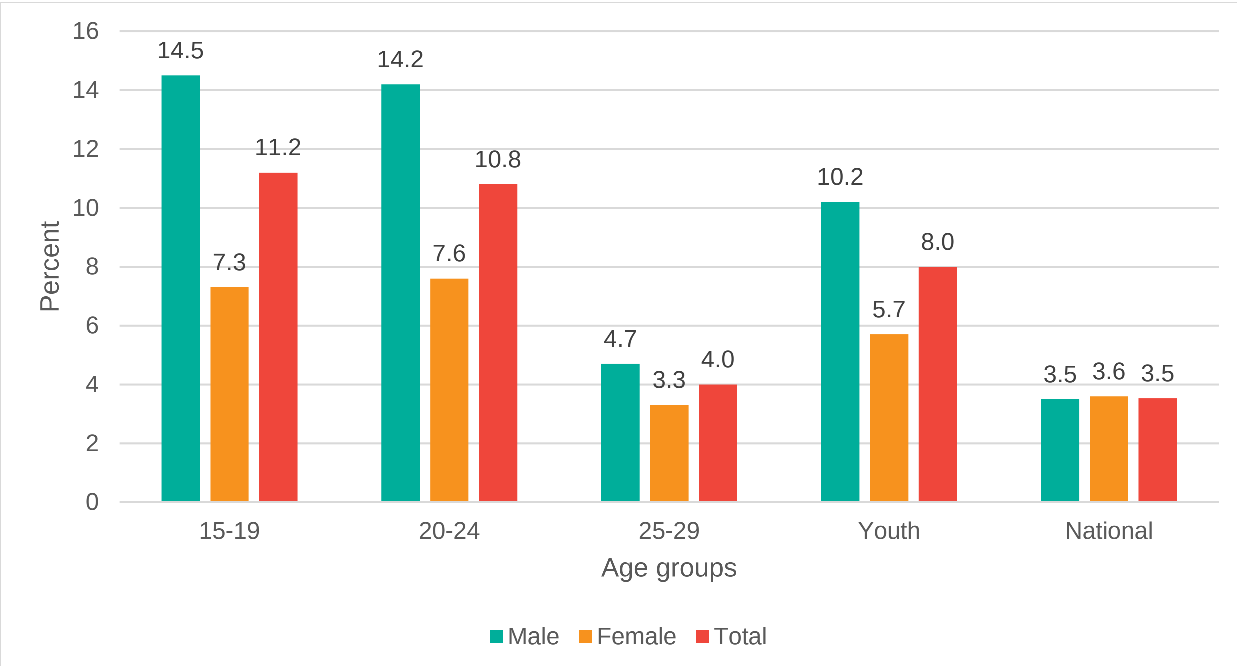
Figure 4.28: Trend in unemployment rate by sex



Source: Report of Labor Force Survey 2022 (BBS 2023c).

Figure 4.29 shows youth unemployment rates by age and sex. The 15-19 age group has the highest unemployment, with males at 14.5 percent and females at 7.3 percent, resulting in an overall rate of 11.2 percent. The 20-24 age group has lower rates, with males at 14.2 percent and females at 7.6 percent, leading to a total of 10.8 percent. In the 25-29 age group, unemployment drops to 4.7 percent for males and 3.3 percent for females, yielding a total of 4.0 percent. Overall, youth unemployment rates are 10.2 percent for males and 5.7 percent for females, above the national average of 3.5 percent.

Figure 4.29: Unemployment rate of youths by age and sex

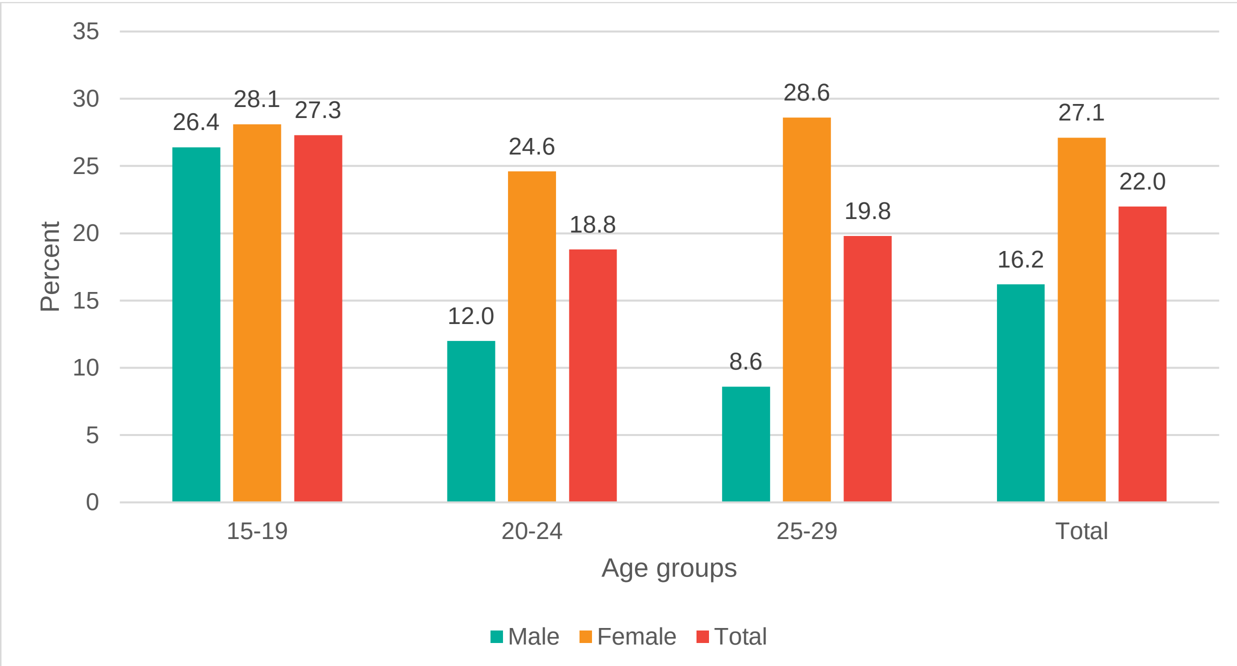


Source: Report of Labor Force Survey 2022 (BBS 2023c).

The Labor Force Survey 2022 highlights the proportion of young individuals classified as Not in Education, Employment, or Training (NEET) as a key labor market indicator (Figure 4.30). NEET measures the percentage of youth who are not engaged in education, training, or employment. It captures a broader range of potential labor force entrants than youth unemployment alone, as it includes those who are completely outside the labor force. NEET youth may be either unemployed or inactive, without pursuing education or training.

Overall, 22.0 percent of the youth population is classified as NEET, with a higher proportion of females not engaged in education, employment, or training than males across all ages. This gender gap becomes more pronounced in older age groups.

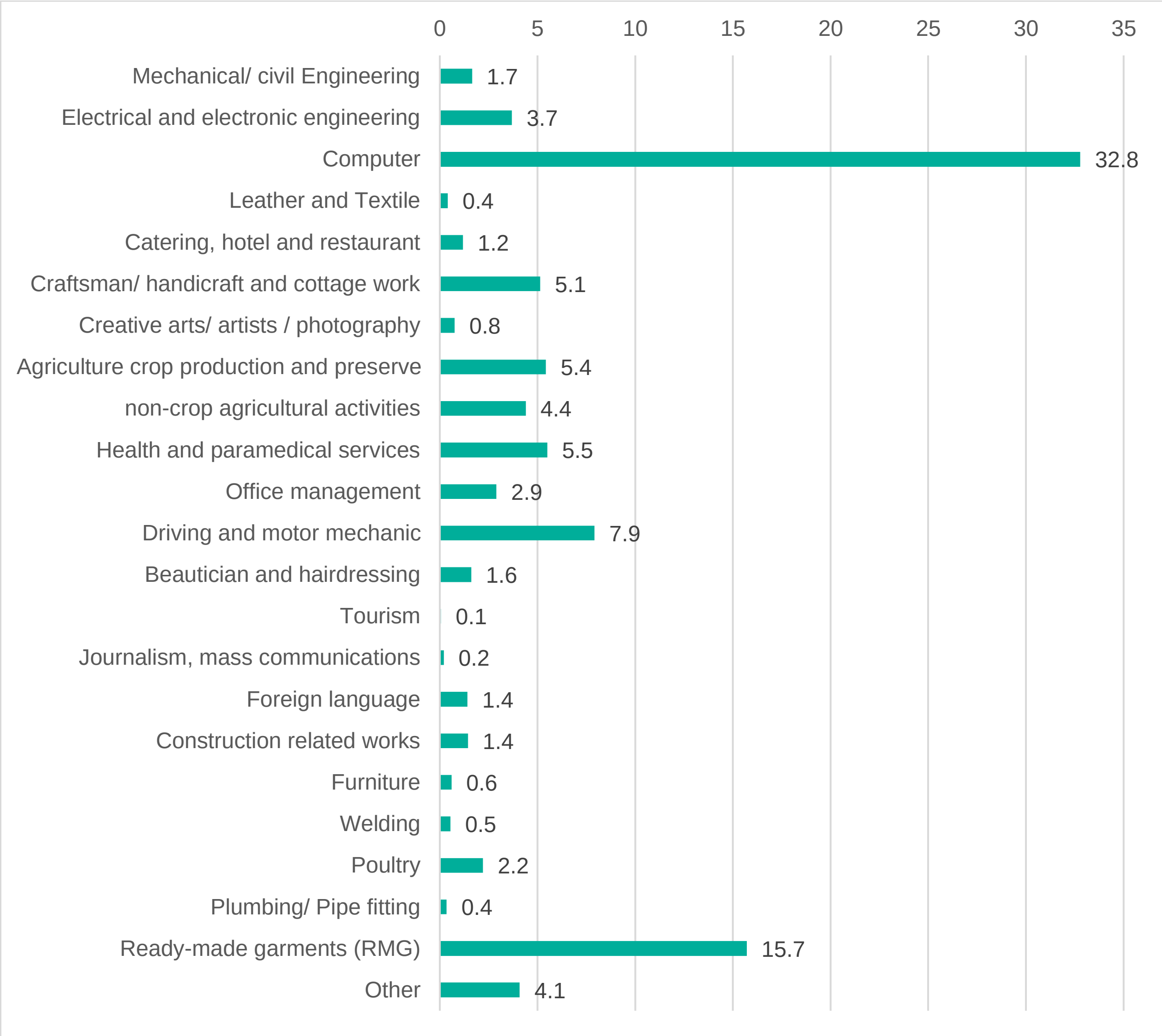
Figure 4.30: NEET youths as share of working age population by age and sex



Source: Report of Labor Force Survey 2022 (BBS 2023c).

Figure 4.31 illustrates the percentage of the population aged 15 and older who have received training, categorized by type. Only 1.5 percent of the working-age population received formal vocational training in the past 12 months. Among those trained, 1.7 percent underwent training in mechanical or civil engineering, translating to just 0.03 percent of the total working-age population receiving formal training in these critical sectors (Figure 4.31). This is particularly concerning given the rapid mechanization of agriculture. There is a significant opportunity to bridge the employment and skills gap by training unemployed youth in the operation, repair, and maintenance of farm machinery—a move that could significantly enhance both productivity and employability.

Figure 4.31: Percent of population aged 15 and older who have received training, by type



Source: Report of Labor Force Survey 2022 (BBS 2023c).

CHAPTER 5 KEY FACTORS INFLUENCING FOOD UTILIZATION

NUTRITION

To improve nutrition in Bangladesh, it is essential to break the cycle of malnutrition that traps many of the poor. This cycle begins when undernourished women give birth to children who are malnourished in the womb, resulting in low birth weight. These children are more likely to suffer from malnutrition during the critical first two years of life, leaving them vulnerable to disease and early death. Survivors often face stunted physical growth and impaired cognitive development, reducing their chances of escaping poverty. For girls, poor nutrition early in life increases the likelihood of becoming underweight mothers, which raises the risk of maternal mortality and giving birth to low-weight babies. This perpetuates a generational cycle of malnutrition.

Evolving nutrition policies

Since Bangladesh's independence in 1971, the right to food and nutrition has been enshrined as a fundamental right, reflected in the government's long-standing policy commitments. Over the decades, Bangladesh has made significant progress on improving nutrition through the establishment of key government bodies, such as the Institute of Public Health Nutrition (IPHN) and the Bangladesh National Nutrition Council (BNNC), which have been central to shaping nutrition policies, conducting research, and ensuring surveillance.

In the 1990s, policy frameworks like the National Plan of Action for Nutrition (NPAN) in 1995 and the National Food and Nutrition Policy in 1997 laid the foundation for implementing nutrition programs. Over time, nutrition policies and programs shifted from a vertical, standalone focus to a more integrated approach, reflecting their multisectoral nature by aligning with broader health, food, and development frameworks. For instance, nutrition became a core component of the National Food Policy (NFP 2006) and its Plan of Action (NFPPoA 2008 - 2015), which emphasized the importance of balanced diets, food fortification, and improved access to clean water and sanitation. This was further solidified by the establishment of the National Nutrition Services (NNS) in 2011. The NNS, replacing the NNP, mainstreamed nutrition into the health sector, ensuring multi-sectoral coordination and support from development partners and civil society.

Bangladesh's focus on maternal and child health gained momentum with the National Strategy for Infant and Young Child Feeding (2007), followed by the National Nutrition Policy in 2015 and the Second National Plan of Action for Nutrition (2016-2025). These policies promoted dietary diversity, nutrition-sensitive interventions, and addressed urban-rural nutrition disparities. Alongside these efforts, the National Strategy on Micronutrient Deficiencies

(2015–2024) and the Operational Guideline for Adolescent Nutrition (2020) highlighted Bangladesh’s commitment to tackling malnutrition in all its forms and across all stages of life.

Moreover, Bangladesh has developed a series of five-year Country Investment Plans (CIPs) that provide a coherent framework of priority investment programs for enhancing food security and nutrition, aligning with broader national policy goals. The first plan, CIP-1 (2011-2015), identified 12 priority investment programs aimed at addressing the key components of food security in an integrated way. These included sustainable agriculture, improved water resource management, fisheries and livestock development, enhanced market access, food safety, community-based nutrition interventions, and climate change adaptation strategies. The plan was built on the National Food Policy (2006). Building on the first plan, the CIP-2 (2016-2020) aimed to make agriculture more productive and sustainable, while enhancing access to social protection, resilience, and inclusive agricultural systems, all in support of the Sustainable Development Goals (SDGs). Then, amid the challenges posed by the COVID-19 pandemic and other shocks, the current CIP-3 (2021-2025) emphasizes creating a resilient, nutrition-sensitive food system that can withstand shocks and crises, with a strong focus on private sector involvement and alignment with the National Food and Nutrition Security Policy (NFNSP 2020) and its action plans.

These strategic plans reflect Bangladesh's ongoing commitment to enhancing food security and nutrition at the national level. In parallel with these efforts, Bangladesh’s engagement in global initiatives such as Scaling Up Nutrition (SUN) since 2011 and the Nutrition for Growth summits further reinforced the country’s dedication to advancing nutrition against global goals and commitments.

In recent years, IFPRI has generated evidence on the linkages between nutrition and other sectors to accelerate nutrition progress. For instance, IFPRI designed and conducted a randomized controlled trial (RCT) called the Transfer Modality Research Initiative (TMRI), implemented by the UN World Food Programme (WFP). The study shows that cash transfers combined with nutrition behavior change communication (BCC) led to significant improvements in child nutritional status, notably a 7.8 percentage point decrease in stunting over a two-year period from 2012-2014, which is three times higher than the national level reduction at that time (Ahmed, Hoddinott, and Roy 2024). This is an example of nutrition-sensitive social protection. Similarly, IFPRI designed and conducted another RCT, the Agriculture, Nutrition, and Gender Linkages (ANGeL) project, implemented by the Ministry of Agriculture. The research finds that combining agriculture, nutrition, and gender sensitization trainings for farm households—both husbands and wives—improved agricultural diversity, dietary diversity, and empowered women – a testament to the value of enhancing nutrition-sensitive agriculture (Ahmed et al. 2024).

While Bangladesh has made significant strides in improving nutrition, maintaining this momentum has been challenging, especially in the face of the COVID-19 pandemic and other shocks. Continued efforts are crucial to address persistent issues related to child nutrition, women's diets, and overall dietary intake.

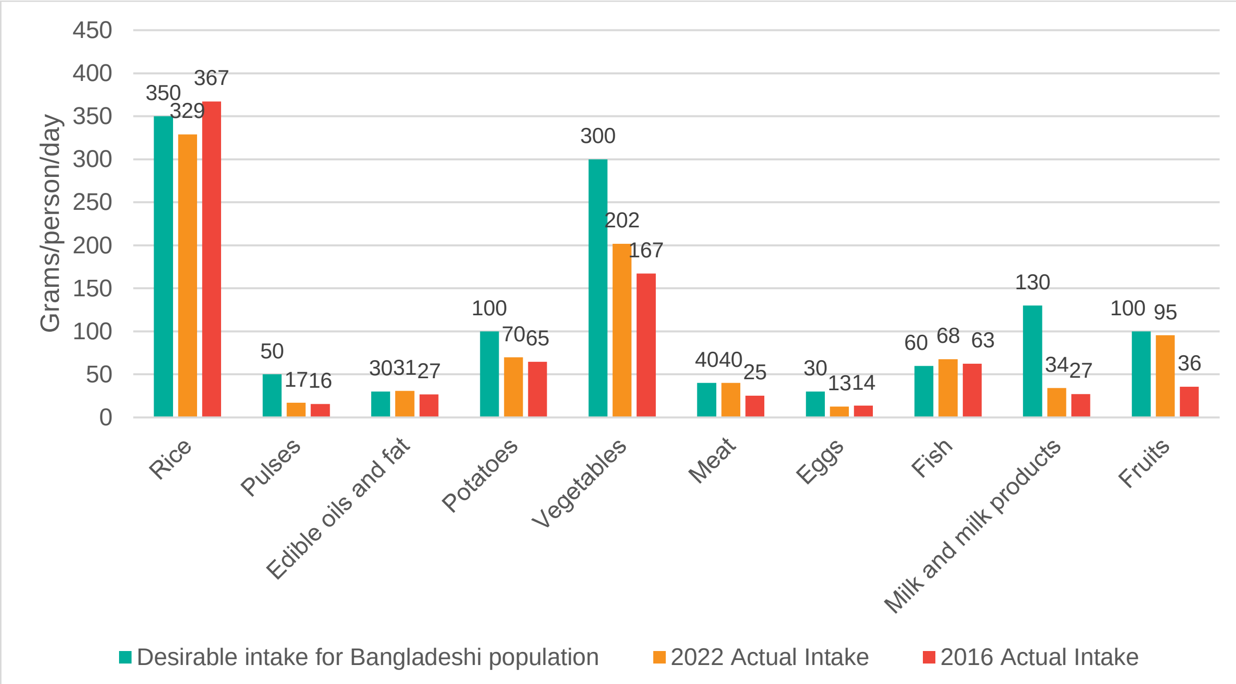
Nutrient intakes

Desirable dietary intake is crucial for maintaining health because it ensures that individuals receive essential nutrients needed to prevent deficiencies and reduce the risk of chronic diseases. In Bangladesh, the dietary guidelines are designed to meet the nutritional needs of its population, addressing local dietary challenges and promoting overall well-being (Shaheen et al. 2013).

Figure 5.1 depicts desirable intakes and changes in actual intakes of selected foods in Bangladesh in 2016 and 2022. The actual intake of foods increased between 2016 and 2022 for all selected food groups except rice and eggs. The food groups that demonstrated the greatest increase in actual intake between 2016 and 2022 were fruits (by 59 grams per person per day), vegetables (by 35 grams per person per day), and meat (by 15 grams per person per day). Notably, rice was the only food item that decreased in per person per day intake, from 367 to 329 grams per person per day over the six-year period.

While the actual intake per person per day exceeded or was equal to the desirable intake for several food groups including edible fats and oils, fish, and meat in 2022, there was still a substantial difference between the desirable intake and actual intake for several food items, including pulses, vegetables, eggs, and milk products.

Figure 5.1: Desirable intake[1] (grams per capita) for Bangladeshi population and actual intake of select food groups in 2016 and 2022

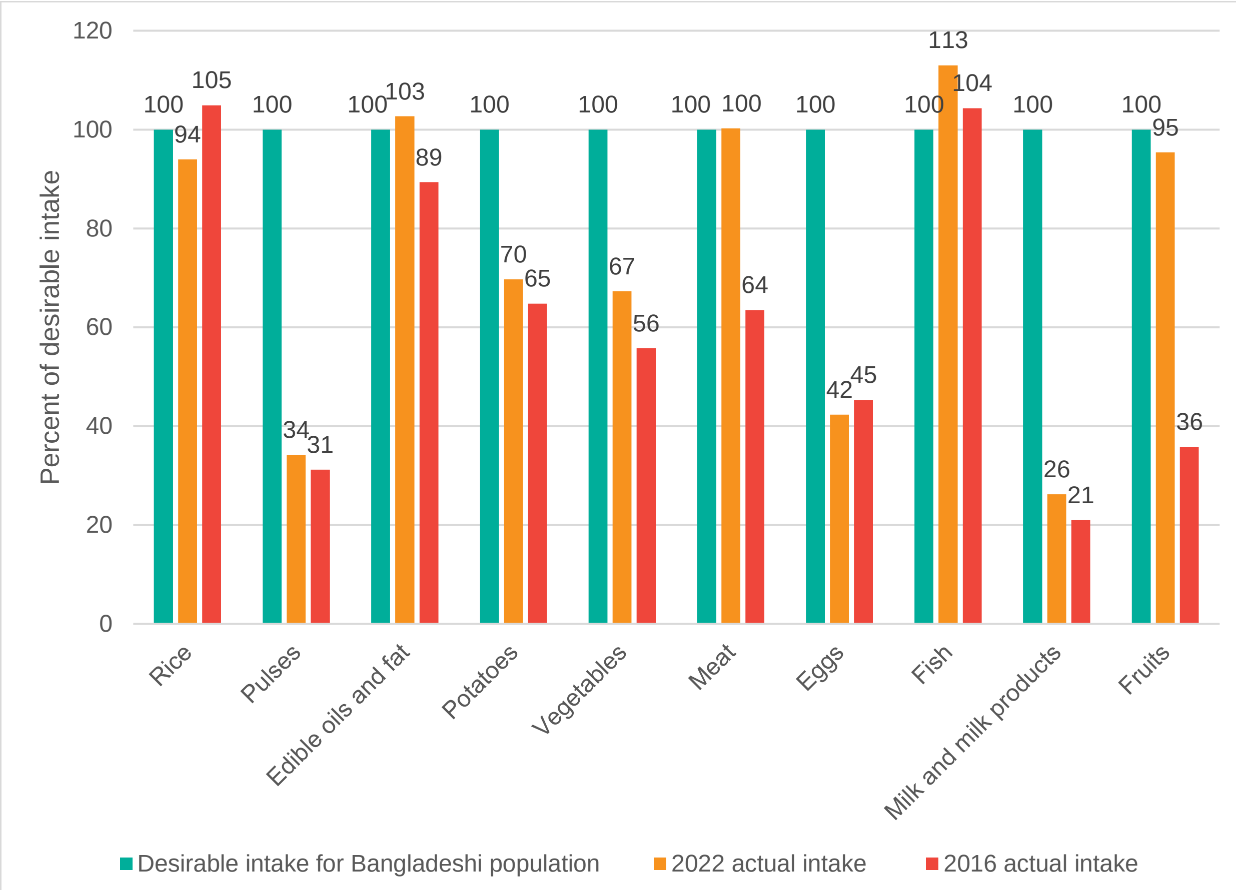


Source: Household Income and Expenditure Survey (HIES) 2016 and 2022

[1]Desirable intakes for the Bangladeshi population were obtained from the Desirable Dietary Pattern for Bangladesh study, conducted by the Bangladesh Institute of Research and Rehabilitation in Diabetes, Endocrine and Metabolic Disorders (Nahar et al. 2013).

Figure 5.2 illustrates actual intakes as percentage of desirable intakes of selected food groups in Bangladesh between 2016 and 2022, showing notable shifts in dietary patterns. Overall, there were improvements in dietary diversity between 2016 and 2022. Intake of all food groups increased during this period, except for rice and eggs. The most significant increases were observed for fruits and meats, with considerable growth also seen in the consumption of vegetables, edible fats and oils, fish, milk and milk products, and pulses. Rice intake declined during this period, likely allowing for increased consumption of other food groups.

Figure 5.2: Percentages of desirable intake[1] and actual intake of select food groups in 2016 and 2022



Source: Household Income and Expenditure Survey (HIES) 2016 and 2022

[1]Desirable intakes for the Bangladeshi population were obtained from the Desirable Dietary Pattern for Bangladesh study, conducted by the Bangladesh Institute of Research and Rehabilitation in Diabetes, Endocrine and Metabolic Disorders (Nahar et al. 2013).

Rice is a major source of nutrients in the Bangladeshi diet. Figure 5.3 shows the percentages of total calorie, protein, iron, and zinc from rice in 2018/19. Rice accounts for nearly two-thirds (64.3 percent) of total calorie intake, over half (51 percent) of total protein intake, one-third of iron intake, and 56.0 percent of zinc intake.

Figure 5.3: Share of total nutrient intakes from rice, 2018/19

Source: IFPRI's Bangladesh Integrated Household Survey (BIHS), 2018/2019, national rural stratum

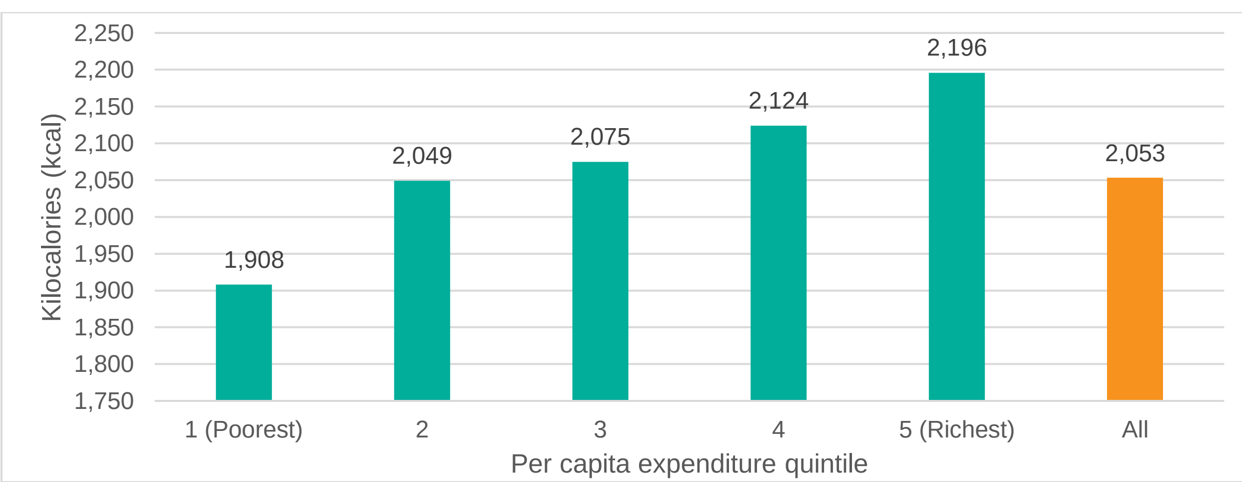
Macronutrient intakes

This section presents results on macronutrient intakes, disaggregated by age, sex, and income groups. Appendix 5 details IFPRI's method for calculating macronutrient intakes.

Energy (calorie) intake and inadequacy

How does average per capita daily calorie intake vary by income group? Figure 5.4 shows that, in 2018/19, average per capita daily calorie intake increased as income increased. Per capita daily calorie intake depends upon income and food prices. Individuals from lower-income groups have a lower capacity of purchasing foods and hence lower calorie intake compared to the richest income group.

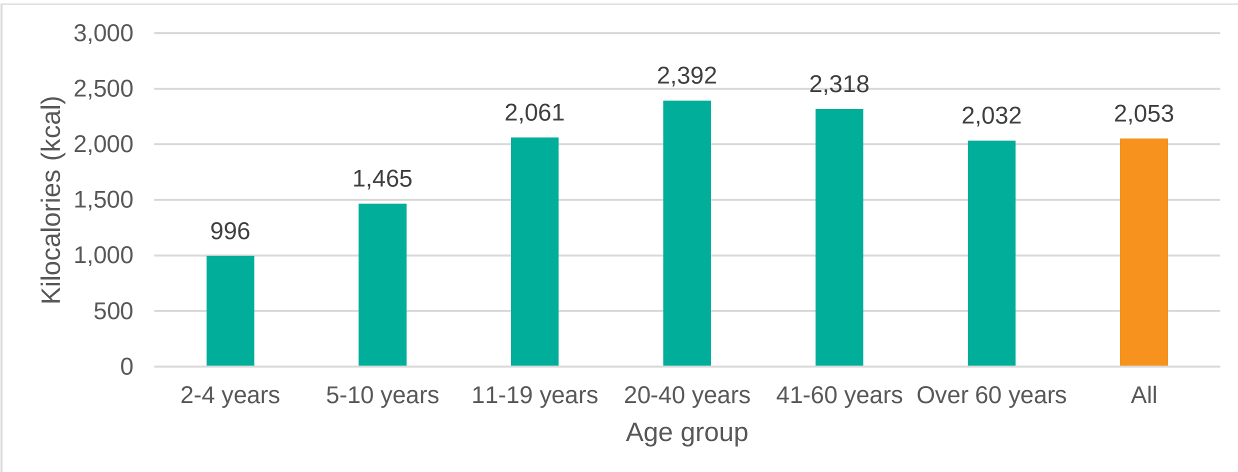
Figure 5.4: Average per capita daily calorie intake, by income group, 2018/19



Source: IFPRI's Bangladesh Integrated Household Survey (BIHS), 2018/2019, national rural stratum

Figure 5.5 illustrates the average per capita daily calorie intake by age groups, expressed in kilocalories (kcal). Since calorie intake varies across ages and requirement is highest during adulthood, the graph shows the variation by age group. The highest average per capita daily calorie intake was among 20–40-year-olds (2,392 kcal), followed by 41-60-year-olds (2,318 kcal).

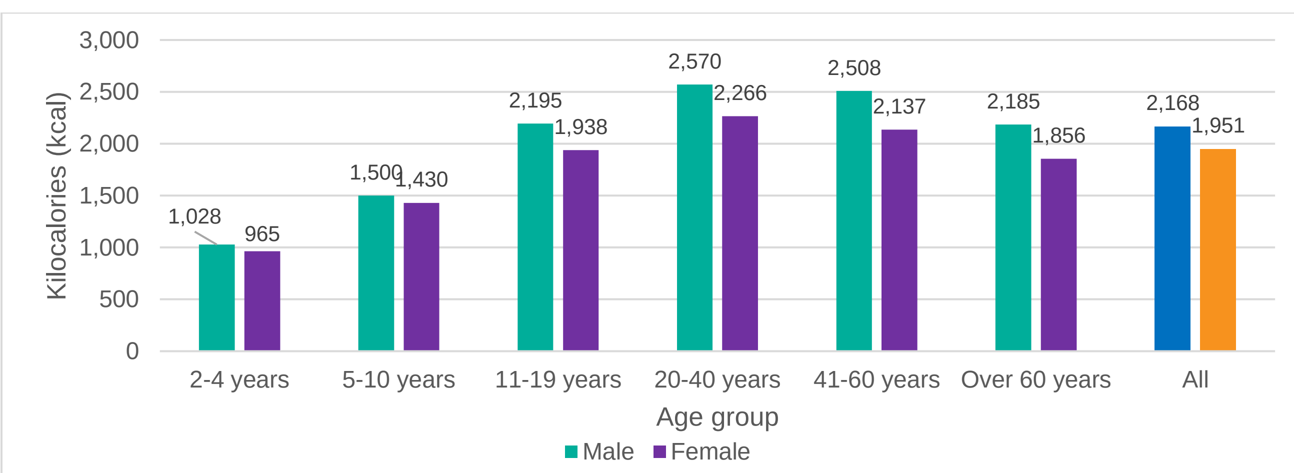
Figure 5.5: Average per capita daily calorie intake, by age group, 2018/19



Source: IFPRI's Bangladesh Integrated Household Survey (BIHS), 2018/2019, national rural stratum

Figure 5.6 shows the average per capita daily calorie intake by age groups and sex in 2018/19. Overall, calorie intake was 10 percent lower among females than males. Although male and female calorie intakes among young children (were very similar, the gender gap in per capita daily calorie intake widened among the older age groups, with females consuming fewer calories per day than males.

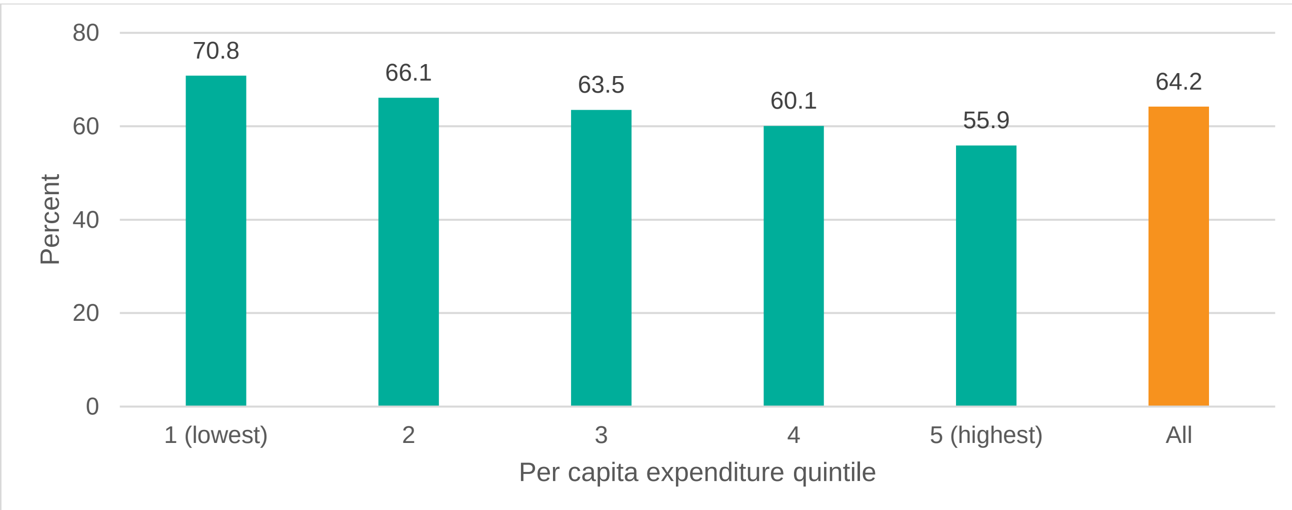
Figure 5.6: Average per capita daily calorie intake, by sex and age group, 2018/19



Source: IFPRI's Bangladesh Integrated Household Survey (BIHS), 2018/2019, national rural stratum

Figure 5.7 shows that the share of total calorie intake from rice decreases with the increase in household income. Average share of per capita calorie intake among the richest income group was 1.2-times higher than the poorest income group. This shows the dependency of rice in diets decreases and other sources of food meet the calorie requirement in higher income groups.

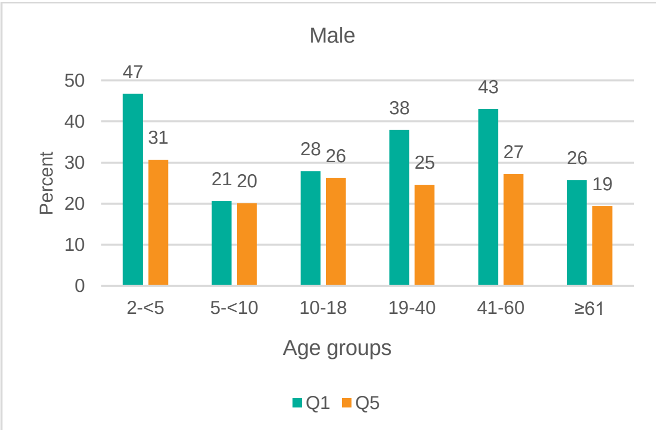
Figure 5.7: Percentage of total calorie intake from rice, by income group, 2018/19

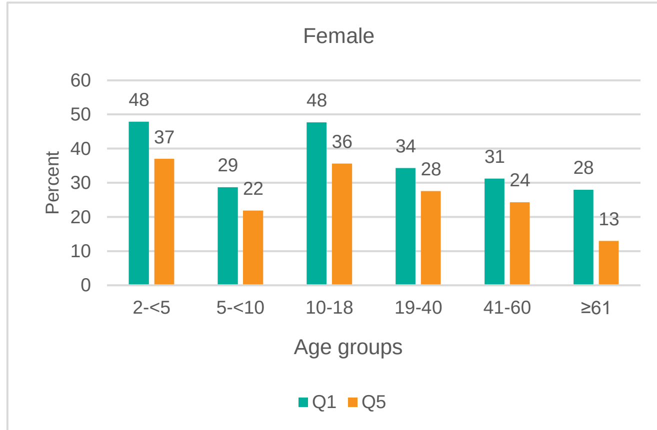


Source: IFPRI's Bangladesh Integrated Household Survey (BIHS), 2018/2019, national rural stratum

Figure 5.8 presents insufficient energy (calorie) intake among males and females by age group and income group, with Q1 representing the poorest 20 percent and Q5 representing the wealthiest 20 percent of the sample. The proportion of insufficient energy intake was high in children <5 years of age for all income groups. Among adolescents 10-18 years, the poorest females had the highest insufficient energy intake compared to sex and wealth quintile of the same age group. In contrast, males 41-60 years of age had higher insufficient energy intake than females aged 41-60 years, irrespective of income group. However, insufficient energy intake among males and females in the wealthiest wealth quintile was lower than in the poorest quintile across all age groups, suggesting that the poor are still at higher risk of suboptimal nutrient intakes.

Figure 5.8: Inequity gaps in insufficient intakes of energy by sex, age group, and income group, 2018/19





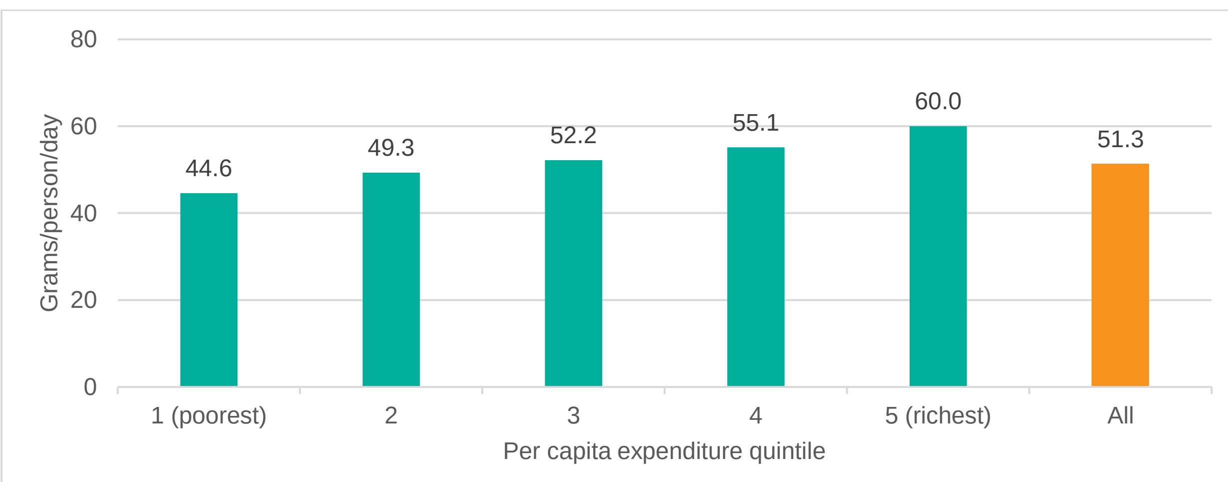
Source: (Ahmed et al. 2022)

Note: Q1=poorest quintile, Q5=richest quintile

Protein intake and inadequacy

Figure 5.9 shows that protein intake increases with the increase in household income. Average per capita protein intake among the richest income group was 1.3-times higher than the poorest income group. Since sources of protein like meat, fish, and eggs are more expensive than other foods, people belonging to the wealthiest quintile have higher access to protein-rich foods than those belonging to the poorest quintile.

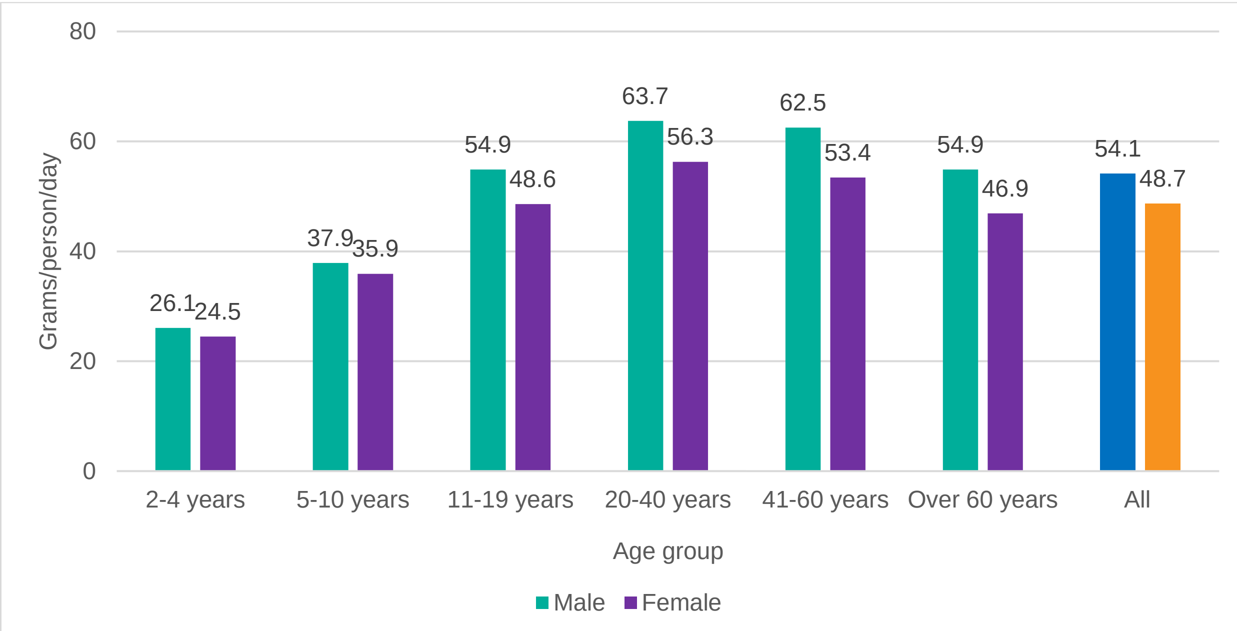
Figure 5.9: Average per capita daily protein intake, by income group, 2018/19



Source: IFPRI's Bangladesh Integrated Household Survey (BIHS), 2018/2019, national rural stratum

How does average per capita daily protein intake vary by age group and sex? Figure 5.10 shows that in 2018/19, average daily protein intake per capita was consistently lower for females than for males across all age groups. On average, females consumed 10 grams less protein per day compared to males. As expected, protein intake increased with age for both sexes, though females consistently had lower intake levels than their male counterparts at every stage of life.

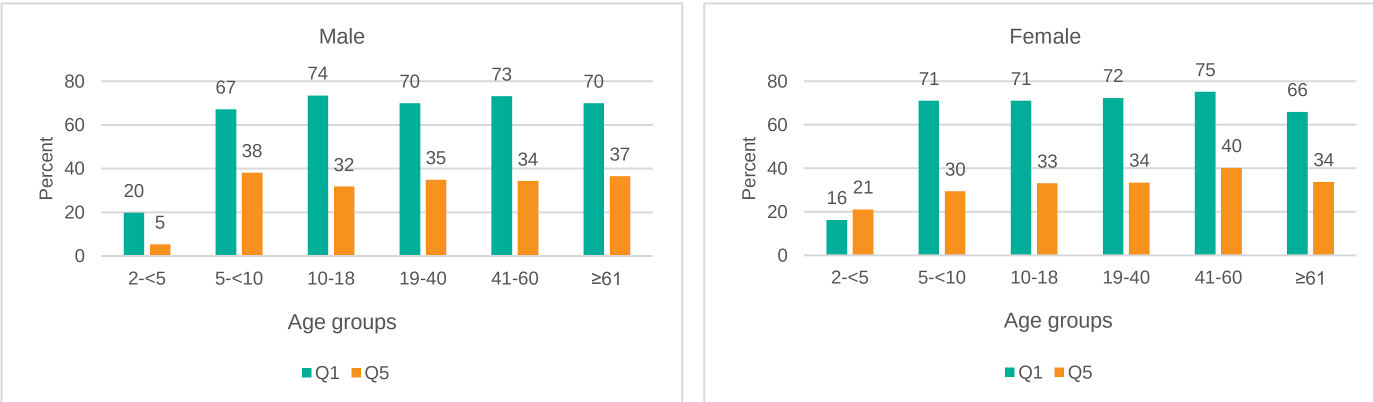
Figure 5.10: Average per capita daily protein intake by age and sex groups, 2018/19



Source: IFPRI's Bangladesh Integrated Household Survey (BIHS), 2018/2019, national rural stratum

Figure 5.11 shows insufficient protein intake among males and females by age group and income level. Insufficient protein intake was notably higher for both males and females in the poorest wealth quintile across all age groups except females aged 2-<5 years. Conversely, the incidence of insufficient protein intake was lower among children aged 2-<5 years compared to other age groups. Since intake of protein highly depends on purchasing power and income, the disparity in protein intake between the poorest and richest quintiles are evident, with the poor nearly always falling behind, irrespective of sex or age group.

Figure 5.11: Inequity gaps in insufficient intakes of protein by sex, age group, and income group, 2018/19



Source: (Ahmed et al. 2022)

Note: Q1=poorest quintile, Q5=richest quintile.

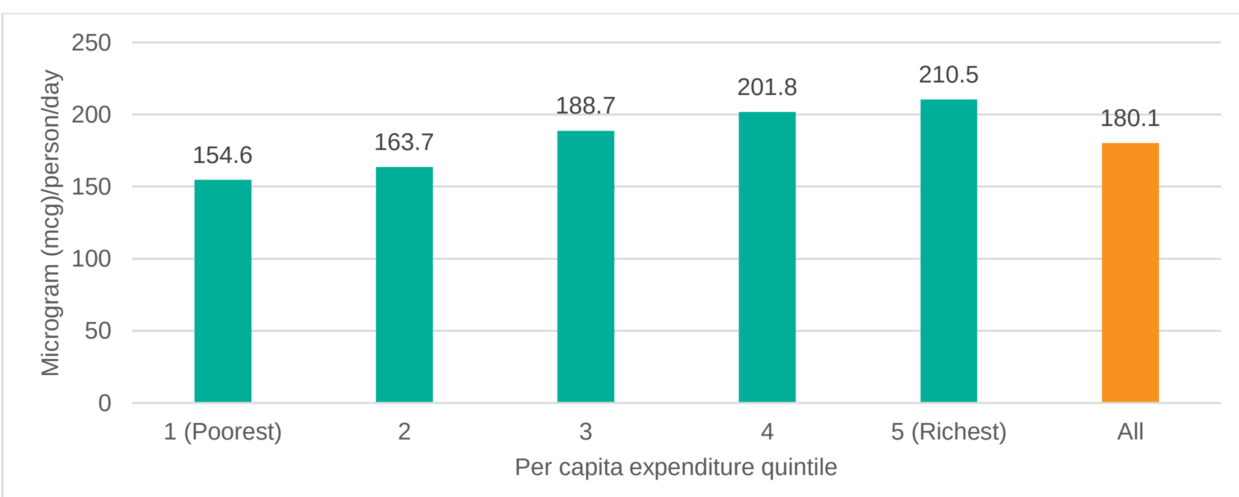
Micronutrient intake

<u>Vitamin A</u>

Vitamin A is important for normal vision, the immune system, and reproduction, and helps the heart, lungs, kidneys, and other organs function properly (NIH 2022).

Figure 5.12 shows daily vitamin A intake per capita by income group. Average per capita daily vitamin A intake increased by 1.4-times with rising household income, primarily due to the consumption of colored fruits and vegetables, which tend to be more expensive. Individuals in the highest income group had a vitamin A intake that was 36 percent higher than that of individuals in the lowest income group.

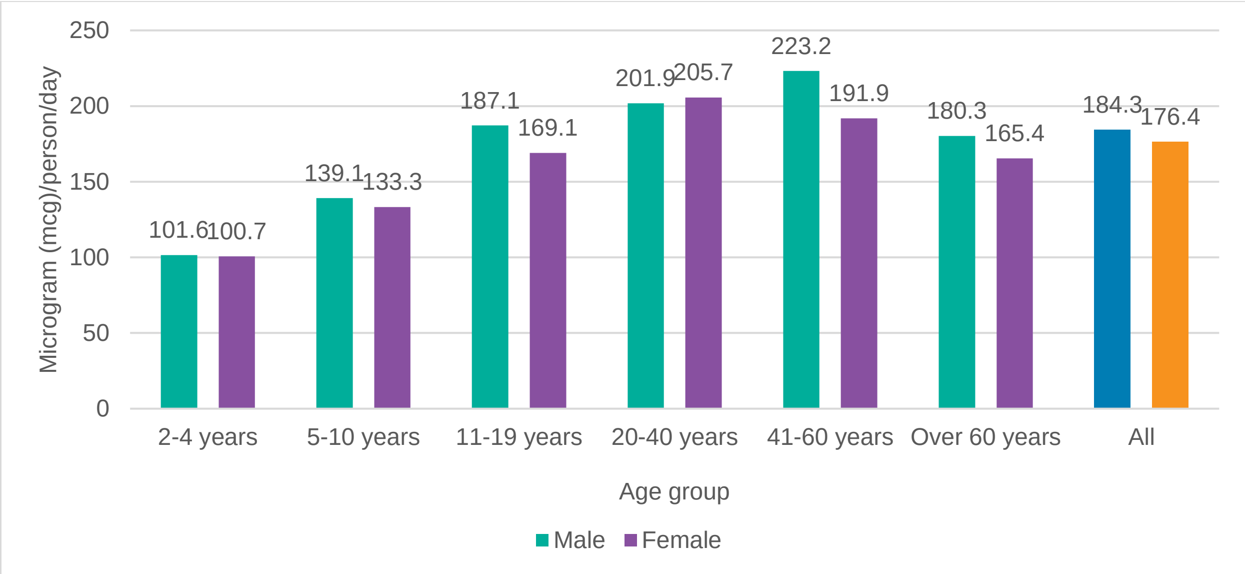
Figure 5.12: Average per capita daily vitamin A intake, by income group, 2018/19



Source: IFPRI's Bangladesh Integrated Household Survey (BIHS), 2018/2019, national rural stratum

Overall, the average per capita daily vitamin A intake was 4.3 percent lower for females than males in 2018/19 (Figure 5.13). Across nearly all age groups except for 20-40 years of age, vitamin A intake among females lags behind that of males.

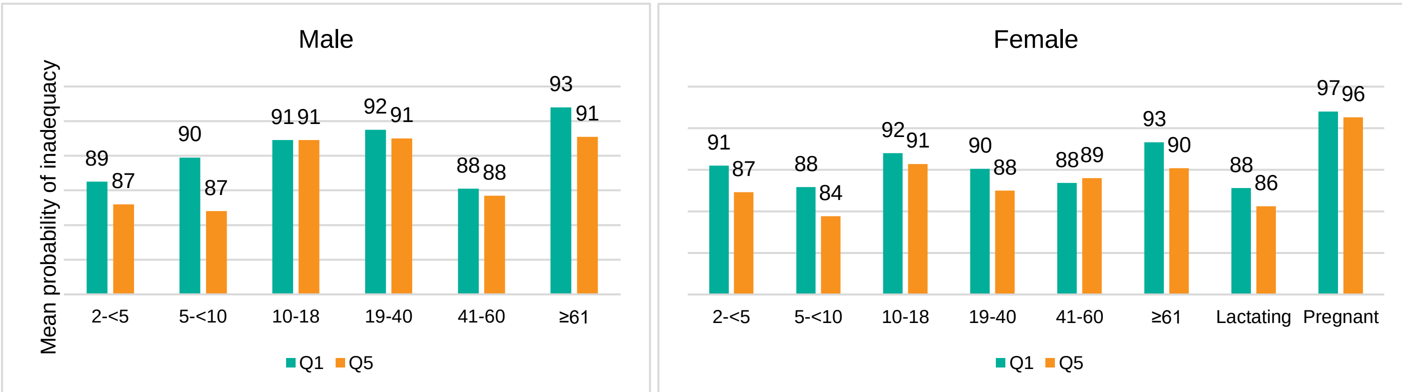
Figure 5.13: Average per capita daily vitamin A intake by age group and sex, 2018/19



Source: IFPRI's Bangladesh Integrated Household Survey (BIHS), 2018/2019, national rural stratum

Figure 5.14 illustrates insufficient intakes of vitamin A by sex, age group, and expenditure quintile. The differences in deficiency rates among wealth quintiles were minimal, indicating a widespread lack of nutritional knowledge within the population. Vitamin A is particularly vital for the growth and development of children during pregnancy and lactation; however, the proportion of individuals experiencing deficiency remains alarmingly high, exceeding 85 percent.

Figure 5.14: Inequity gaps in insufficient intakes of vitamin A, by sex, age group, and income group, 2018/19



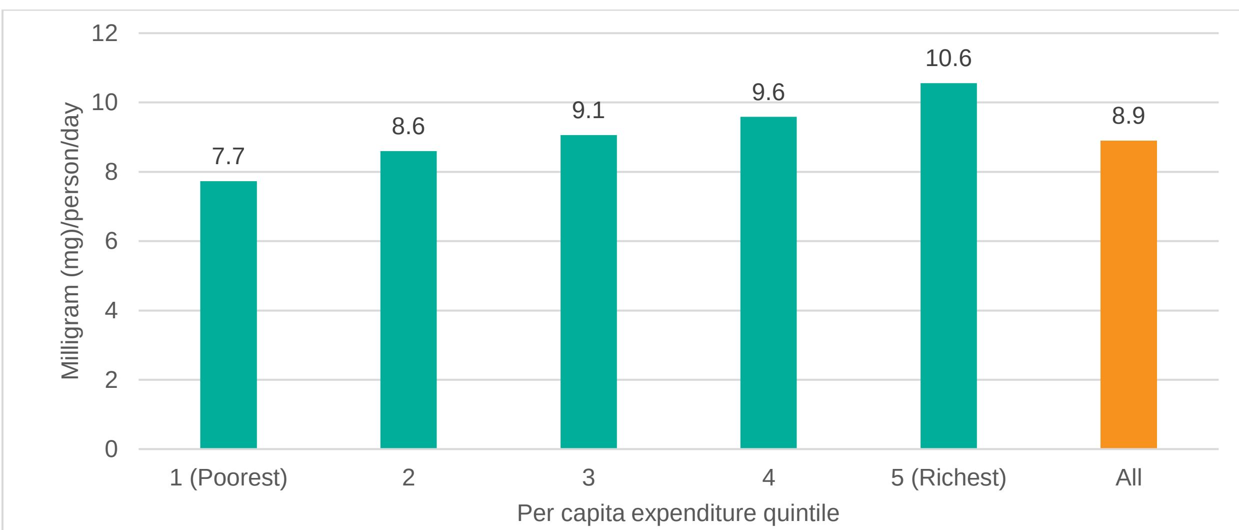
Source: (Nguyen et al. Forthcoming)

Note: Q1=poorest quintile, Q5=richest quintile.

Iron

Iron is essential for preventing anemia, supporting cognitive development, and maintaining overall health. Figure 5.15 illustrates a positive association between average per capita daily iron intake and income. Individuals in the richest income group had 38 percent higher average iron intake than those belonging to the poorest group.

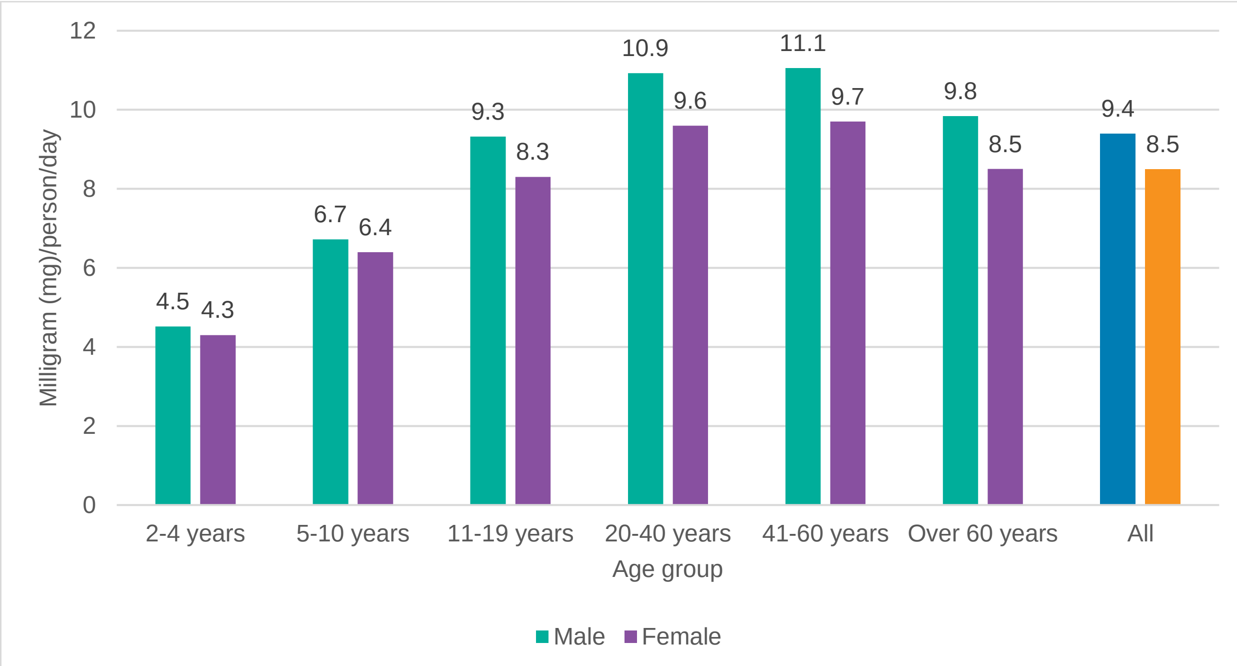
Figure 5.15: Average per capita daily iron intake, by income group, 2018/19



Source: IFPRI's Bangladesh Integrated Household Survey (BIHS), 2018/2019, national rural stratum

Figure 5.16 shows that, overall, per capita daily iron intake by males was 10.6 percent higher than intake by females in 2018/19. Iron intake was higher for males than females across all age groups.

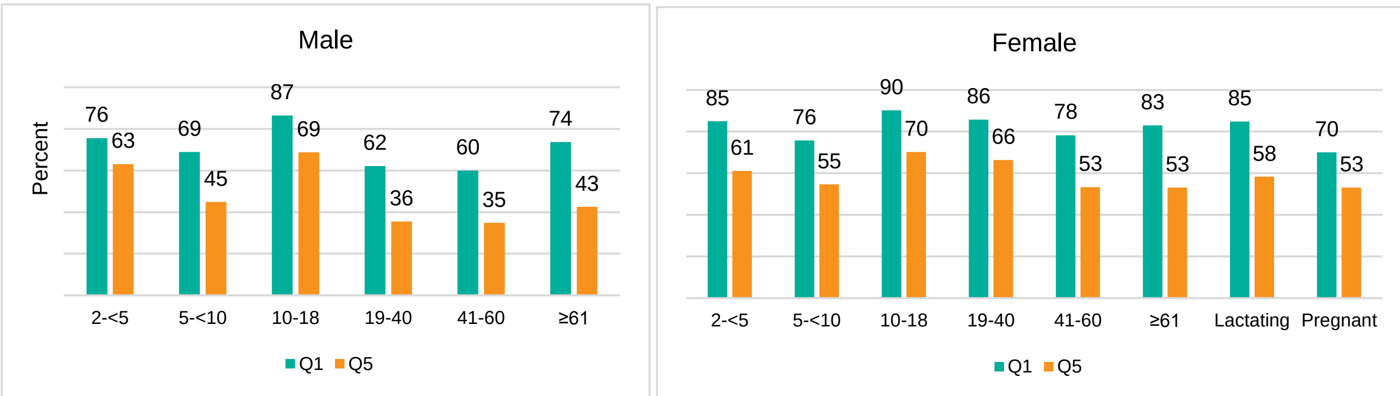
Figure 5.16: Average per capita daily iron intake by age group and sex, 2018/19



Source: IFPRI's Bangladesh Integrated Household Survey (BIHS), 2018/2019, national rural stratum

Figure 5.17 presents insufficient iron intake by sex, age group, and income group. Data from 2018/19 shows that iron deficiency was higher among females across all age groups than males. The intake of iron was lower in the richest quintile compared to the poorest. Despite increased iron requirements during adolescence, pregnancy, and lactation, iron deficiency remained widespread across these life stages, especially among females in the poorest quintile, where rates consistently surpassed 70 percent.

Figure 5.17: Inequity gaps in insufficient intakes of iron, by sex, age group, and income group, 2018/19



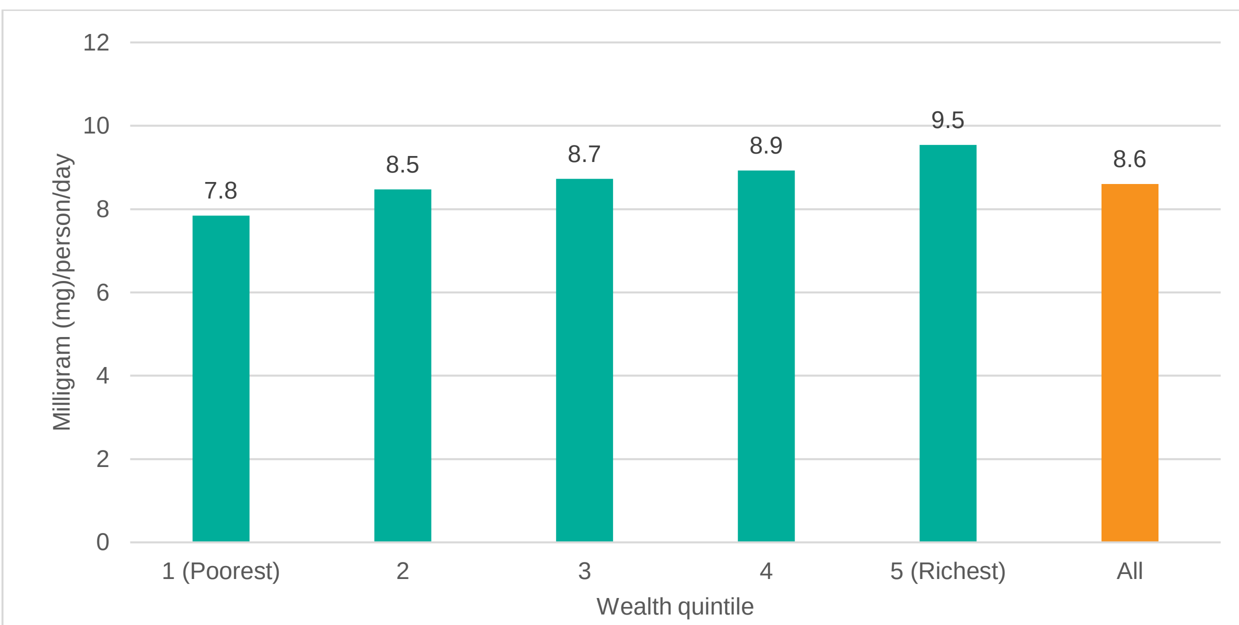
Source: (Nguyen et al. Forthcoming)

Note: Q1=poorest quintile, Q5=richest quintile.

<u>Zinc</u>

Zinc is essential for immune function, growth, and development. Figure 5.18 depicts per capita zinc intake by income group. There is a positive association between average per capita daily zinc intake rises and income, with intake among the richest income group 1.2-times higher than the poorest income group.

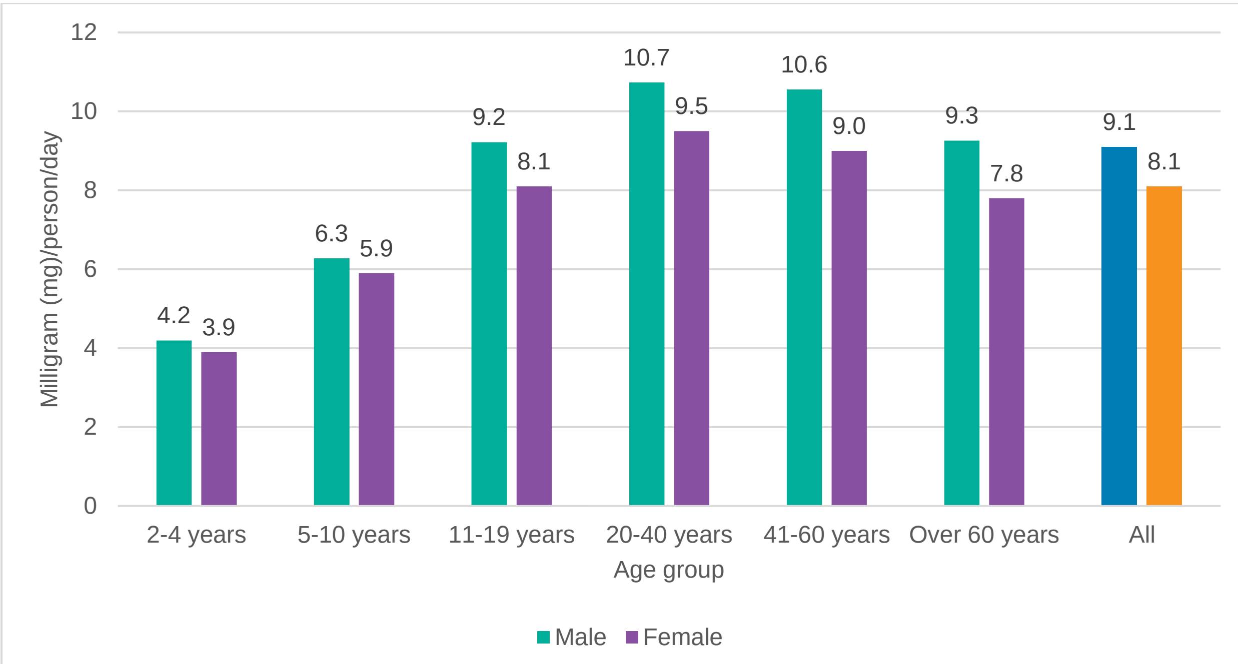
Figure 5.18: Average per capita daily zinc intake, by income group, 2018/19



Source: IFPRI's Bangladesh Integrated Household Survey (BIHS), 2018/2019, national rural stratum (IFPRI 2020)

Figure 5.19 shows that average per capita daily zinc intake was lower for females than males for all age groups at 2018/19. Zinc intake increased as individuals became older (up to 41-60 years), then decreased for individuals over 61 years of age.

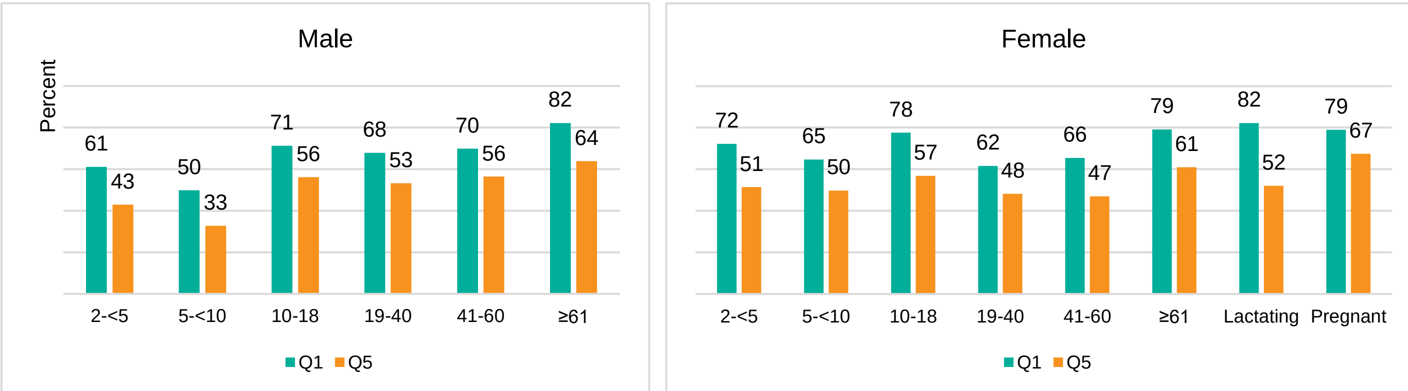
Figure 5.19: Average per capita daily zinc intake, by age group and sex, 2018/19



Source: IFPRI's Bangladesh Integrated Household Survey (BIHS), 2018/2019, national rural stratum

Figure 5.20 shows inequity gaps in zinc intake by sex, age group, and income group. The proportion of insufficient intake was higher in females than males, except for the 19-40 years and 41-60 years age groups. Inequities across wealth quintiles between males and females were evident across all age groups. Despite the increased zinc requirements during pregnancy and lactation for both mother and child, insufficient intake remains notably high, especially in the poorest wealth quintile, with rates exceeding 70 percent.

Figure 5.20: Inequity gaps in insufficient intakes of zinc, by sex, age group, and income group in 2018/19



Source: (Nguyen et al. Forthcoming)

Note: Q1=poorest quintile, Q5=richest quintile

Child nutritional status

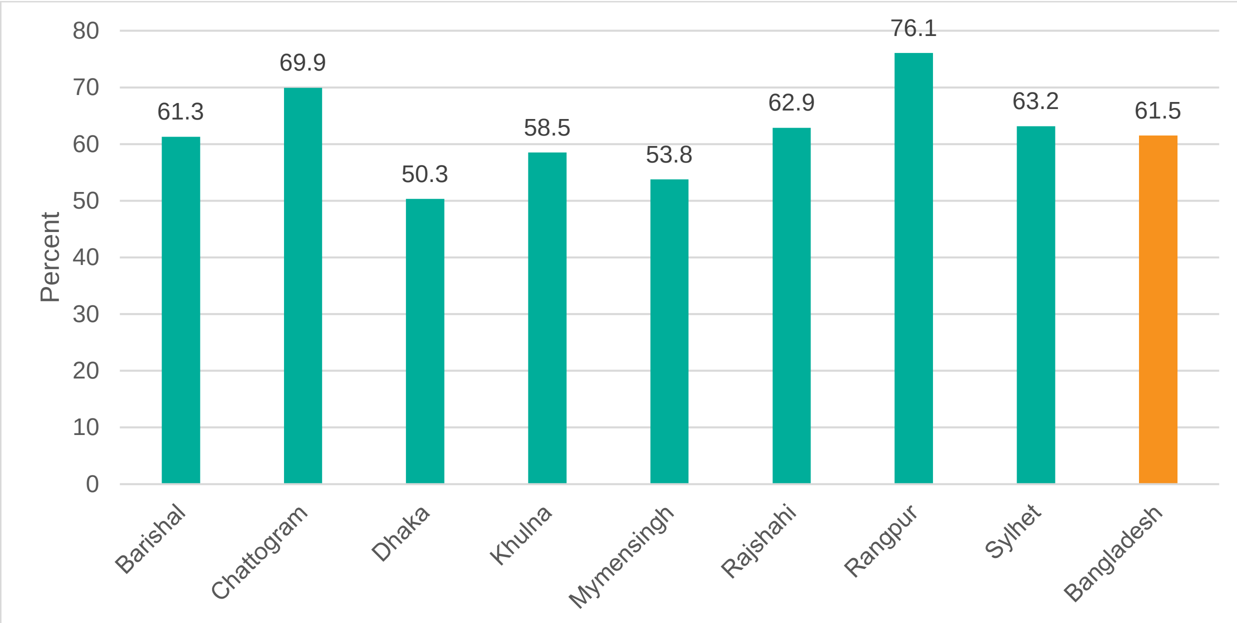
Exclusive breastfeeding

Exclusive breastfeeding is crucial because it provides all the essential nutrients and antibodies an infant need for optimal growth, development, and protection against infections during the first six months of life. The World Health Organization (WHO) defines exclusive breastfeeding as the practice of feeding an infant only breast milk, with no other foods or liquids, not even water, for the first six months of life (World Health Organization 2010b). This means that the infant receives all of its nutritional needs from breast milk alone, with no additional supplemental foods or drinks, except for medicines or vitamin drops as prescribed by a healthcare provider.

Figure 5.21 shows that the overall prevalence of exclusive breastfeeding in Bangladesh was 61.5 percent. The highest prevalence was in Rangpur Division (76.1 percent) and lowest prevalence was in Dhaka Division (50.3 percent).

Table 5.1 also shows the percentage of exclusive breastfeeding under 6 months by 64 districts. In 2019, the highest performing districts were Dinajpur (87.8 percent), Naogaon (84.5 percent), Panchagarh (83.9 percent), Noakhali (82.4 percent), and Rangamati (81.8 percent), and the lowest performing districts were Sirajganj (35.2 percent), Narsingdi (36.2 percent), Rajbari (40.8 percent), Khulna (41 percent), and Tangail (41.0 percent).

Figure 5.21: Percentage of children under 6 months who exclusively breastfed by division, 2019



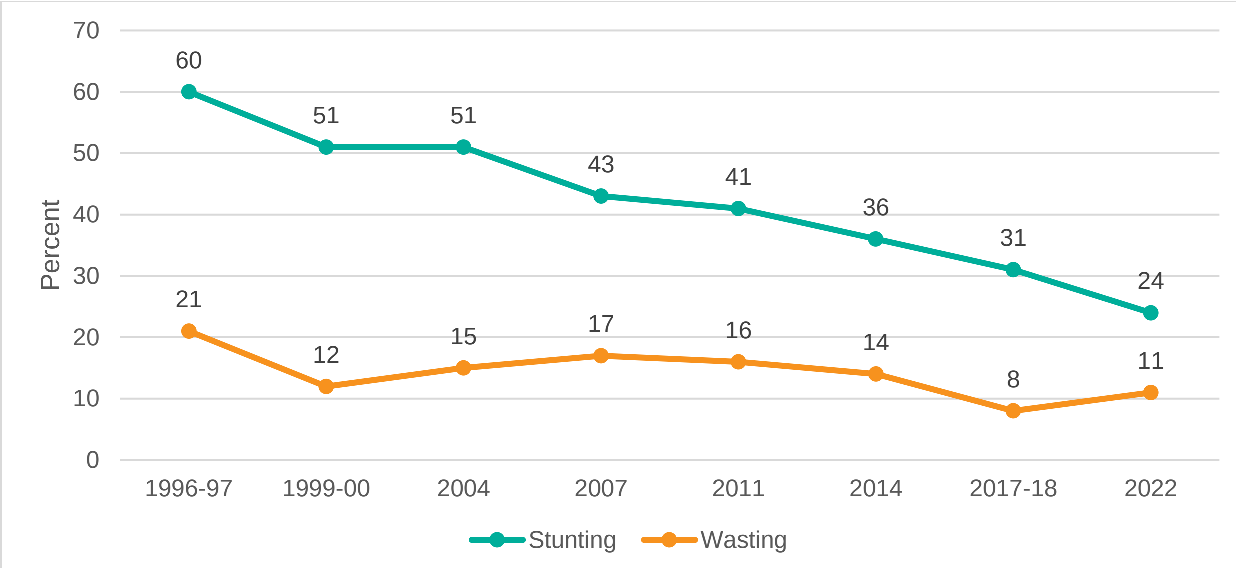
Source: Authors' calculations using the Multiple Indicator Cluster Survey (MICS), 2019

Nutritional status of children

The rate of stunting (low height-for-age) among children under five is a major indicator of the state of chronic undernutrition in the population as a whole. Stunting is an indicator of linear growth retardation, most often due to a prolonged inadequate diet and poor health. It is a height-for-age measurement that reflects chronic undernutrition. This indicator measures the percentage of children 0-59 months who are stunted, as defined by a height-forage Z-score more than two standard deviations (SD) below the median of the 2006 WHO Child Growth Standard (<-2SD). Meanwhile, the rate of wasting (low weight-for-height) among children under five is a key indicator of acute undernutrition, reflecting recent and severe weight loss. Wasting is measured by the percentage of children 0-59 months whose weight-for-height Z-score is more than two standard deviations (SD) below the median of the 2006 WHO Child Growth Standard (<-2SD), often caused by insufficient food intake or illness.

Figure 5.22 represents the trends of stunting and wasting of children under 5 years of age from 1996/97 to 2022. Stunting among children under five years has decreased steadily from 60 percent in 1996/97 to 24 percent in 2022. On the other hand, wasting followed a more variable trend over the years, decreasing from 17 percent in 2007 to 8 percent in 2017/18, but then rising again to 11 percent by 2022. This increase between 2017/18 and 2022 is likely attributed to food insecurity due to the COVID-19 pandemic (UNICEF 2020).

Figure 5.22: Trends of stunting and wasting of children under age 5, 1996-97 to 2022



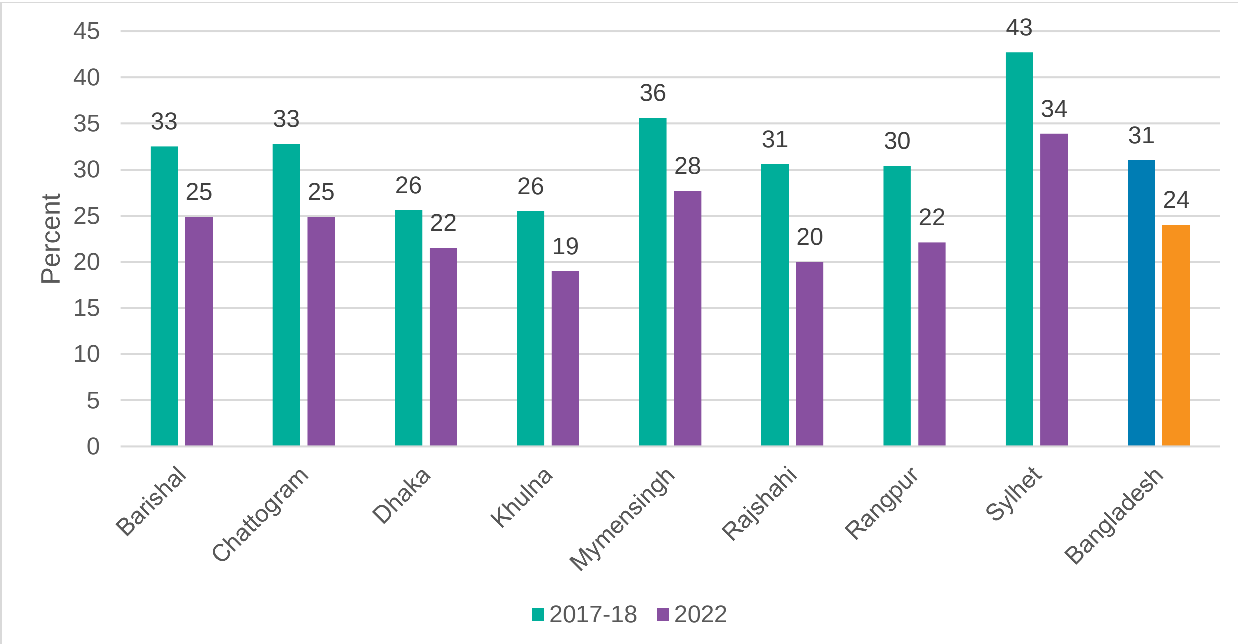
Source: Bangladesh Demographic and Health Survey (BDHS), 1996-97 to 2022, national

Figures 5.23 and 5.24 provide stunting and wasting by division in 2017/18 and 2022. While stunting decreased across all divisions during this time period, the prevalence of wasting increased across all divisions. Sylhet Division reported the highest prevalence of stunting in both 2017/2018 and 2022. The prevalence of wasting was highest in Sylhet Division in 2017/18 but in 2022, the highest prevalence was in Barishal Division.

Table 5.2 provides district-level estimates on stunting and wasting. The prevalence of stunting was highest in Sunamganj (44.2 percent), Panchagarh (40.2 percent), Bhola (38 percent), Sylhet (37.3 percent) and Netrokona (36.7 percent). The prevalence of stunting was lowest in Natore (18.2 percent), Khulna (17.2 percent), Rangpur (15.9 percent), Meherpur (15.6 percent), and Kushtia (15.3 percent).

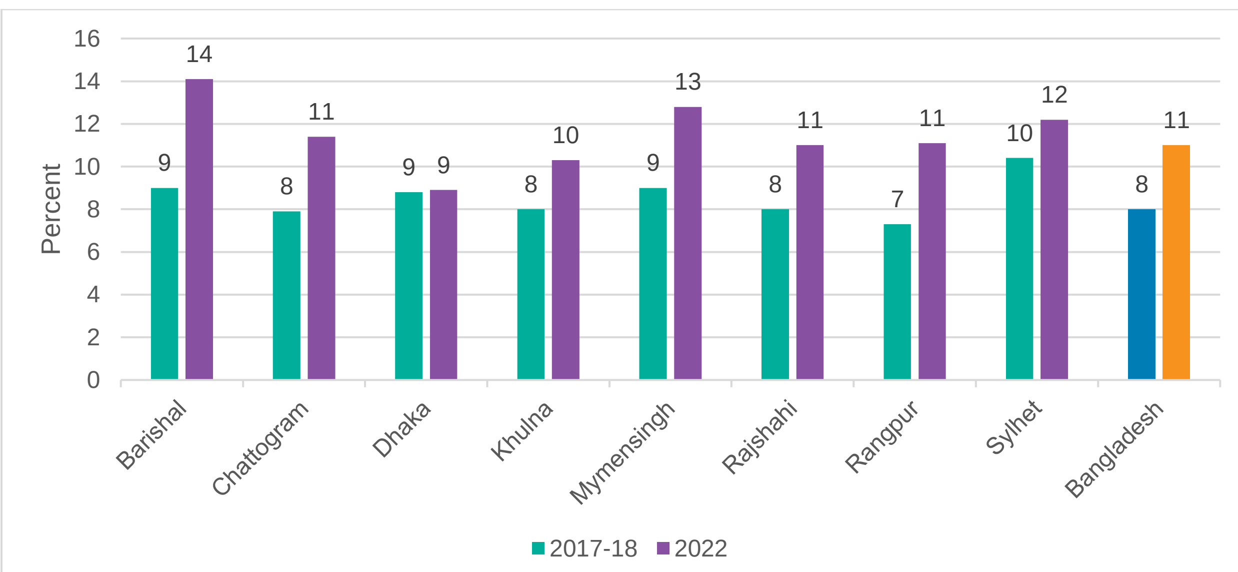
For wasting, the highest prevalence districts included Lakshmipur (15.5 percent), Sherpur (15.2 percent), Moulvibazar (15.0 percent), Bandarban (14.4 percent) and Tangail (14.1 percent). In contrast, the districts with the lowest prevlalence included Narayanganj (6.6 percent), Jhalokathi (6.5 percent), Chapai Nawabganj (4.8 percent), Manikganj (4.8 percent), and Khagrachhari (4.0 percent).

Figure 5.23: Prevalence of stunting, by division, 2017/18 and 2022



Source: Bangladesh Demographic and Health Survey (BDHS), 2017/18 and 2022, national

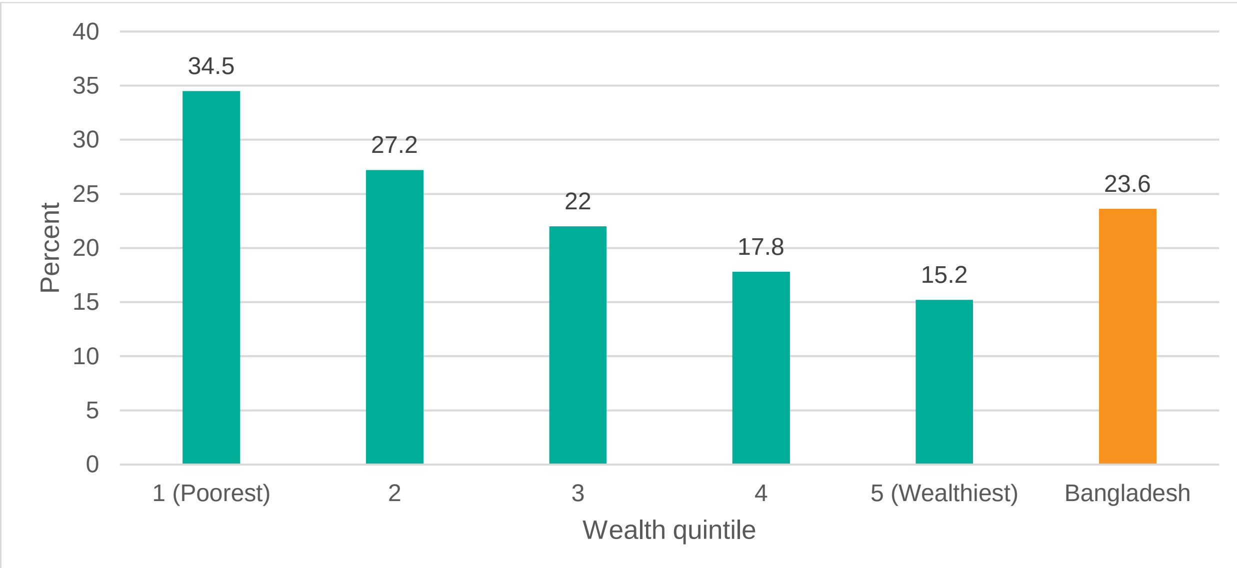
Figure 5.24: Prevalence of wasting, by division, 2017/18 and 2022



Source: Bangladesh Demographic and Health Survey (BDHS), 2017/18 and 2022, national

Figure 5.25 shows the changes in the prevalence of stunting by wealth quintile nationally. The prevalence of stunting is highest among the poorest quintile and lowest among the wealthiest quintile.Specifically, the BDHS 2022 data show that poor children under five were over twice as likely to be stunted compared to children under five from the wealthiest 20 percent of households.

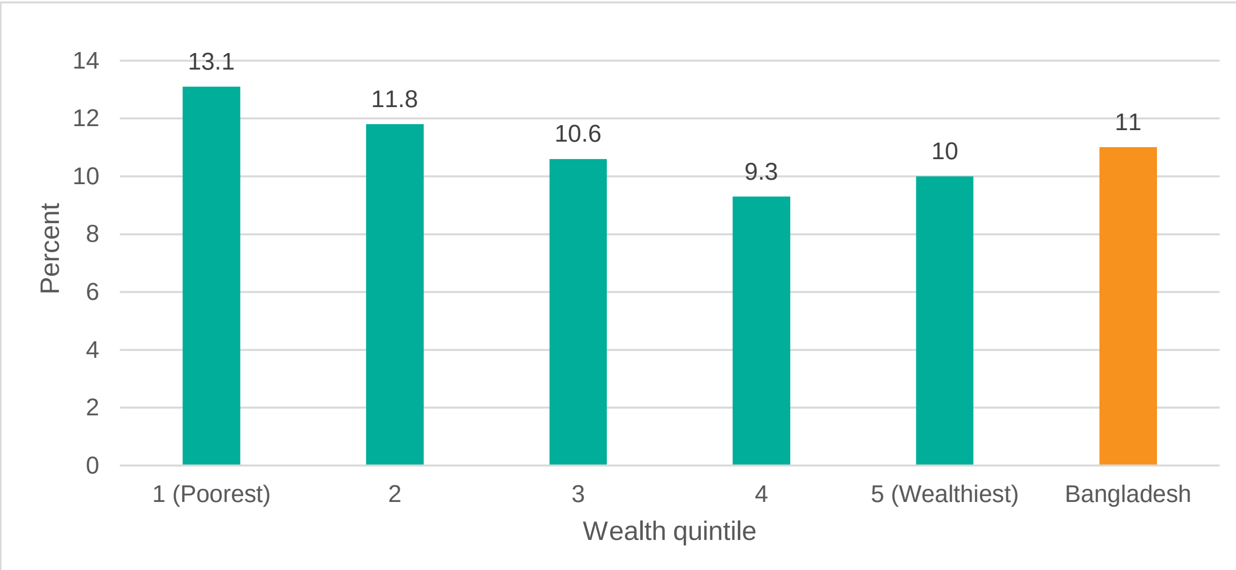
Figure 5.25: Prevalence of child stunting (0 to 59 months), by wealth quintile, 2022



Source: Bangladesh Demographic and Health Survey (BDHS), 2022, national

Figure 5.26 illustrates the prevalence of wasting by income. There is an inverse relationship between wasting and income, with the prevalence of wasting decreasing as income rises, except among the wealthiest 20 percent of households, where the trend diverges.

Figure 5.26: Prevalence of child wasting (0 to 59 months), by wealth quintile, 2022



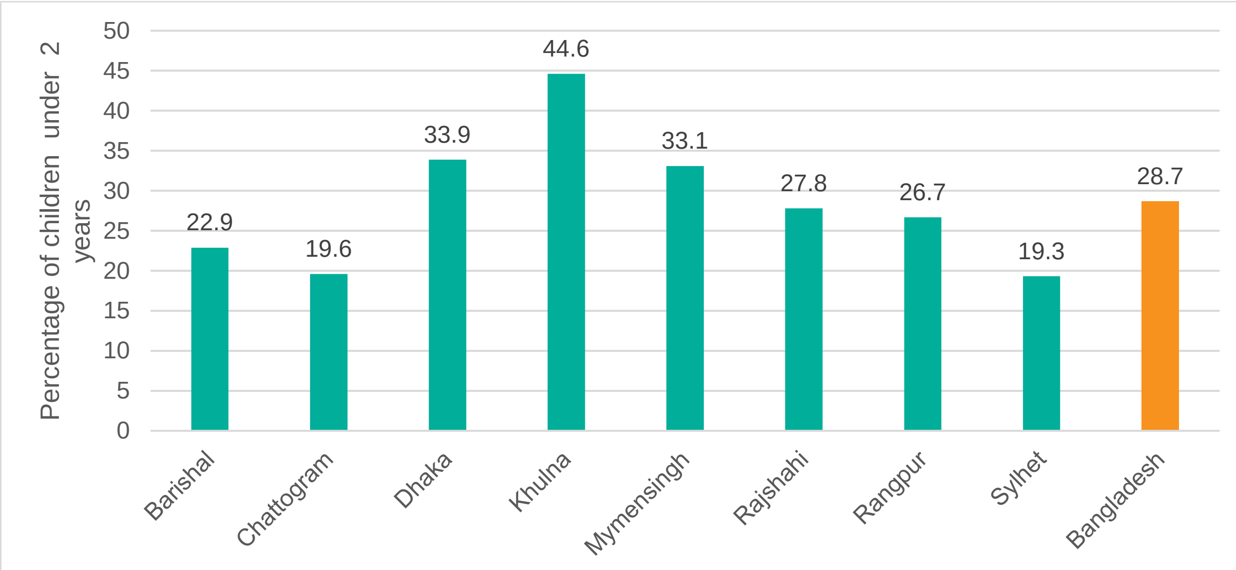
Source: Bangladesh Demographic and Health Survey (BDHS), 2022, national

Dietary diversity of children

Minimum Acceptable Diet (MAD) is a composite indicator of minimum dietary diversity and meal frequency of children 6-23 months of age from the previous day (World Health Organization 2010a; 2010b). Figure 5.27 depicts the percentage of MAD in 2022. Overall, more than one-quarter of children 6-23 months of age (28.7 percent) received a minimum acceptable diet. Among children 6-23 months of age, Khulna Division had the highest percentage of children receiving a minimum acceptable diet of children, whereas Sylhet Division had the lowest.

Table 5.3 shows MAD district-level estimates for all 64 districts. The districts with the highest percentages of children achieving minimum dietary diversity included Barguna (55.8 percent), Meherpur (48.3 percent), Kushtia (45.8 percent), Patuakhali (43.3 percent) and Satkhira (43.1 percent). The lowest performing districts were Sunamganj (8.5 percent), Sherpur (9.0 percent), and Lalmonirhat (9.6 percent).

Figure 5.27: Percentage of minimum acceptable diet of children under 2 years of age, by division, 2022



Source: Bangladesh Demographic Health Survey (BDHS), 2022, national

Women's nutrition

Adolescent pregnancy

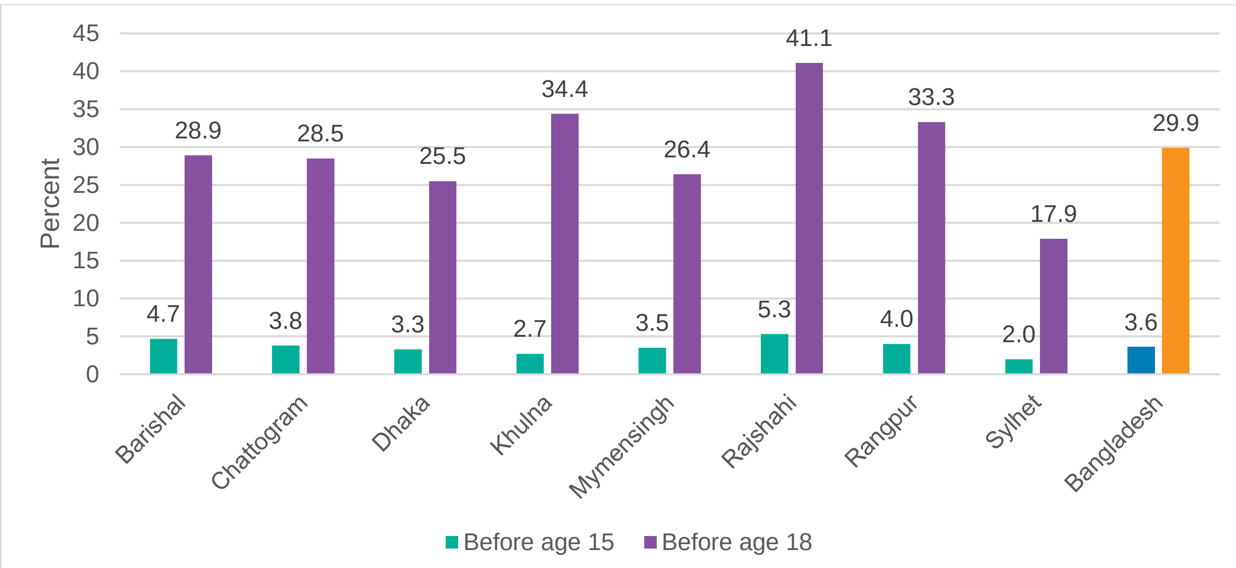
Adolescence is a period of rapid growth and physical change, during which nutritional requirements increase significantly. Pregnancy during adolescence further heightens these nutritional demands and increases the risk of adolescent girls becoming shorter, thinner, or having depleted energy and micronutrient stores if their needs are not met. Pregnancy during this critical growth phase results in competition for nutrients between the mother and fetus—a competition the fetus often loses (Osmani et al. 2016). Inadequate nutrition among pregnant adolescents can lead to adverse pregnancy outcomes, such as low birthweight, preterm delivery, and severe neonatal conditions. It may also impair the physical growth of children born to adolescent mothers, contributing to stunting and underweight (Nguyen et al. 2019), both of which are linked to poor outcomes in childhood and later life (Black et al. 2013). As such, adolescent pregnancy plays a key role in perpetuating the intergenerational cycle of growth failure (Martorell and Zongrone 2012).

Figure 5.28 shows the percentage of women with live births before ages 15 and 18, by division. The overall percentages of women with live births before ages 15 and 18 were 3.6 percent and 29.9 percent, respectively. The highest prevalence for both age groups was in Rajshahi and the lowest prevalence was in Sylhet Division.

Table 5.4 shows the percentage of women who reported a live birth for all 64 districts. The districts with the highest live birth rates in 2019 were Chapai Nawabganj (11.4 percent) followed by Rajshahi (7.5 percent). The districts with the lowest rates were Habiganj (0.7 percent) and Madaripur (0.8 percent).

Table 5.4 shows the percentage of women who reported a live birth before age 15 and 18 by district. The districts with the highest percentage of women who reported a live birth before age 18 were Chapai Nawabganj (53.5 percent), followed by Rajshahi (45.1 percent). The districts with the lowest rates of live birth before age 18 were Madaripur (14.7 percent) and Sylhet (14.8 percent).

Figure 5.28: Percentage of women with live birth before age 15 and 18, by division, 2019



Source: Authors' calculations using the Multiple Indicator Cluster Survey (MICS) 2019, Bangladesh

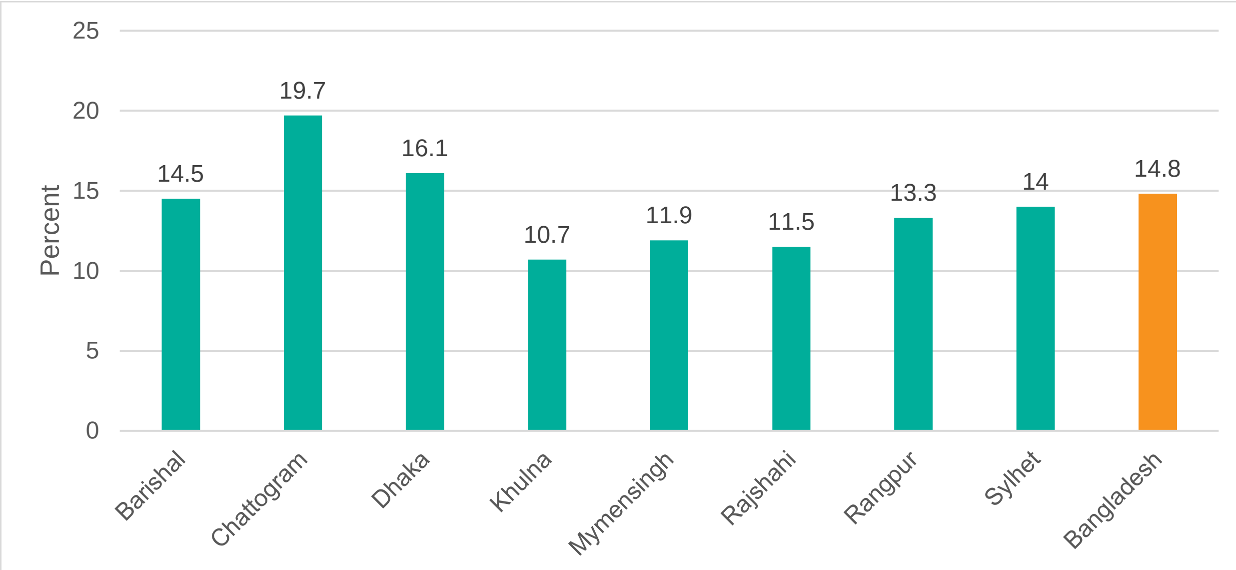
Low birth weight

Low birth weight (LBW), defined as a birth weight of less than 2,500 grams, increases the risk of infant mortality and can lead to delayed development. The nutritional status of the mother during pregnancy significantly influences the birth weight of the baby.

Figure 5.29 shows the percentage of LBW by division. In 2019, the overall percentage of LBW was 14.8 percent. The highest prevalence was in Chattogram Division (19.7 percent) and lowest was in Khulna Division (10.7 percent).

Table 5.5 shows that, at the district-level, the highest LBW rates were in Chattogram (26.4 percent), Lalmonirhat (23.5 percent) and Faridpur (23.5 percent). In contrast, the lowest rates were in Joypurhat (1.8 percent), Narail (4.7 percent) and Dinajpur (4.9 percent).

Figure 5.29: Percentage of low birth weight (below 2,500 grams), by division, 2019



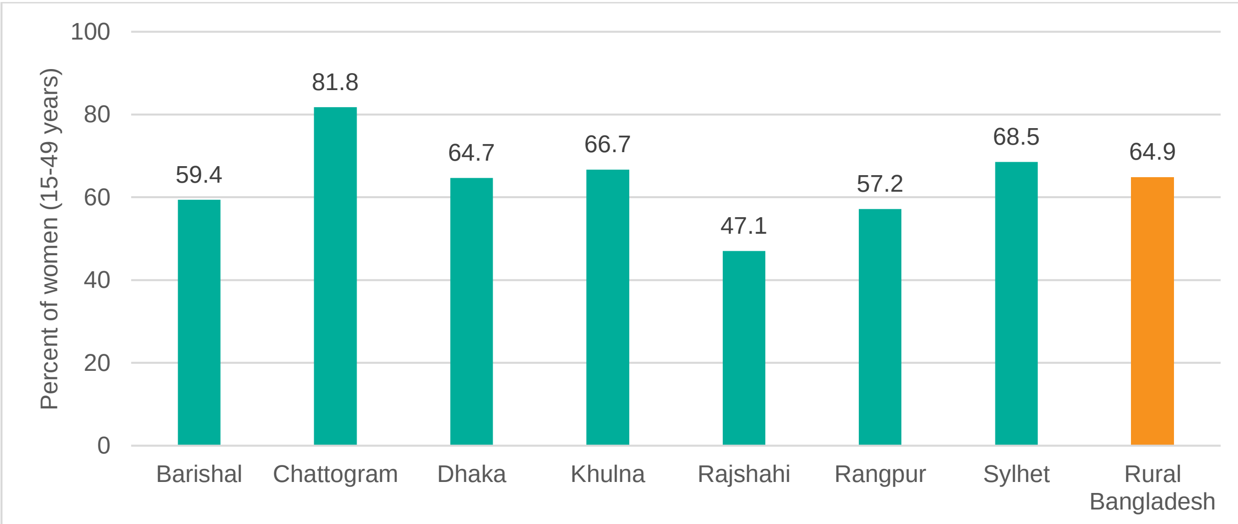
Source: Authors' calculations using the Multiple Indicator Cluster Survey (MICS) 2019, Bangladesh

Women's dietary diversity

Minimum Dietary Diversity for Women (MDD-W) is defined as the proportion of women aged 15-49 who have consumed foods from at least five out of ten specified food groups in the 24 hours before the survey (FANTA n.d.) (FANTA n.d.). This measure helps assess the variety in women's diets, reflecting their nutritional diversity. The food groups are: (1) grains, roots, and tubers; (2) legumes and beans; (3) nuts and seeds; (4) dairy products; (5) eggs; (6) flesh foods, including organ meat and miscellaneous small animal protein; (7) vitamin A-rich dark green leafy vegetables; (8) other vitamin A-rich vegetables and fruits; (9) other fruits; and (10) other vegetables.

Figure 5.30 shows the percentages of all women of reproductive age (15-49 years of age) who have achieved MDD-W by division. The overall percentage of MDD-W in rural Bangladesh was 64.9 percent. MDD-W was highest in Chattogram Division (81.8 percent) and lowest in Rajshahi Division (47.1 percent). Achievements in MDD-W were similar for Dhaka (64.7 percent), Khulna (66.7 percent), and Sylhet (68.5 percent) Divisions.

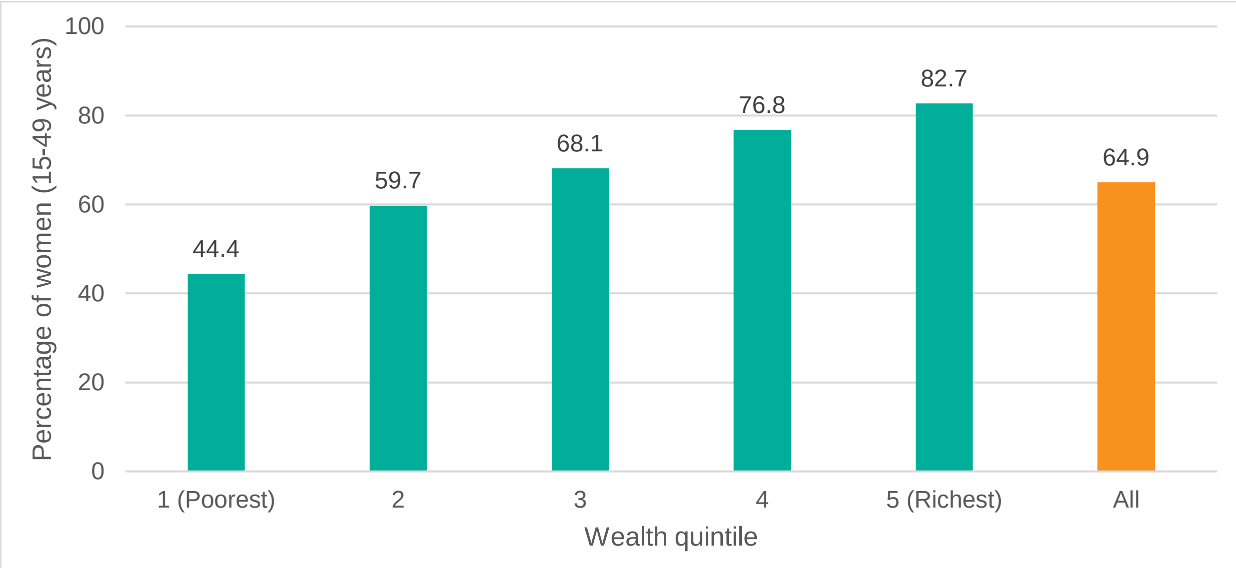
Figure 5.30: Percentage of women of reproductive age achieving the minimum dietary diversity, by division, 2018/19



Source: IFPRI's Bangladesh Integrated Household Survey (BIHS), 2018/2019, national rural stratum

Figure 5.31 shows the MDD-W for women of reproductive age by income group. There was a strong positive association between MDD-W and income. MDD-W was highest among the wealthiest group (82.7 percent of women of reproductive age), while it was lowest among the poorest group (44.4 percent of women of reproductive age). This suggests that higher income levels are linked to better access to diverse diets, which is critical for meeting nutritional needs. This suggests that higher income levels are linked to better access to diverse diets, which is critical for meeting nutritional needs.

Figure 5.31: Percentage of women of reproductive age achieving the minimum dietary diversity, by wealth quintile, 2018/19



Source: IFPRI's Bangladesh Integrated Household Survey (BIHS), 2018/2019

WATER, SANITATION, AND HYGIENE (WASH)

Water, sanitation, and hygiene (WASH) refers to access to clean water, improved sanitation facilities and improved hygiene practices. WASH is crucial for nutritional status because it prevents the spread of diseases and infections that can impair nutrient absorption, contribute to malnutrition, and affect overall health. Clean water and proper sanitation reduce the risk of gastrointestinal illnesses, which can hinder growth and nutrient uptake, while good hygiene practices help maintain overall health and well-being.

Table 5.6 presents district-level estimates of 64 districts for three indicators: 1) improved source of drinking water, 2) handwashing facilities with soap and water, and 3) improved sanitation facilities.

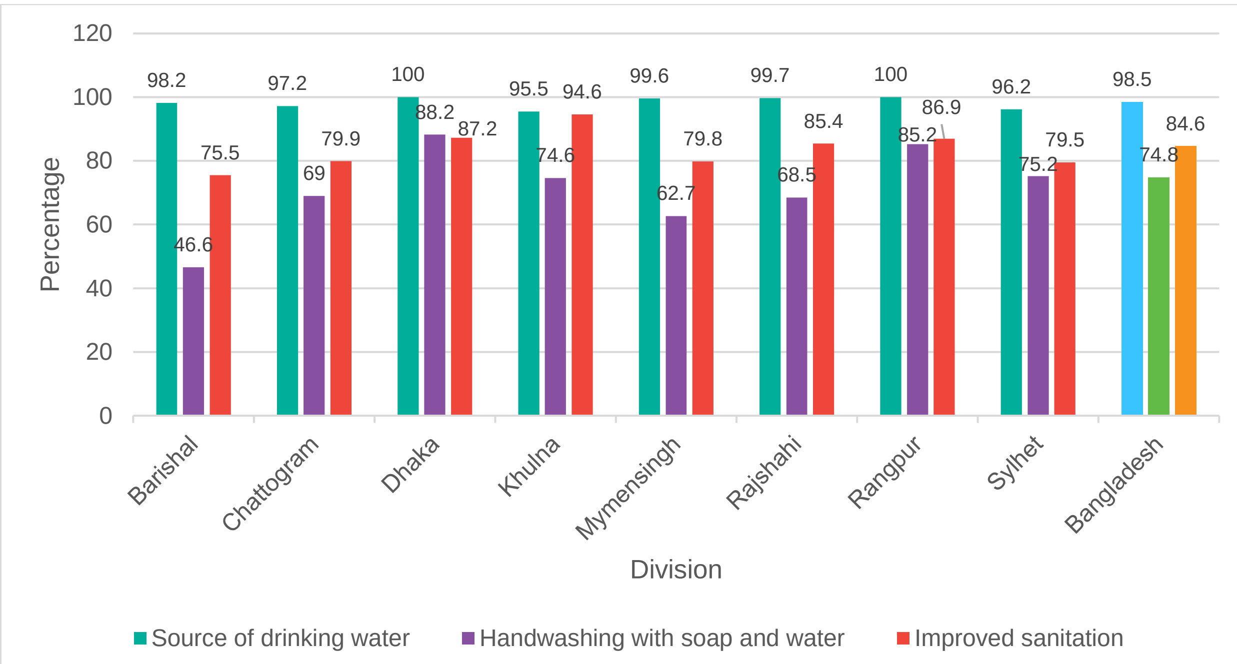
For improved source of drinking water, 34 of 64 districts achieved 100 percent coverage. The lowest performing districts were Bandarban (56.8 percent) and Rangamati (59.2 percent), which are located in the hill tract districts of Chattogram Division.

For handwashing facilities with soap and water, the highest performing districts included Narsingdi (97.3 percent), Tangail (95.7percent), Rangpur (95.6 percent), Gazipur (94.6 percent), and Dhaka (94.1 percent). Among the highest performing districts, all districts except Rangpur belong to Dhaka Division. The lowest performing districts were Pirojpur (31.8 percent), Bagerhat (41 percent), and Barguna (42 percent).

Improved sanitation facilities include pit latrine with slab, ventilated improved pit latrine, a flush latrine, a pour-flush toilet, or a composting toilet. The highest performing districts in terms of improved sanitation facilities were Narail (99.4 percent), Gopalganj (98.4 percent) and Tangail (98.2 percent). The lowest performing districts were Bandarban (43.1 percent), Cox's Bazar (52.4 percent) and Rangamati (54.8 percent) which are located in the Hill Tracts regions of Chattogram Division.

Figure 5.32 shows the percentage of drinking water, handwashing with soap and water, and improved sanitation by division. For improved source of drinking water, all divisions have satisfactory achievement, with an overall percentage of 98.5 percent.

Figure 5.32: Percentage of improved source of drinking water, handwashing with soap and water and improved sanitation, 2019



Source: Authors' calculations using the Multiple Indicator Cluster Survey (MICS) 2019, Bangladesh

Menstrual hygiene

Menstrual hygiene is vital for development as it impacts both health and dignity of girls and women. The experience of menstruation for adolescents and women is influenced by factors such as their physical well-being, financial circumstances, and access to social support and information on menstruation. It is crucial for women of reproductive age to have access to sanitary products for managing menstrual flow and private, hygienic facilities to change, wash, and dispose of sanitary products, as well as maintain personal hygiene through proper washing with soap and water.

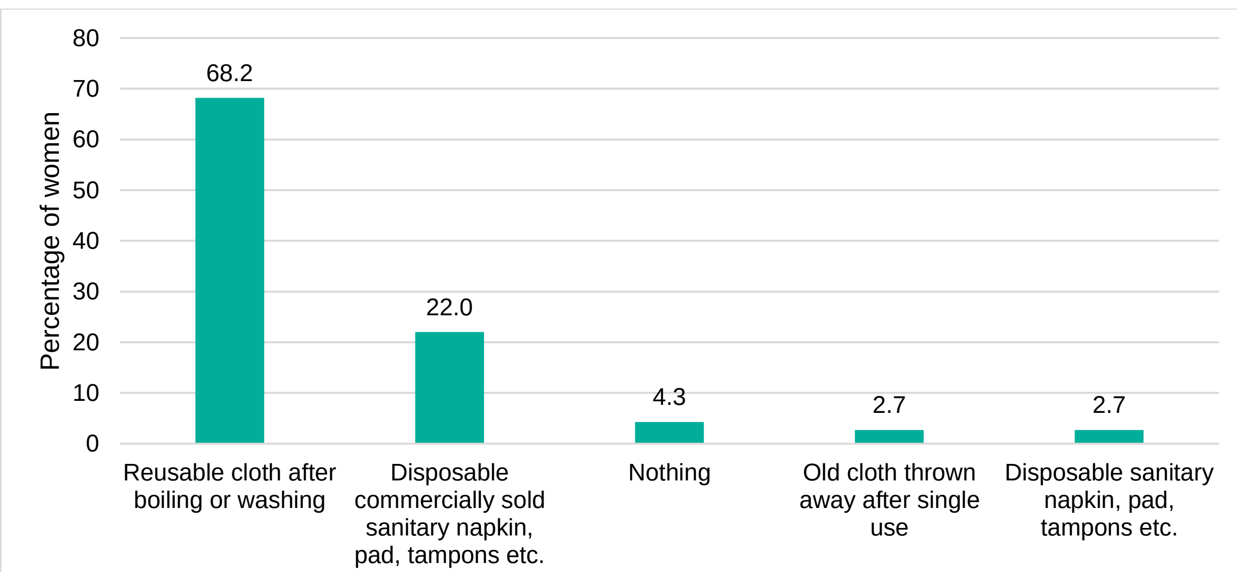
Figure 5.33 presents the types of materials used during menstruation among women 15-49 years of age in rural Bangladesh. Most women used reusable cloth, which is boiled or washed after each use during their menstruation (68 percent) and disposable commercially-sold sanitary napkin, tampon etc. were used by 22 percent of the women of reproductive age. In contrast, 4 percent of women used nothing during their menstruation.

Table 5.7 provides the information on menstrual hygiene, across different divisions of rural Bangladesh. The most popular form of material used during menstruation is reusable cloth (68 percent). Around 68 percent of women used this method during menstruation, with highest percentage of user from Rangpur division (77 percent). Disposable, commercially-sold sanitary napkin, pad, tampons etc. were most popular among women from Khulna and Dhaka (26 percent and 23 percent, respectively).

The proportion of women 15-49 years of age in rural Bangladesh that did not use any material during menstruation (e.g., pad, sanitary napkin, tampon, reusable cloth, etc.) was 4.3 percent. Among those who do not use disposable sanitary napkins/pads/tampons, the leading reasons were consistent across all divisions: it is expensive, followed by not feeling comfortable. When interviewed about the disposal of the sanitary napkin/pad/cloth etc., the most common disposal methods were burning and throwing away, with a substantial number of people reporting methods that do not apply or were unspecified.

Most women in rural Bangladesh change their pads/cloth two or three times in one day on average (75 percent).

Figure 5.33: Type of material used during menstruation of women age (15-49), 2018/19



Source: IFPRI's Bangladesh Integrated Household Survey, 2018/19, national rural stratum

CHAPTER 6 WOMEN'S EMPOWERMENT

Women's empowerment is essential for enhancing food security and improving dietary diversity, particularly in the context of Bangladesh. IFPRI's research in Bangladesh, based on IFPRI's nationally representative Bangladesh Integrated Household Survey (BIHS), shows that empowering women improves household food security and increases dietary diversity among children, women, and other family members (Malapit et al. 2015; Sraboni et al. 2014), and women's empowerment is linked with agricultural production diversity and dietary diversity (Sraboni et al. 2014). IFPRI's research using nationally representative panel data found that women's empowerment is a key factor in breaking chronic and transient poverty (Ahmed and Tauseef 2022).

Although women's empowerment has a profound impact on food security and agriculture, women face persistent economic and social constraints. Closing the gender gap in agriculture is critical to increasing agricultural productivity and efficiency, reducing hunger and malnutrition, and achieving food security. This chapter presents findings on women's empowerment using the Women's Empowerment in Agriculture Index (WEAI) (Alkire et al. 2013).

OVERVIEW

The BIHS collected the data required for constructing the WEAI for rural Bangladesh. WEAI is the first ever measure to directly capture women's empowerment and inclusion in the agriculture sector. The WEAI measures empowerment in five domains. The production domain assesses the ability of individuals to provide input and autonomously make decisions about agricultural production. The resources domain reflects individuals' control over and access to productive resources. The income domain monitors individuals' ability to direct the financial resources derived from agricultural production or other sources. The leadership domain reflects individuals' social capital and comfort speaking in public within their community. The time domain reflects individuals' workload and satisfaction with leisure time. The WEAI aggregates information collected for each of the five domains into a single empowerment indicator.

The index is composed of two sub-indices: (1) the Five Domains of Empowerment sub-index (5DE), which measures the empowerment of women in the five empowerment domains; and (2) the Gender Parity Index (GPI), which measures the relative empowerment of men and women within the household. The WEAI questionnaire is asked of the primary adult male and female decision-maker in each household and compares the 5DE profiles of women and men in the same household. The primary adult decision-makers are individuals aged 18 or older who are self-identified as the primary male or female decision-maker during the collection of the household roster.[13] The WEAI score is computed as a weighted sum of the 5DE and the GPI. Please see Appendix 5 for more information on WEAI methodology.

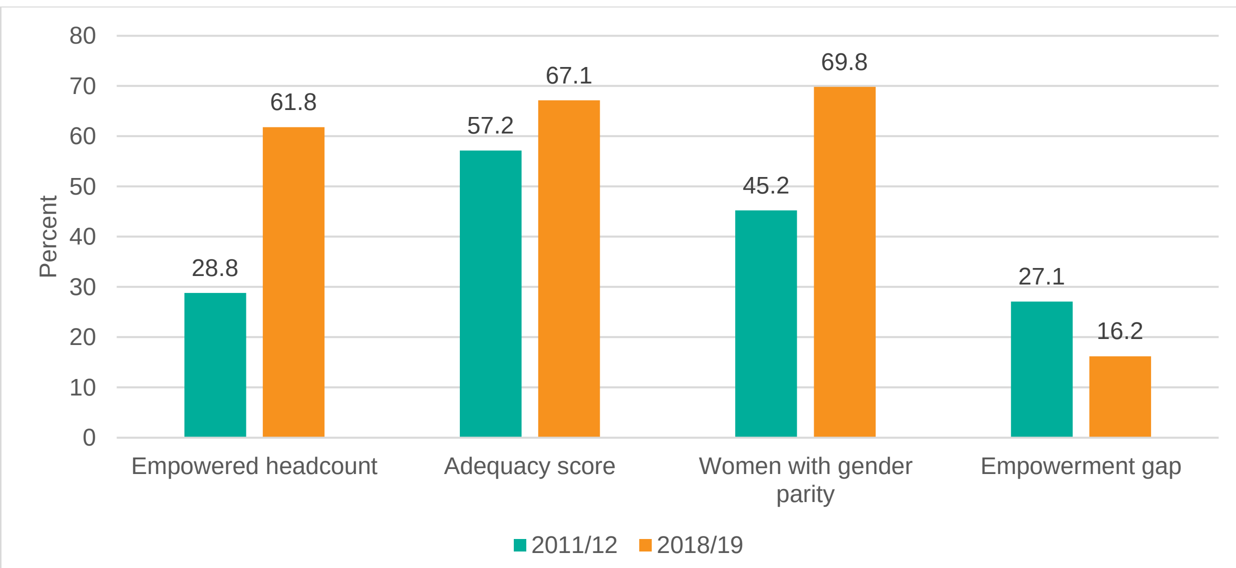
RESULTS AND DISCUSSION

Figure 6.1 features the empowerment headcount, adequacy score, percentage of women who have gender parity with their male counterpart, and empowerment gap between 2011/12 and 2018/19.

There were remarkable improvements in empowerment: less than one-third (29 percent) of women were empowered in 2011/12, which doubled to 61.8 percent by 2018/19. The percentage of weighted indicators in which disempowered individuals have adequate achievements increased from 57 percent to 67 percent.

The proportion of women achieving gender parity was 45 percent in 2011/12 compared with 69.8 percent in 2018/19. An increase in women's empowerment, in turn, shrank the empowerment gap, from 27.1 percent in 2011/12 to 16.2 percent in 2018/19.

Figure 6.1: Changes in women's empowerment status, 2011/12 and 2018/19



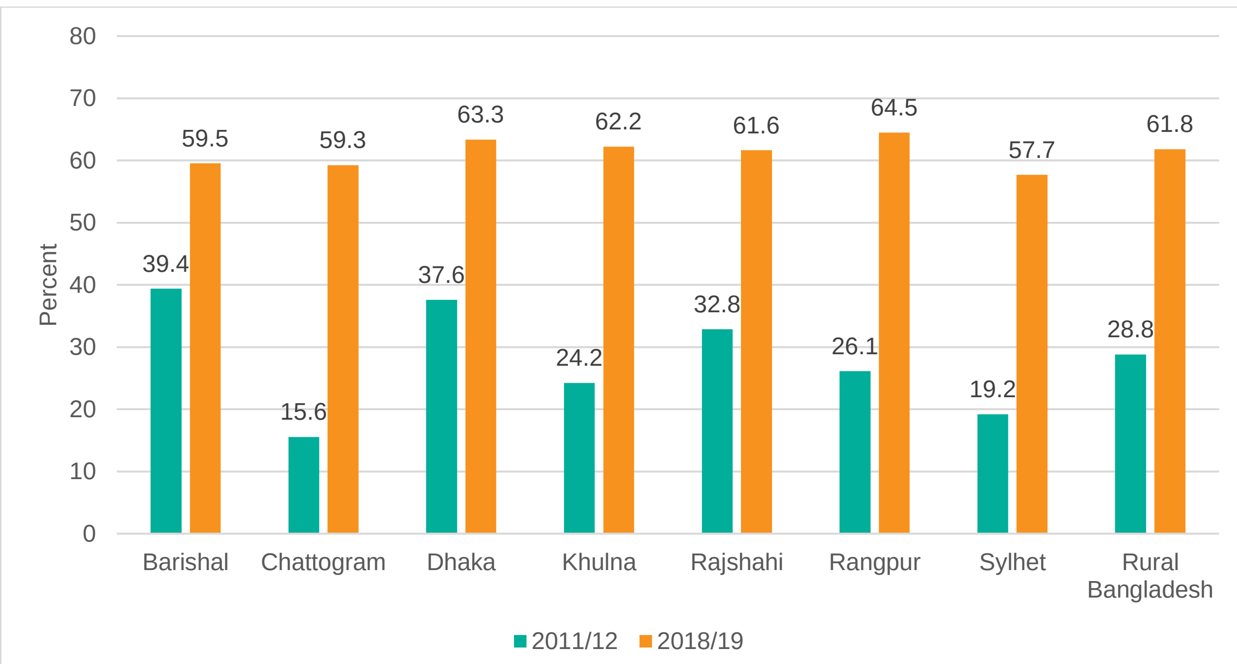
Source: IFPRI's Bangladesh Integrated Household Survey (BIHS), 2011/12 and 2018/19, national rural stratum

[13] The respondents of the WEAI questionnaire are only the primary decision-makers in the household and, therefore, may not be representative of the entire female and male populations in the surveyed area.

Figure 6.2 shows the changes in the percentage of empowered women from 2011/12 to 2018/19 across the seven divisions and in rural Bangladesh overall. In all divisions, the percentage of empowered women increased. In 2011/12, Barishal had the highest proportion of empowered women, followed by Dhaka (39.4 percent and 37.6 percent, respectively), whereas the lowest proportions of empowered women were in Chattogram and Sylhet divisions (15.6 percent and 19.2 percent, respectively).

A division-wide analysis in 2018/19 shows a different picture: the highest percentage of empowered women is now in Rangpur Division (64.5 percent), followed by Dhaka (63.3 percent), and Khulna (62.2 percent). High rates of disempowerment, however, persist in Sylhet and Chattogram divisions, with the percentages of empowered women at 57.7 percent and 59.3 percent, respectively, in 2018/19. Although Barishal was the highest performer in empowerment nearly a decade ago, the results show that advancements in women's empowerment accelerated faster in divisions other than Barishal.

Figure 6.2: Empowered headcount of women, by division, 2011/12 and 2018/19



Source: IFPRI's Bangladesh Integrated Household Survey (BIHS), 2011/2012 and 2018/2019, national rural stratum

Figure 6.3 represents the empowered headcounts of women by income group in 2011/12 and 2018/19. The trend is similar across both survey rounds: the percentage of empowered women gradually increases from the poorest income group until the fourth group (23 percent to 32 percent in 2011/12, respectively, and 58 percent to 65 percent at 2018/19, respectively), yet slightly dipped among households in the richest income group (30 percent in 2011/12 and 62 percent in 2018/19).

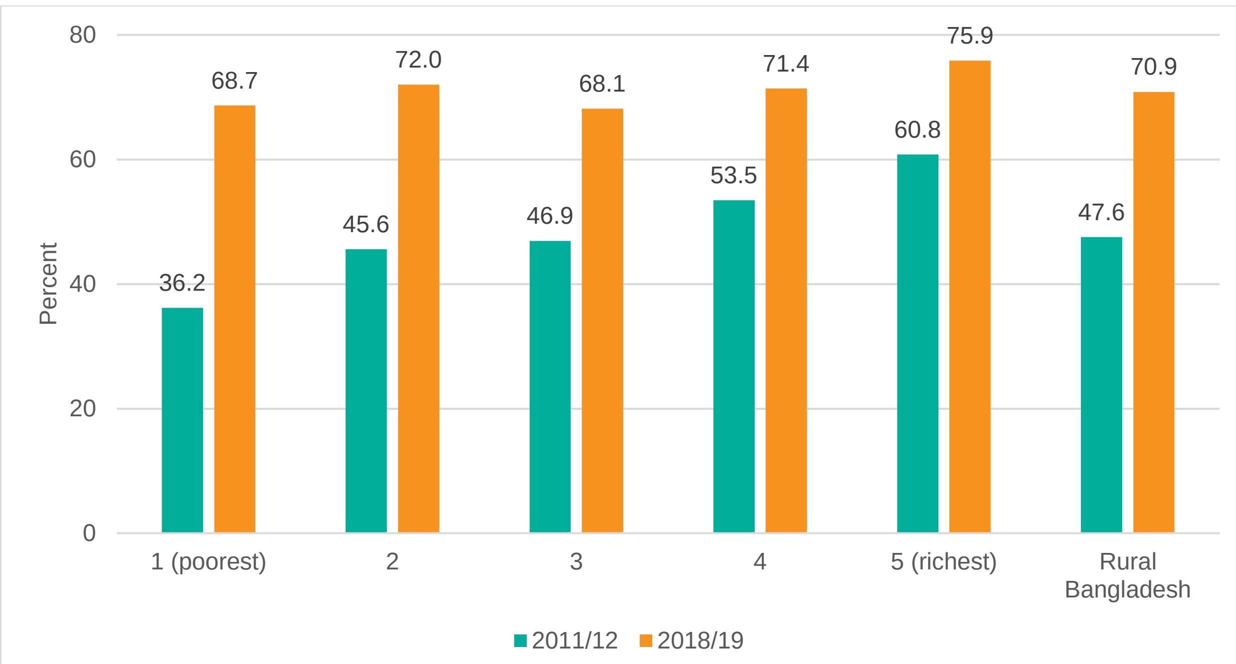
Figure 6.3: Empowered headcount of women, by income group, 2011/12 and 2018/19

Source: IFPRI's Bangladesh Integrated Household Survey (BIHS), 2011/2012 and 2018/2019, national rural stratum

Figure 6.4 shows the percentage of men in rural Bangladesh who are empowered in 2011/12 and 2018/19 by income group. Overall, the percentage of empowered men increased for all income groups, from less than half (47.6 percent) to 70.9 percent.

In 2011/12, the percentage of empowered men gradually increased from 36.2 percent among the poorest 20 percent of households to 60.8 percent in the richest income group. However, by 2018/19, the association between the percentage of men empowered and income was not as linear. The percentage of empowered men increased from 68.7 percent to 72.0 percent between the poorest income group and the second group, slightly reduced to 68.1 percent at the third group, and then increased to 71.4 percent and 75.9 percent among the top two income groups.

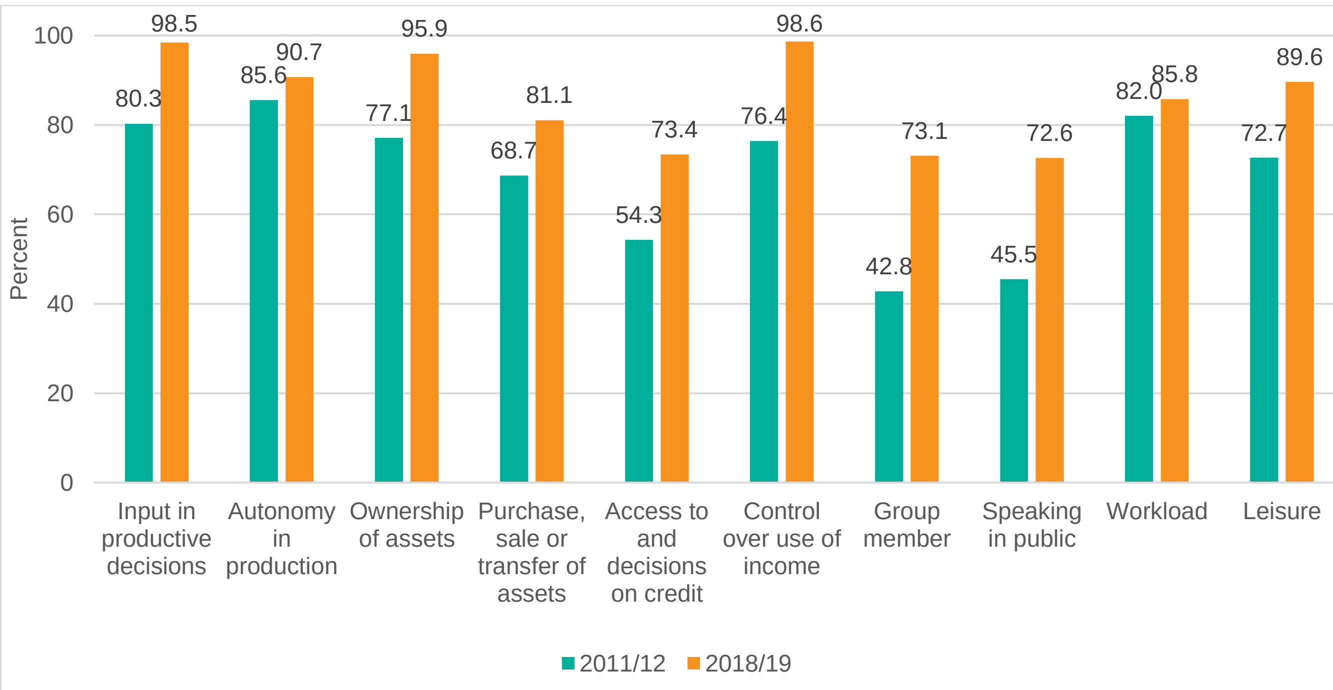
Figure 6.4: Empowered headcount of men, by income group, 2011/12 and 2018/19



Source: IFPRI's Bangladesh Integrated Household Survey (BIHS), 2011/12 and 2018/19, national rural stratum

Figure 6.5 shows the changes in the empowered headcount of women for the ten indicators constructing the five WEAI domains (that is, production, resources, income, leadership, and time) in 2011/12 and 2018/19. Women's empowerment status improved for all indicators. The largest improvements were observed in two indicators that belong to the leadership domain: (1) group membership by 30.3 percentage points, and (2) speaking in public by 27.1 percentage points. The lowest improvement was observed in the workload indicator by 3.8 percentage points and autonomy in production indicator by 5.1 percentage points from 2011/12 to 2018/19.

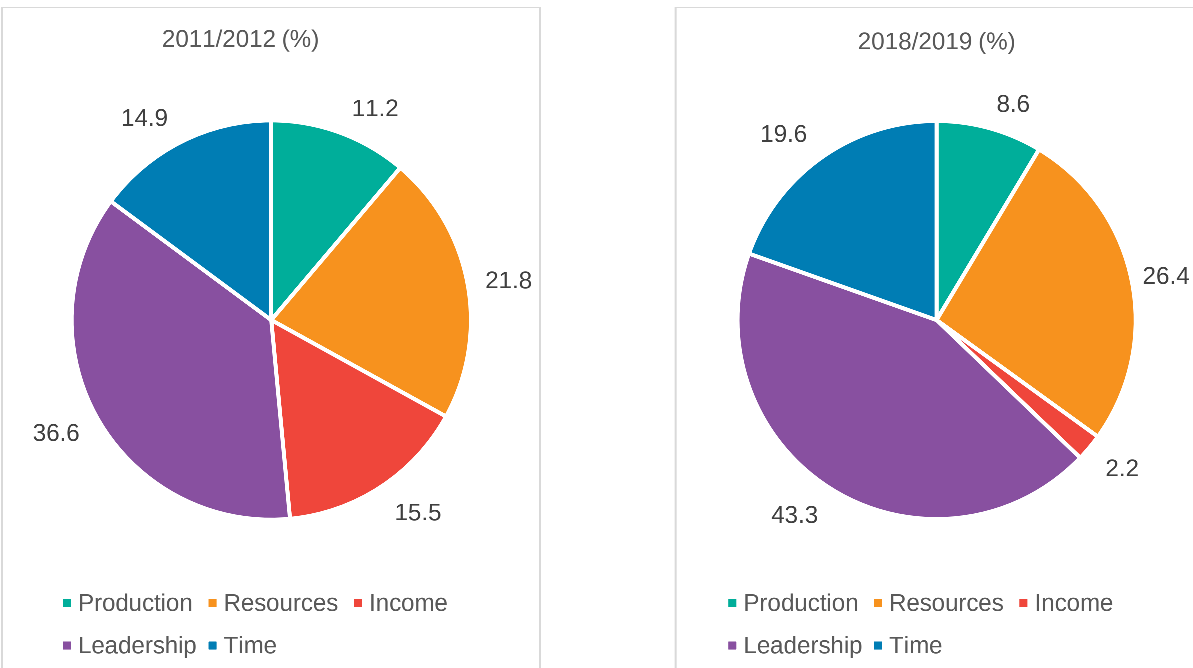
Figure 6.5: Changes in WEAI empowerment headcount of women in 10 sub-domain indicators, 2011/12 and 2018/19



Source: IFPRI's Bangladesh Integrated Household Survey (BIHS), 2011/12 and 2018/19, national rural stratum

Figure 6.6 shows the leading constraints to women's disempowerment in 2011/12 and 2018/19, broken down by the five WEAI domains. Across both survey rounds, the major contributors to women's disempowerment were leadership and influence in the community, representing 37 percent and 43 percent at baseline and at endline, respectively. Women's lack of control over resources became an even more significant contributor to women's disempowerment, increasing from 22 percent to 26 percent over the seven-year reference period, as has the contribution of time poverty, from 15 percent to 20 percent. However, women's *disempowerment* as a result of control over income and decision-making power related to production have both diminished by 13.3 percentage points and 2.6 percentage points, respectively, which suggests that improvements have been made in these areas.

Figure 6.6: Contributions of five WEAI domains to disempowerment of women, 2011/12 and 2018/19



Source: IFPRI's Bangladesh Integrated Household Survey (BIHS), 2011/12 and 2018/19, national rural stratum

CHAPTER 7 GEOGRAPHIC IDENTIFICATION OF FOOD INSECURITY, ENVIRONMENTAL RISKS, AND CLIMATE VULNERABILITIES

INTRODUCTION

Bangladesh, being an economy with limited resources and highly vulnerable to environmental risks and climate shocks, must prioritize certain geographic areas for focused spending. In this chapter, we construct indices for food insecurity, as well as environmental and climate risks for the districts of Bangladesh, aimed at assisting policymakers in efficiently allocating the nation's limited resources. To develop a composite index for food insecurity, we have identified three main domains: food availability, food access, and food utilization at the district level of Bangladesh.

The availability of food at the household level relies on the household's ability to produce food, their food reserves, and the availability of food in local markets. The presence of food in local markets is dependent on market activities, infrastructure, information dissemination, and the seasonal changes in domestic food output. Considering these factors, we have used cropping intensity, irrigation coverage, rice yield rate, per capita fish production, and rural road density as variables to construct an index for district-level food availability. The first four variables represent the status of food and fish output within the district, while the last variable is used as an indicator of farmers' market accessibility by facilitating transportation for production inputs and marketing outputs. Table A7.1 in the Appendix presents the definition and calculation procedure of the variables with the data sources.

Access to food for households is influenced by food prices, household earnings, and their asset base or resources. Persistent poverty contributes to household food insecurity. We utilize four variables to identify a district's poverty status. Firstly, we consider the percentage of the population living below the lower poverty threshold to indicate the extent of extreme poverty. Additionally, we include the poverty gap measure, which quantifies the average shortfall in consumption levels relative to the poverty line. Thirdly, per capita nominal expenditure of the district is utilized as a proxy for income. Finally, the lack of electricity, quantified by the percentage of households without access to electricity, is used to gauge the overall socioeconomic status of the district.

Food utilization, the third component of food security, is linked to nutrition. Though an increase in food availability and accessibility may lead to a reduction in hunger, this doesn't automatically resolve malnutrition. Persistent malnutrition may stem from the complex relationship between food consumption and illness, which affects the way the body uses food. This process is further affected by the general health and caregiving conditions. We use stunting rates, wasting rates, basic sanitation services, hand-washing facilities, and consumption of a minimum acceptable diet as the main indicators under the food utilization domain.

Additionally, we create an index to measure environmental and climate risks. We assume that the primary environmental and climate-related issues arise from droughts, floods, cyclones, tidal surges, and the intrusion of saline water. We also incorporate a variable related to the political economy of environmental and climate concerns—a count of trans-boundary rivers within a district. Considering that Bangladesh and India share multiple trans-boundary rivers, and that Bangladesh, being downstream, often relies on the upstream country's decisions regarding natural disaster management and water sharing policies. We use these six variables to create a district-level map of environmental and climate risks in Bangladesh.

Although grasping the extent of food insecurity at the national and divisional scales is crucial, forming effective policies is challenging without data at a more granular level. Our study details the vulnerabilities in different districts, focusing separately on food access, food availability, and food utilization. Policymakers can concentrate on one of these aspects based on the priority for geographical intervention. For a complete food security assessment, we also provide the district-level food insecurity index to assist policymakers in spatially targeting and addressing food vulnerabilities in Bangladesh. We employ a comparable method to analyze climate and environmental vulnerabilities at the district level in Bangladesh, which is discussed in a separate section. In the following segment, we explain our methodology for constructing these indices.

METHODOLOGY

We employ principal component analysis (PCA) to create indices for all 64 districts in Bangladesh. Three key domains are used to construct a food insecurity index for districts. The three domains are food availability, food access, and food utilization. Initially, we construct a subindex for each domain by using variables that are logically associated with that domain. Each of the sub-indices is developed using principal component analysis. We first normalized each variable using the following formula:

$$Normalized\ Indicator_{c,d} = \frac{(X_{c,d} - min(X_{c,d}))}{(max(X_{c,d}) - min(X_{c,d}))} \qquad (1)$$

X (c,d) is the district specific value for a variable *c* of district *d* for a domain, while min(X (c,d)) and max(X (c,d) are the specific minimum and maximum values of the variable at the district level. Creating a vulnerability index through this method is well-supported by existing research and can be highly beneficial for policy formulation (Shonchoy et al. 2023). Table A7.1 in the Appendix shows the variables under each domain and sources of information.

PCA proves to be highly beneficial when dealing with a large set of variables to construct an index. PCA streamlines data by ensuring that all variables are standardized to a common scale, allowing each variable to contribute equally. It then determines the relationships between these variables through the use of a covariance matrix. From the covariance matrix, PCA identifies major directions, referred to as principal components, which captures the highest variations in the dataset, the first component capturing the highest variance, followed by components capturing progressively lesser variance in the system. By concentrating on the first component or considering components with eigenvalues greater than 1 (Braeken and van Assen 2017), PCA simplifies the data's complexity and dimensionality while preserving the most vital information. Ultimately, scores derived from the selected components are used to establish a ranking for each observation. The PCA approach is better than additive ranking as it captures the underlying structure of the data by incorporating the correlations among variables, effectively reducing redundancy when the variables are highly correlated, as is the case here. PCA creates uncorrelated components and assigns optimal weights based on their contribution to variance, providing a more accurate representation of the system.

For each of the domains, we developed a district-specific map of vulnerabilities using the PCA scores. Afterwards, using all the 14 variables of the three domains, we developed the overall food insecurity index by employing PCA.

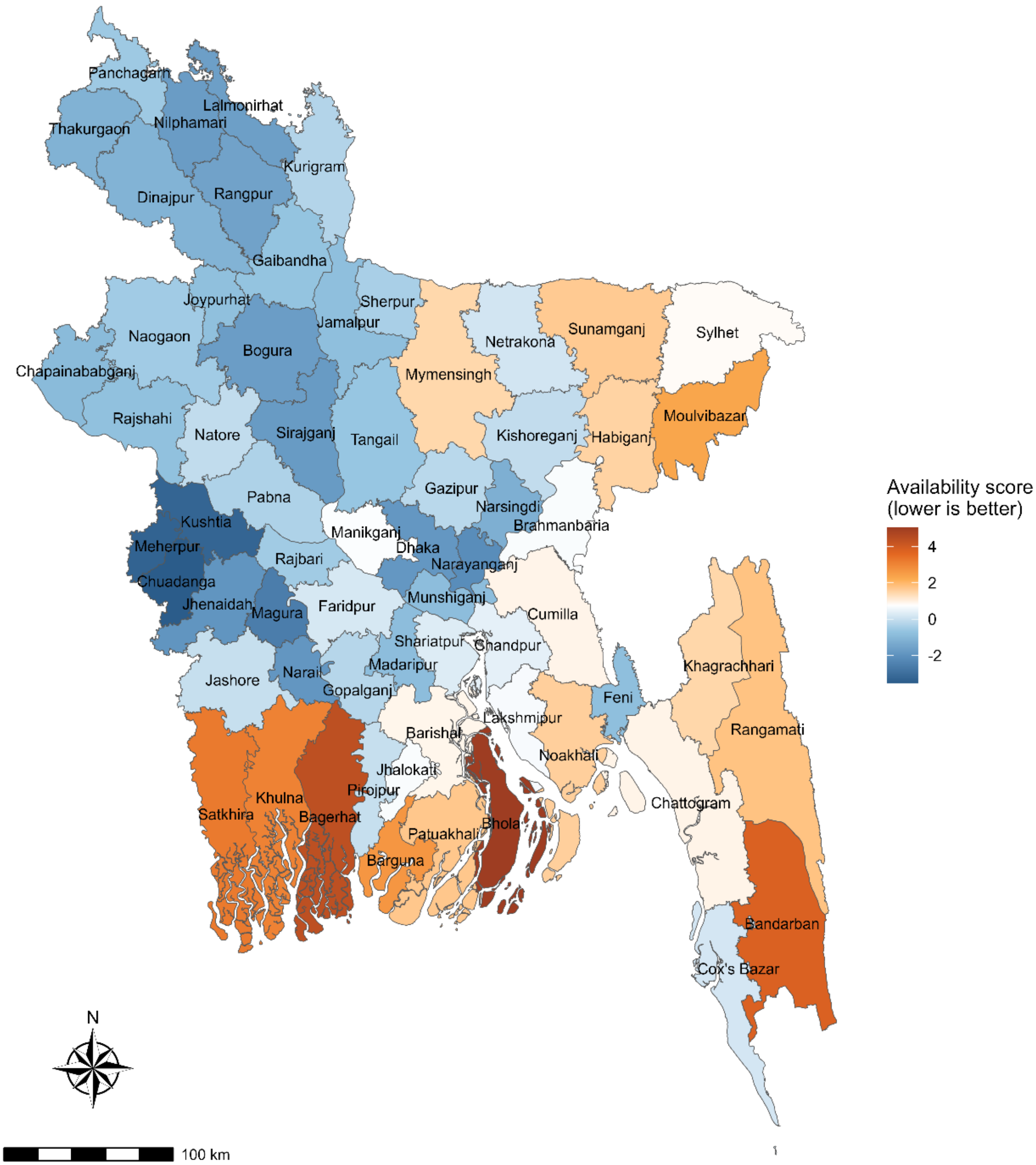
FOOD INSECURITY

In this chapter, we present four maps highlighting food vulnerabilities across Bangladesh. The PCA scores for each district, used in these maps, were derived using the methodology outlined in the previous chapter. These scores range from negative to positive, where lower negative values signify less vulnerabilities and higher positive values indicate greater vulnerabilities.

Food availability vulnerability

Figure 7.1 depicts the 64 districts of Bangladesh ranked by their food availability vulnerability score, as determined by PCA of the following standardized indicators: (1) cropping intensity, (2) irrigation coverage, (3) rice yield rate, (4) per capita fish production, and (5) rural road density. Please see Table A7.3 in the Appendix for the district-wise data on the four variables that we have used to construct the map on food availability.

Figure 7.1: Food availability vulnerability, by district



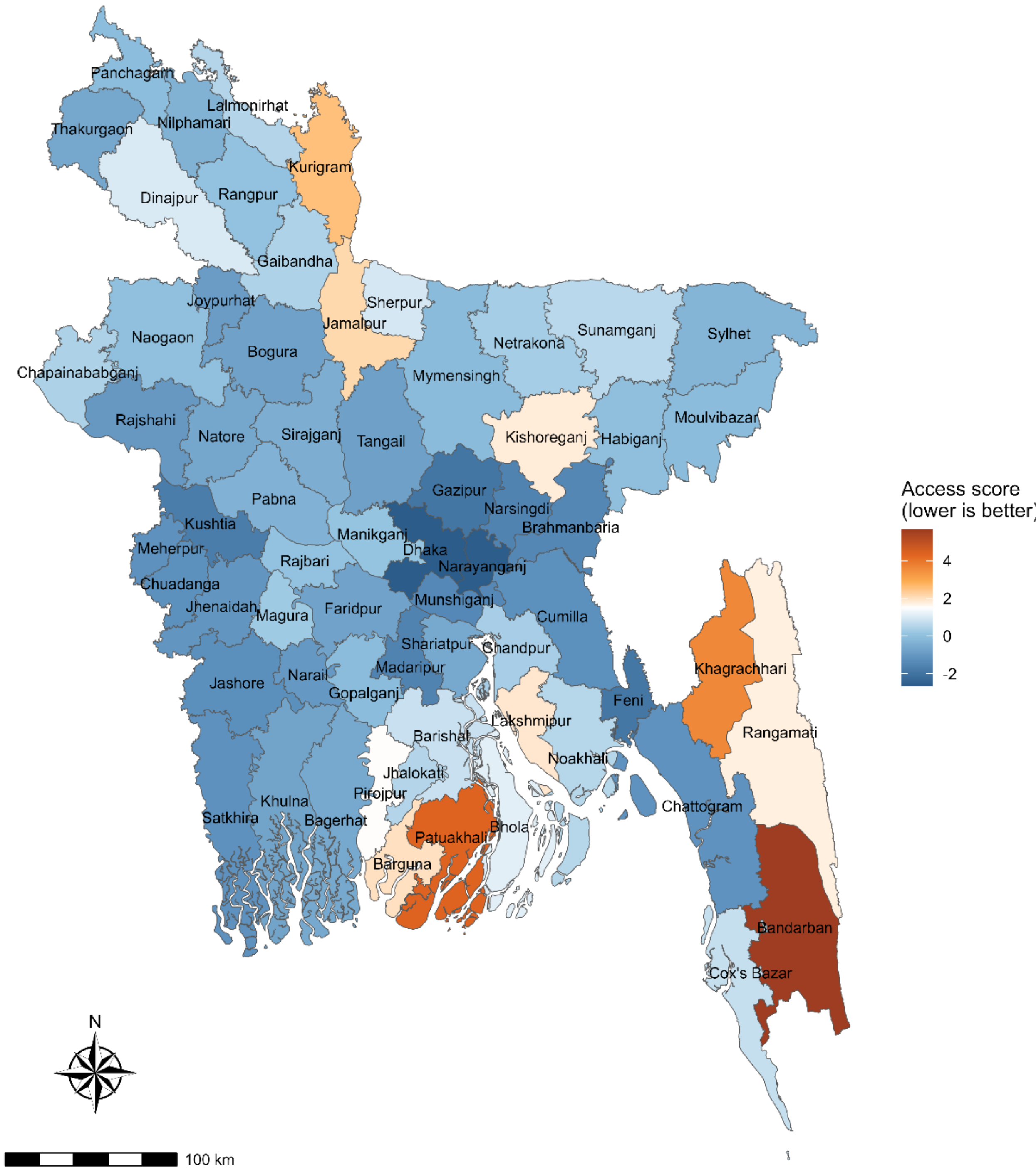
Source: Authors' calculations using data from the 2022 Household Income and Expenditure Survey (HIES), 2023 Yearbook of Agricultural Statistics, and LGED's Road and Market Database (available online at: https://oldweb.lged.gov.bd/ViewRoad2.aspx, updated July 2024).

The top five most vulnerable districts in terms of availability vulnerability scores are Bhola (5.1), Bagerhat (4.4), Bandarban (3.8), Satkhira (3.2), and Khulna (3.1). Meanwhile, the five districts that perform best in terms of food availability (i.e., with the lowest scores) are Chuadanga (-3.5), Meherpur (-3.3), Kushtia (-3.3), Magura (-2.6), and Narayanganj (-2.2). Overall, the southern region and Hill Tracts areas seem the most vulnerable in terms of food availability, followed by the north-eastern part of Bangladesh.

Food access vulnerability

Figure 7.2 illustrates the district-level rankings in terms of food access vulnerability scores, calculated using the same method as above based on the following standardized indicators: (1) population below the lower poverty line, (2) lack of electricity, (3) depth of poverty, and (4) per capita nominal consumption expenditure. Please see Table A7.4 in the Appendix for the district-wise data on the four variables that we have used to construct the map on food access.

Figure 7.2: Food access vulnerability, by district



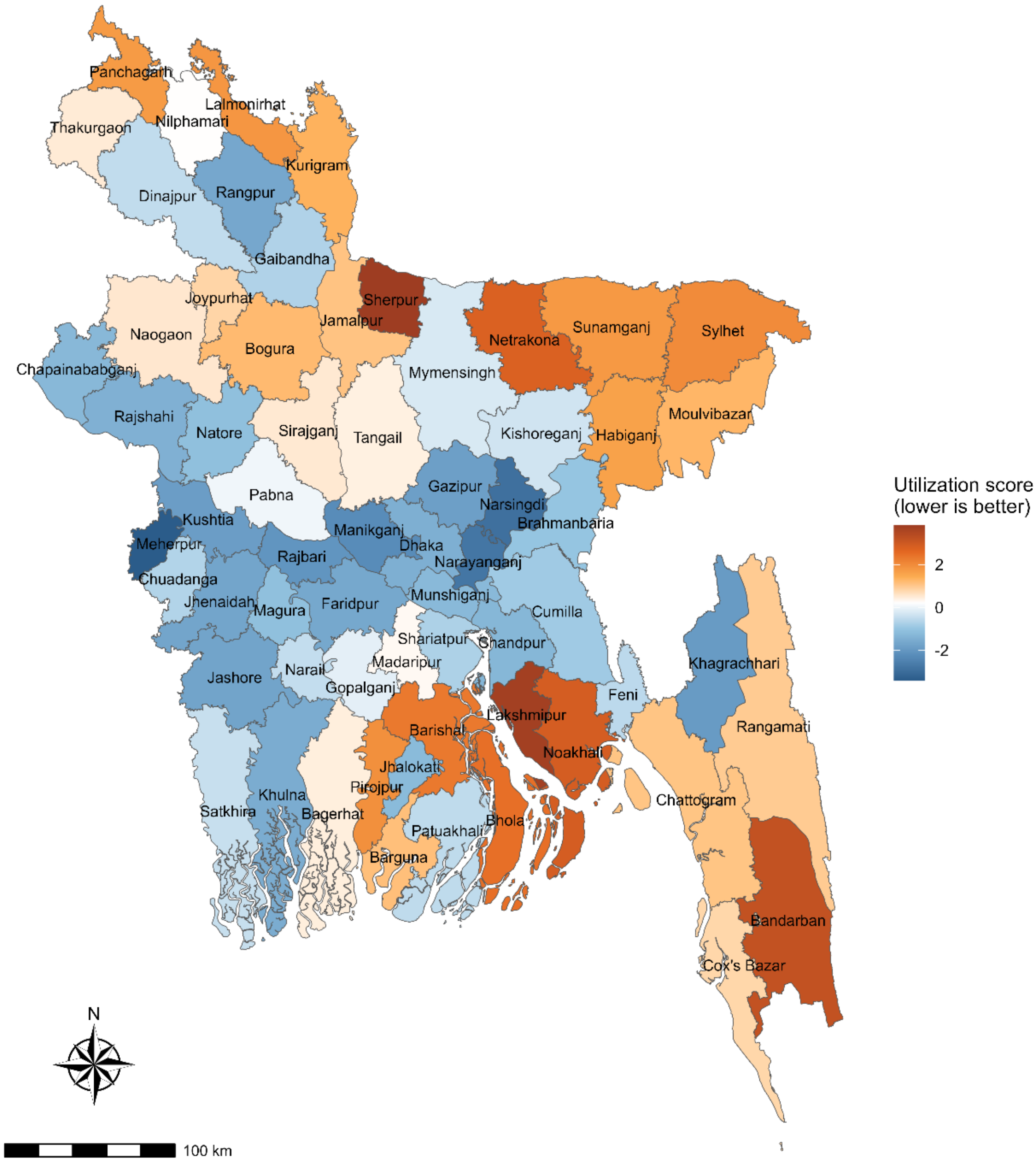
Source: Authors' calculations using data from Household Income and Expenditure Survey (HIES) 2016 and 2022, and Multiple Indicator Cluster Survey (MICS), 2019.

The five most vulnerable districts in terms of food access vulnerability scores are Bandarban (5.7), Patuakhali (4.4), Khagrachhari (3.6), Kurigram (2.6), and Jamalpur (2.1). Conversely, the five districts that perform best in terms of food access are Dhaka (-2.7), Narayanganj (-2.6), Gazipur (-1.9), Feni (-1.9), and Kushtia (-1.7).

Food utilization vulnerability

The final pillar of food security—food utilization—is illustrated in Figure 7.3, showing the district-level rankings in terms of food utilization vulnerability scores based on the following standardized indicators: (1) stunting rates, (2) wasting rates, (3) basic sanitation services, (4) handwashing facilities, and (5) consumption of a minimum acceptable diet. Please see Table A7.5 in the Appendix for the district-wise data on the five variables that we have used to construct the map on food utilization.

Figure 7.3: Food utilization vulnerability, by district



Source: Authors' calculations using data from the 2019 Multiple Indicator Cluster Survey (MICS).

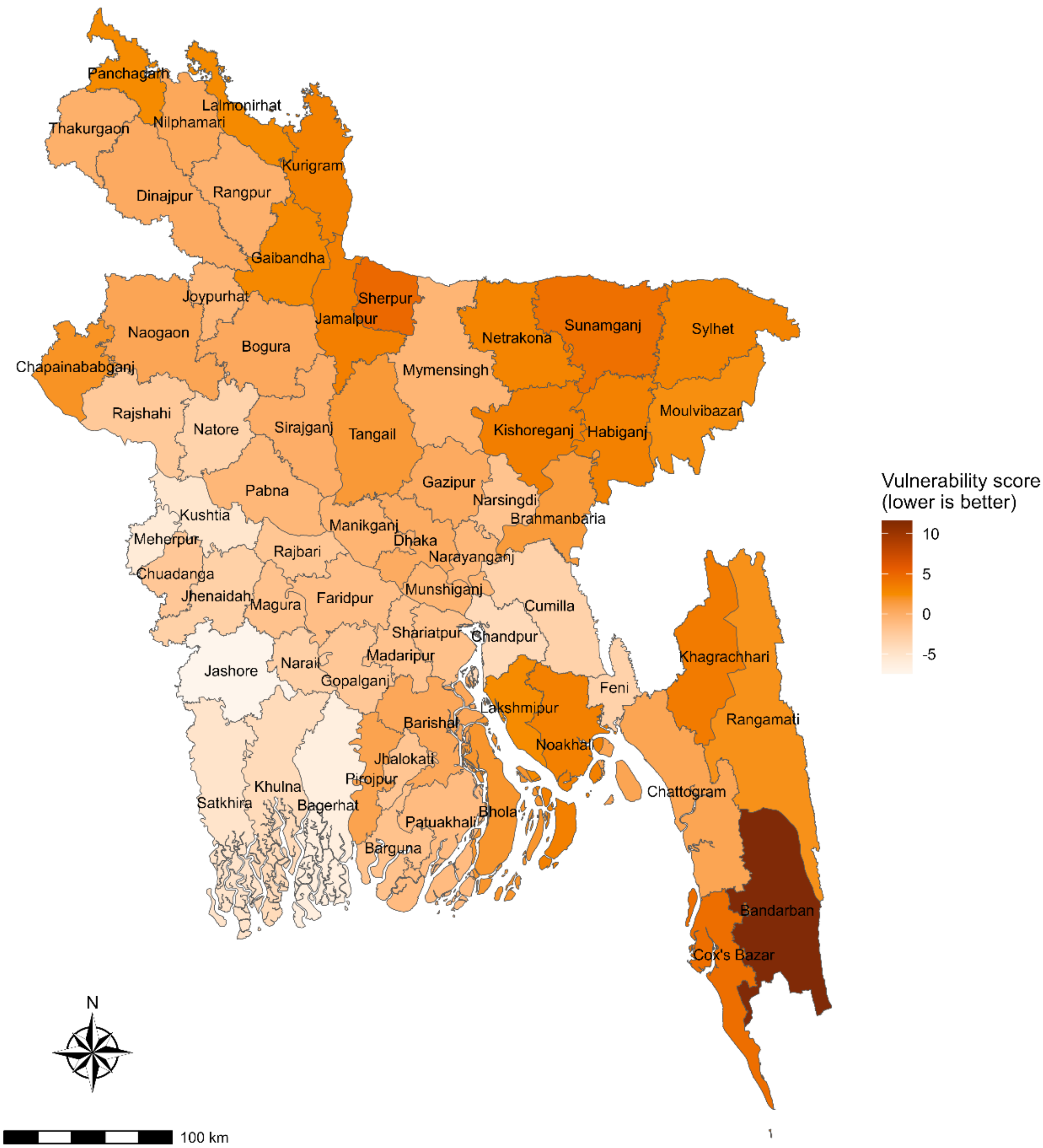
We find that the five most vulnerable districts in terms of food utilization vulnerability scores are Sherpur (3.8), Lakshmipur (3.8), Bandarban (3.2), Noakhali (2.9), and Netrakona (2.8). The five best-performing districts are Meherpur (-3.4), Narsingdi (-2.9), Narayanganj (-2.8), Manikganj (-2.3), and Rajbari (-2.1). Overall, the north-east and northern regions of Bangladesh, followed by the south and the Hill Tracts regions are most vulnerable in terms of food utilization.

Overall food insecurity

We use all the 14 variables under the three domains of food security to develop overall PCA scores to report an overall food insecurity score, as shown in Figure 7.6.

Here, we find that Bandarban ranks poorest in terms of food insecurity (11.7), followed by Sherpur (4.9), Cox's Bazar (4.6), Sunamganj (4.4), and Khagrachhari (3.7). On the other hand, districts in southern Bangladesh appear to perform best in terms of overall food insecurity, with Jashore being the least food insecure (-7.5), followed by Bagerhat (-6.3), Meherpur (-5.8), Kushtia (-5.1), and Satkhira (-5.0). Please see Table A7.2 in the Appendix for the full ranks and scores of all 64 districts for overall food insecurity.

Figure 7.4: Overall food insecurity, by district



Source: Authors' calculations using data from the 2022 Household Income and Expenditure Survey (HIES), 2023 Yearbook of Agricultural Statistics, the 2019 Multiple Indicator Cluster Survey (MICS), and LGED's Roads and Markets Database.

In the upcoming years, it appears that the government intends to implement contractionary fiscal policies given the high inflationary pressure the economy is facing. In this situation, it is anticipated that the government's fiscal budget will be restrained, making it crucial to conduct fiscal expenditures in a targeted manner. In our study, we present the comparative levels of food insecurity in the 64 districts of Bangladesh. The government could distribute the budget proportionally based on each district's relative vulnerabilities to optimize its limited resources to tackle food insecurity in Bangladesh.

CLIMATE AND ENVIRONMENTAL RISKS

Due to its geographic location, Bangladesh has always been susceptible to environmental disasters. In the domains of policy and research, it is widely recognized that Bangladesh ranks among the countries most susceptible to the effects of climate change. Nonetheless, the adverse effects of environmental and climate vulnerabilities will not be uniform throughout Bangladesh. In this chapter, we develop an index to assess environmental and climate vulnerabilities in the 64 districts of Bangladesh. We use seven variables to construct an index through the PCA approach. We have carefully selected these seven variables to represent the various dimensions of environmental and climate risks encountered by each district. Percentage of households in a district impacted by drought, floods, cyclones, storm surges, river or coastal erosion, saline water intrusion, and the count of transboundary rivers shared with a neighboring nation are used to develop the index. A detailed explanation of the variables is given below.

Data for the climate and environment risk were collected from the Bangladesh Disaster Related Statistics (BDRS) 2021 (BBS 2023a). The BDRS survey targeted households that experienced significant impacts from natural disasters between 2015 and 2020. In a pre-survey census a total of 7,515,977 households were included as the disastrous mauzas and mahallas, representing the all the districts in Bangladesh. According to the survey, from 2015 to 2020, drought impacted 354,739 households, flooding affected 4,110,532 households, cyclones struck 2,555,137 households, storms/tidal surges influenced 169,759 households, river/coastal erosion affected 754,979 households, and saline water intrusion impacted 245,845 households. The survey provides a district-wise distribution of households affected by each of these environmental calamities. Standardized proportions of the affected households were included in the principal component analysis.

- **Drought**: A drought takes place when there is a lack of sufficient precipitation, resulting in substantial hazards with extensive impacts. This condition can cause (i) increased temperatures, (ii) reduced water levels in rivers, lakes, and ponds, (iii) crop failure or desiccation, and (iv) soil drying and heightened salinity.
- **Flood**: A household is deemed impacted by a flood when water overflows and fully submerges it. Although floods can occur near rivers, lakes, and coastlines, river flooding is the most prevalent one. In Bangladesh, floods represent a major natural disaster.

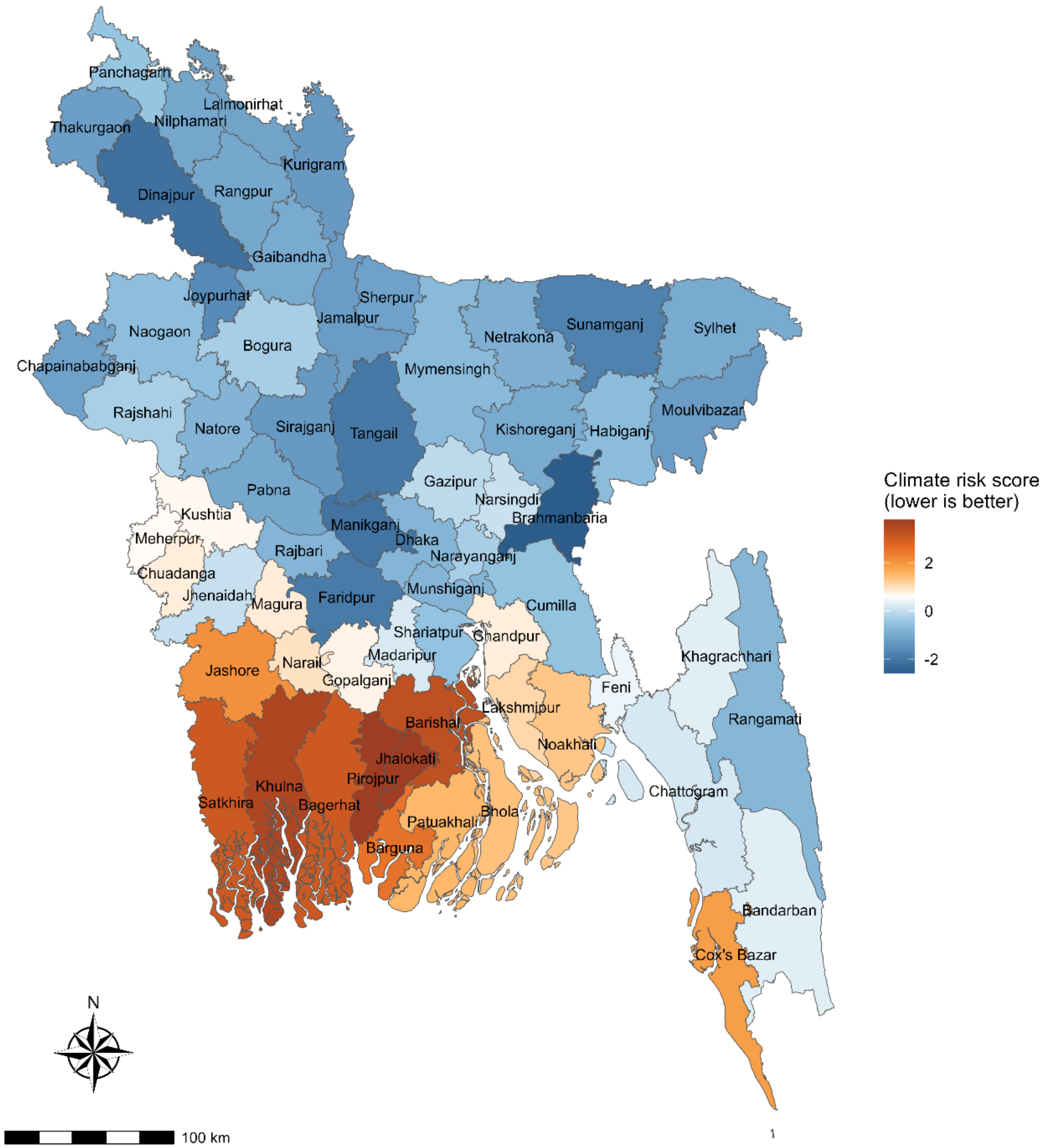
- **Cyclone**: A cyclone is a weather phenomenon characterized by rotating winds around a low-pressure center, typically traveling at speeds between 30 to 50 mph (approximately 40 to 80 km/h).
- **Storm surge**: A storm surge refers to an abnormal rise in sea level occurring during a storm, mainly caused by strong winds driving water towards the coast.
- **River/coastal Erosion**: River and coastal erosion denotes the process through which land along coastlines or riverbanks is either lost or shifted, driven by the relentless forces of waves, currents, tides, wind-driven water, among other elements.
- **Saline water intrusion**: Saline water intrusion happens when seawater seeps into freshwater aquifers, causing a reduction in groundwater quality and impacting drinking water supplies. Coastal areas including Satkhira, Khulna, Bagerhat, Barguna, Patuakhali, and Barisal are especially at risk from this issue.
- **Trans-boundary river counts**: This variable has been included to evaluate the political-economic dimensions of environmental risks in Bangladesh. Sharing several trans-boundary rivers with India, Bangladesh's flooding patterns are significantly influenced by upstream water management decisions made by India. Consequently, it is essential to mark the districts based on the number of trans-boundary rivers they share. We hypothesize that an increased number of shared rivers correlates with a higher risk of flooding in those districts.

Using the seven variables mentioned above, we run a further PCA to compute a climate and environmental risk score for each of the 64 districts of Bangladesh using standardized data on the following indicators: (1) proportions of households affected by droughts, (2) floods, (3) salinity, (4) cyclones, (5) storms and tidal surges, (6) river/coastal erosion, and (7) the number of transboundary rivers. Appendix 7 presents district-wise data for the seven variables used to construct the food access map.

It is quite clear from our analysis that districts in the southern coastal region of Bangladesh fare poorest. Pirojpur (3.8), Jhalokati (3.8), Khulna (3.5), Barishal (3.3), and Bagerhat (3.1) are the most climate vulnerable districts, while Brahmanbaria (-2.6), Dinajpur (-2.2), Manikganj (-2.1), Tangail (-2.0), and Faridpur (-1.9) are the least vulnerable to climate and environmental risks.

Eastern flash floods recently triggered by heavy rainfall and upstream water flows in India have severely impacted Bangladesh, particularly causing devastation in the 11 eastern districts of the country. In the end, the southern regions were likewise heavily impacted by the recent flood. In our assessment, Khulna ranks as one of the districts most susceptible to climate and environmental disruptions. Recent news confirmed significant damage to aman rice fields, shrimp farms, and seedbeds in this district. Identifying the most vulnerable districts in advance is crucial for the government to implement suitable measures to reduce the potential losses from such environmental disasters.

Figure 7.5: Climate and environmental risk by district



Source: Authors' calculations using data from the 2021 Disaster-Related Statistics of the Bangladesh Bureau of Statistics (BBS), and Rivers Beyond Borders: India Bangladesh Trans-boundary River Atlas (Nishat et al. 2014).

CHAPTER 8 POLICY CONCLUSIONS AND RECOMMENDATIONS

The International Food Policy Research Institute (IFPRI) prepared this food security assessment to provide a comprehensive evaluation of the current status of food security in Bangladesh, offering critical insights to guide policy decisions. The report is grounded in disaggregated data from Bangladesh's 8 divisions and 64 districts, enabling a nuanced understanding of food availability, access, and utilization across regions. It also examines climate vulnerabilities and identifies pathways for agricultural growth, poverty reduction, and the empowerment of women in agriculture.

This chapter brings together the evaluation's findings and concludes with actionable recommendations to address the challenges and opportunities identified throughout the assessment. At the end of this chapter, a summary table provides an overview of the key issues, challenges, and actions to improve food security across the many areas discussed.

FOOD AVAILABILITY

Land tenure

Land is the most important factor for agricultural production. However, in rural Bangladesh, 56 percent of households are landless, owning no cultivable land beyond their homestead plots. Additionally, about 40 percent of farm households are pure tenants, meaning they do not own the land they cultivate. These farmers operate under sharecropping or cash-lease agreements with landlords. Since they have to pay rent—either in crops or cash—farming is a low-profit venture for them. They likely remain in agriculture due to the lack of alternative employment opportunities.

♦ RECOMMENDATIONS FOR ADDRESSING LAND TENURE CONSTRAINTS

- Create nonfarm jobs in higher-productivity sectors: Developing nonfarm employment in sectors such as manufacturing and services can enhance economic resilience and improve livelihoods for rural workers through targeted skills training.
- Promote micro, small, and medium enterprises (MSMEs): This can be done by providing access to credit, which could strengthen rural-urban food value chains.

Labor productivity and enhancing agricultural growth

In general, labor productivity in agriculture is relatively low compared to other sectors. In Bangladesh, the agriculture sector's capacity to absorb the growing rural labor force is severely constrained by the lack of land expansion opportunities. The growth of crop production now hinges almost entirely on technological advancements, resulting in minimal employment response of increased output. Therefore, shifting the rural labor force from agriculture to nonfarm employment, alongside faster agricultural growth, is crucial to boosting rural incomes. Our analysis in this report shows that agricultural growth is three times more effective at reducing poverty than an equivalent level of growth in non-agricultural sectors of the economy.

A comprehensive strategy that fosters yield-enhancing technological advancements and encourages higher-value agricultural production is essential for accelerating agricultural growth and, consequently, reducing poverty in Bangladesh.

♦ RECOMMENDATIONS FOR ENHANCING AGRICULTURAL GROWTH

- Promote yield-increasing technological change: This can be facilitated through access to institutional credit and efficient agricultural extension services.
- Intensify rice production through increased yields rather than expanding the gross area under rice cultivation: This will allow diversification into higher-value crops, including maize, pulses, oilseed crops, vegetables, and fruits.
- Ensure farmers, especially smallholders, have access to critical resources for improving productivity:
    - Provide fertilizers, improved seeds, irrigation, farm machinery, and diesel fuel in a timely and sufficient manner.
    - Expand access to institutional credit to help smallholder farmers invest in high-value crops like horticulture, which can boost their incomes.
    - Support smallholder farmers by ensuring they have access to effective agricultural extension services that provide guidance on best practices and modern technologies.

Access to finance: Challenges and opportunities for smallholder farmers

Access to finance is essential for farmers to invest in productive resources, enhance agricultural productivity, and provide a cushion against economic shocks. However, financial access remains constrained, particularly for smallholder farmers, who face significant obstacles in obtaining formal bank finance in Bangladesh. Key barriers include stringent collateral requirements and unclear land ownership documentation. Moreover, many farmers lack financial literacy and are unaware of available financial products, while the absence of formal credit histories further restricts their ability to secure loans.

An IFPRI survey underscored a critical challenge: following the government's announcement of low-interest loans to support farmers and value chain actors during the COVID-19 pandemic, few farmers applied, and of those, only about 1 percent successfully secured the loan.

This reflects both a lack of trust in the system and the complexity of the application process, which many smallholder farmers find difficult to navigate.

One major obstacle is that traditional banks are unfamiliar with rural operations, resulting in higher costs for disbursing agricultural loans. Banks often avoid serving remote areas due to these operational expenses. Additionally, the loan application process is burdensome, requiring multiple visits to upazila (sub-district) bank offices and significant paperwork, which is further complicated by limited staffing in rural banking.

♦ RECOMMENDATIONS FOR IMPROVING ACCESS TO FINANCE FOR SMALLHOLDER FARMERS

- Bangladesh Bank introduced a BDT 5,000 crore refinancing scheme offering banks low-cost funds at 0.5 percent interest, capping farmers' loan interest at 4 percent. Banks face challenges utilizing these funds due to capacity constraints, unfamiliarity with rural areas, and reluctance to handle small loans.
    - Partner with ag-tech firms: Collaborating with ag-tech firms or networks like Syngenta could improve lending decisions by providing reliable data on farmers' creditworthiness.
    - Establish a loss-buffer fund: Creating a loss-buffer fund could reduce risks in agricultural lending and encourage more banks to finance smallholder farmers.
    - Implement a centralized credit tracking system: A centralized credit tracking system could help banks better assess lending risks and extend credit more confidently.

- Microfinance institutions (MFIs) and NGOs remain the primary sources of credit for smallholder farmers, despite government efforts to increase bank financing.
    - Reduce borrowing costs from MFIs.
    - Offer flexible loan repayment options.
    - Align loan repayment schedules with harvest periods: Adopting practices similar to those of the Palli Karma-Sahayak Foundation (PKSF) can make financing more sustainable and accessible.

- Lower borrowing costs through MFIs: Government efforts to lower borrowing costs through banks, like the refinancing scheme, may be more effective if implemented through MFIs, which are better equipped to reach smallholder farmers.

Strengthening agricultural extension services

Agricultural extension services play a pivotal role in empowering farmers by providing them with essential knowledge, skills, and techniques to enhance their agricultural practices. Despite the importance of these services, many farmers in Bangladesh, especially smallholders, lack access to such support. Instead, they often rely on informal networks, learning about new technologies and practices through peer-to-peer exchanges rather than from extension officials.

♦ RECOMMENDATIONS FOR MODERNIZING AND ADVANCING AGRICULTURAL EXTENSION SERVICES

- Enhance extension worker capacity: Strengthen the government's ability to support farmers by increasing the reach and improving the skills of extension workers, facilitating the adoption of sustainable agricultural practices.
- Leverage information and communication technologies (ICT) for agricultural information: Implement mobile-phone-based services, video-based training, and other ICT tools to deliver timely, tailored agricultural information to farmers, enhancing accessibility and efficiency.
- Regular training for extension officials: Organize regular refresher courses for extension officials in collaboration with agricultural research institutes to ensure that workers stay up to date on the latest farming techniques.
- Update agricultural extension curriculum: Periodically update the curriculum of agricultural extension institutes to reflect technological advancements and emerging best practices, equipping extension officials and farmers with innovative tools and knowledge.
- Scale up integrated nutrition initiatives: Expand initiatives like the Agriculture, Nutrition, and Gender Linkages (ANGeL) pilot project to integrate nutrition messages into agricultural extension.
    - ANGeL was designed by IFPRI and implemented by the Department of Agricultural Extension (DAE) under the Ministry of Agriculture, trained agricultural extension field staff (sub-assistant agricultural officers or SAAOs) to integrate nutrition messages into their delivery of modern agricultural practices. These SAAOs effectively communicated nutrition information to farmers (Ahmed et al. 2023).
    - By leveraging the vast national agricultural extension network, ANGeL aims to enhance DAE's existing portfolio with nutrition-focused activities and messages. This approach presents opportunities to scale up and promote nutrition-sensitive agriculture across Bangladesh (Osmani et al. 2016)

Farm mechanization in Bangladesh

Rural agricultural labor supply in Bangladesh is no longer abundant. Historically, real agricultural wages (adjusted for inflation) either declined or remained stable. However, since the mid-2000s, real rural wages have increased significantly, which has reduced farmers' profitability. To mitigate the impact of rising labor costs, promoting farm mechanization has become essential. Policies should focus on advancing mechanization as a solution to the growing labor shortage and rising wages.

Challenges in promoting farm mechanization

Promoting farm mechanization faces several challenges that hinder its effectiveness for smallholder farmers. One major issue is the prohibitive cost of agricultural machinery, which makes ownership unattainable for many. Limited financial access exacerbates this problem, as machine service providers encounter financial constraints, and banks or microfinance institutions often lack suitable loan products for machinery acquisition. Additionally, policy restrictions, such as limitations on transferring subsidized machinery within three years, prevent it from being used as collateral, which deters financial institutions from offering loans. Misallocation of subsidies further complicates the situation, with funding often directed toward low-yield areas while high-yield regions, where machinery could have a more significant impact, receive insufficient support. Finally, a shortage of skilled operators and mechanics results from inadequate training, leading to frequent machinery breakdowns and delays in repairs, which further diminishes efficiency and productivity in the agricultural sector.

♦ RECOMMENDATIONS FOR ENHANCING FARM MECHANIZATION

- Develop a competitive rental market: Make machinery more accessible to smallholder farmers through affordable rental services.
- Improve access to finance: Develop loan products tailored to machine service providers and farmers, and revisit policies on machinery transfer to enhance loan availability.
- Optimize subsidy allocation: Direct more funding to high-yield regions where machinery can have the greatest productivity impact.
- Ensure higher quality of machinery imports: Implement standards to improve the quality and durability of imported agricultural equipment.
- Provide operator and mechanic training: Invest in skill development to reduce machinery breakdowns and repair delays, improving overall efficiency.

Fertilizer sector in Bangladesh

Fertilizer is essential for agricultural growth and food security in Bangladesh. However, the sector faces significant challenges such as supply shortages, import dependency, and outdated production facilities.

Current state of the fertilizer sector

Bangladesh uses about 6 million metric tons of fertilizers annually, with 80 percent imported. Despite producing urea domestically, the country relies heavily on imports for urea as well as triple super phosphate (TSP), diammonium phosphate (DAP), and muriate of potash (MOP), which leaves it vulnerable to price fluctuations and global supply disruptions, especially those caused by the Russia-Ukraine war. Fertilizer prices have surged, with urea jumping from US$238/metric ton[14] in 2021 to $599/metric ton in 2023. The Bangladesh Chemical Industries Corporation (BCIC) operates six fertilizer factories with a combined installed capacity of 2.3 million metric tons per year. However, the actual production capacity has declined significantly due to outdated machinery, inefficiency, and lack of modernization. Four of these factories are currently closed, two of which were shut down due to gas shortages.

♦ RECOMMENDATIONS FOR IMPROVING THE FERTILIZER SECTOR

- Stabilize the gas supply to urea fertilizer plants: The Ministry of Industries should set a baseline quantity of gas to be supplied to fertilizer plants based on annual urea demand. This commitment would help ensure consistent production levels, reducing the need for costly imports.
- Upgrade outdated plants and enhance energy efficiency: Upgrade outdated plants with modern technology and conduct audits to improve energy efficiency. Implement regular overhauls to maintain safety.
- Diversify import sources and build strategic reserves: Reduce dependency on global markets by diversifying import sources and creating a strategic fertilizer reserve.
- Strengthen fertilizer regulation and quality control: Strengthen regulatory frameworks for fertilizer production and importation to ensure the quality of fertilizers being sold in the market. Regular inspections and stringent quality control measures must be enforced.
- Introduce a voucher system for targeted subsidies: Improve the transparency and targeting of subsidies by introducing a voucher system for smallholder farmers.
- Promote sustainable farming through awareness programs: Launch awareness programs to promote balanced fertilizer use and sustainable farming practices.
- Implement a product assurance program for fertilizer quality: Establish a product assurance program where fertilizers have scratch labels with barcodes registered in a database. Farmers or dealers can enter the code on their phones to receive a confirmation text on product quality and details. In Uganda, this approach has been shown to be more cost-effective than fertilizer testing (Gilligan, Karachiwalla, and Thai 2019).

A multifaceted approach is needed to address Bangladesh's fertilizer challenges, including boosting domestic production, securing energy supplies, diversifying imports, and promoting sustainable practices. These measures will enhance resilience, reduce dependency on global markets, and support long-term agricultural growth.

[14] All dollar amounts ($) referenced in this document refer to USD.

FOOD ACCESS

Generating youth employment

The Bangladesh Labor Force Survey 2022 highlights the "not in education, employment, or training" (NEET) rate as a critical labor market indicator, with approximately one-fifth of the country's youth neither employed nor engaged in education or vocational training. Additionally, only about 1.5 percent of the working-age population has received formal vocational training. This presents a significant opportunity to bridge the employment and skills gap by training unemployed youth in the operation, repair, and maintenance of farm machinery—a move that could significantly enhance both productivity and employability.

♦ RECOMMENDATIONS FOR GENERATING YOUTH EMPLOYMENT

- Create employment pathways for rural youth to enhance agriculture-led growth: Prioritize creating pathways for meaningful employment for rural unemployed youth.
    - Integrate vocational and entrepreneurial training: Combine vocational training in farm machinery operations, repair, and maintenance with entrepreneurial skills development for rural youth.
    - Encourage youth to access government machinery subsidies: Motivate youth groups to utilize government subsidies (50–70 percent) on agricultural machinery (e.g., combine harvesters, reapers, rice transplanters) to provide paid services to farmers.
    - Provide low-interest loans for machinery purchase: Offer low-interest loans to help youth groups finance the purchase of subsidized farm machinery, creating employment and income opportunities in rural areas.
    - Involve NGOs in supporting sustainable youth enterprises: Engage NGOs to assist youth groups in becoming sustainable service providers within their communities.

Revamping Bangladesh's social safety nets for enhanced performance

Bangladesh has considerable experience in supporting its poor through social safety net (SSN) programs, many of which are designed to benefit women. The government allocates a significant portion of its budget to these SSN programs. In fiscal year 2015/16 (FY2016), for example, the government spent $4.9 billion on SSNs, which constituted about 14 percent of the total budget and 2.1 percent of the country's GDP. By FY2024, the allocation had surged to $11.8 billion, representing about 17 percent of the national budget and 2.5 percent of GDP (Ministry of Finance 2023).

However, despite this investment, the SSN system faces critical challenges. Many programs suffer from limited coverage and insufficient funding. Targeting errors, both in terms of excluding those in need and including those who are not, are widespread across most programs (Coudouel, Sabbih, and Ahmed 2021). A significant share of the SSN budget, 21.7 percent in FY2024, has been allocated to the government employee pension program, which primarily benefits the nonpoor. In FY2024, there were 115 SSN programs in total, with the top 10 (excluding government employee pensions) absorbing 66 percent of the SSN budget. This leaves resources stretched thin for the remaining programs, diluting the benefits for participants. Most of these programs have limited coverage, are uncoordinated, and are not adequately funded.

Identifying promising social safety net programs for enhancement

To improve the efficacy of Bangladesh's SSN system in alleviating poverty, there is a pressing need to refine targeting mechanisms, increase benefit amounts, and scale up successful programs while phasing out underperforming ones. By enhancing targeting and reducing benefit leakage, the SSN's coverage for poor households can be expanded within the existing SSN budget.

A comprehensive review of SSN evaluations in Bangladesh helped us identify the most effective programs. We assessed targeting performance using data from IFPRI's Bangladesh Integrated Household Survey (BIHS), which is nationally representative of rural Bangladesh.

Key programs for scaling up

We have identified five SSN programs for expansion based on their strong targeting performance and potential welfare impacts:

1. Vulnerable Group Development (VGD)
2. Mother and Child Benefit Program (MCBP)
3. Old Age Allowance
4. Allowances for the Financially Insolvent Disabled
5. Allowances for Widowed, Deserted, and Destitute Women

VGD participants receive 30 kg of rice per month for a period of 24 months. The nominal value of food-based programs adjusts with changes in food prices, ensuring that beneficiaries receive appropriate support despite price fluctuations. However, for cash transfers, inflation erodes the real value of benefits. Therefore, it is critical to adjust cash transfer amounts every 4 to 5 years to account for inflation.

These five programs collectively account for 12.4 percent of the total SSN budget for FY2024 (excluding government employee pensions), covering 13.62 million people. The table below provides details of these programs.

♦ RECOMMENDATIONS FOR STRENGTHENING KEY SOCIAL SAFETY NET PROGRAMS

To further strengthen these programs, we propose the following:

1. Vulnerable Group Development (VGD) program:
   - ▷ Incorporate high-quality, intensive nutrition behavior change communication (BCC) training for women in each two-year program cycle: This addition would make VGD a nutrition-sensitive social protection program.

2. Cash-based programs (Mother and Child Benefit Program; Old Age Allowance; Allowances for Financially Insolvent Disabled; Allowances for Widows, Deserted and Destitute Women):
   - ▷ Expand program coverage: Increase program coverage in both rural and urban areas to reach a larger proportion of vulnerable households.
   - ▷ Increase benefit amounts: Substantially increase the benefit amounts to ensure that participants experience meaningful improvements in their livelihoods.
   - ▷ Implement the government-to-person (G2P) payment scheme: Streamline and expedite the disbursement of cash benefits to program participants through the G2P payment system.

Table 8.1: Five social safety net programs that IFPRI proposes for expansion

Program name	Description	Transfer size	Coverage in 2023/24 (million people)	% of 2023/24 total SSN budget excluding government pension	Implementing agency
Vulnerable Group Development (VGD)	Aims to improve the livelihoods of ultra-poor women. Target group is poor and vulnerable women. The VGD program has a two-year cycle.	30 kg of fortified rice or wheat per month, for a period of 24 months	1.04	2.1	MoWCA
Mother and Child Benefit Program (MCBP)	Aims to reduce maternal and infant mortality rate, increase breastfeeding rate, and enhance utilization of delivery and prenatal care services by providing behavior change communication training. Eligibility criteria: First or second pregnancy, ages 20 to 35 years, poor pregnant woman.	800 taka per month	1.30	1.3	MoWCA
Old Age Allowance	Unconditional cash transfer program to support elderly people from poor families. Eligibility criteria: minimum age for men is 65 years, minimum age for women is 62 years.	600 taka per month	5.80	4.3	MoSW
Allowances for the Financially Insolvent Disabled	Unconditional cash transfer, providing basic income support to people with disabilities (PWDs) living in poverty. Eligibility criteria: registered PWDs who are permanent residents of the area; minimum age is 6 years.	850 taka per month	2.90	3.0	MoSW
Allowances for Widowed, Deserted and Destitute Women	An unconditional cash transfer, which aims to improve the livelihoods of poor women. Eligibility criteria: women of at least 18 years.	550 taka per month	2.58	1.7	MoSW

Source: Authors' compilation using data from Ministry of Finance, Finance Division, Government of Bangladesh.

MoSW= Ministry of Social Welfare, MoWCA= Ministry of Women and Children Affairs.

Notably, the Ministry of Women and Children Affairs (MoWCA) and the World Food Programme (WFP) in Bangladesh commissioned IFPRI to conduct studies aimed at identifying evidence-based indicators to enhance the targeting accuracy of the VGD and MCBP programs. These indicators are strongly correlated with income, easily observable, verifiable, and straightforward to collect. MoWCA has since adopted the IFPRI-proposed targeting criteria for both programs (Ahmed 2018a; Ahmed 2018b).

The five programs are well-targeted to address the needs of vulnerable groups. In the food-based VGD program, the current value of the monthly transfer of 30 kg of coarse rice is approximately BDT 1,500. However, the cash transfer amounts for the other programs—MCBP (BDT 800 per month), Old Age Allowance (BDT 600 per month), Allowances for the Financially Insolvent Disabled (BDT 850 per month), and Allowances for Widowed, Deserted, and Destitute Women (BDT 550 per month)—are relatively low. To ensure a meaningful impact on welfare, we recommend a substantial increase in these cash transfers.

To test the effects of increasing the MCBP transfer value on maternal and newborn outcomes, IFPRI is conducting a randomized controlled trial in collaboration with MoWCA and WFP. The study evaluates the impacts of adding two different types of transfers—top-up cash versus food—to the standard MCBP benefit of BDT 800 per month. Top-up cash recipients receive an additional BDT 1,000 per month, for a total transfer of approximately BDT 1,800 per month. Households receiving food receive an additional monthly "food basket" (fortified rice, lentils, and fortified oil) with an estimated value of BDT 1,000, bringing the total transfer value to approximately BDT 1,800 per month.

Other promising interventions to strengthen the SSN system

Sustainable program benefits: While transfer payments provide short-term relief for the poor, evidence is mixed on whether they lead to sustainable income growth for the ultra-poor. Many SSN programs offer temporary poverty alleviation. To achieve lasting improvements in food security and livelihoods, providing meaningful transfer sizes and bundling the transfers with other components that promote sustained income generation (such as training or access to financial services) appear promising. Research, such as studies on BRAC's Targeted Ultra Poor program, demonstrate that asset transfers bundled with training and other support can lead to sustained improvements (Ahmed et al. 2009). Multisectoral SSN programs are costlier than traditional safety nets, requiring careful balancing between program coverage and sustainability, but their longer-term benefits may enhance their cost-effectiveness. Given their positive outcomes, scaling up these programs with contextually appropriate designs is recommended in economically lagging and disaster-prone areas.

Urban social safety nets: Design of SSN programs for urban areas must account for key differences from rural contexts. Urban women, unlike rural women, are more involved in diverse economic activities. The National Social Security Strategy (NSSS) and the 8th Five Year Plan highlight the inadequate coverage of social security programs for urban poor, despite significant migration from rural areas. In 2010, 30.1 percent of rural households benefited from SSN programs, compared to just 9.4 percent of urban households (GED 2015). The NSSS advocates for expanding urban SSN programs to provide equitable support, especially for vulnerable women.

♦ RECOMMENDATIONS FOR ENHANCING THE URBAN SSN SYSTEM

- Expand the Open Market Sale (OMS) Program: Scale up the distribution of essential foods such as rice, wheat flour, and cooking oil at subsidized prices to help stabilize market prices, especially during seasonal price hikes in March-April and September-October. Prioritize distribution of essential foods in low-income urban areas by trucks to effectively reach the poorest.

- Introduce an urban clean-up program: Launch an urban clean-up initiative that engages both men and women, providing income opportunities for participants while enhancing city cleanliness.

Social health insurance program: Rural households in Bangladesh are highly vulnerable to shocks such as natural disasters, economic downturns, and agricultural losses, which severely disrupt livelihoods and lead to food insecurity and financial instability. Health-related expenses are a major contributor to these shocks. In 2019, 22 percent of rural households reported health expenditures as their most significant negative income shock (Figure 4.25 in Chapter 4), with no households having health insurance. Health-related shocks often drive nonpoor households into poverty and worsen the condition of already poor households (Quisumbing 2011). Given the catastrophic impact of healthcare costs, a well-designed health insurance program for *both* rural and urban poor is essential and should be piloted and evaluated for effectiveness.

Health vouchers: Health insurance systems are complex and time-consuming to establish, requiring strong administration, regulatory frameworks, and funding for sustainable coverage. Health vouchers, by contrast, provide a simpler solution with direct, targeted access to services, needing minimal infrastructure and adaptable to specific needs—ideal for linking social transfers to health services in resource-limited settings. In Bangladesh, programs like the Maternal Health Voucher Scheme have been introduced on a limited scale, showing improved maternal and child health outcomes and increased health service utilization among participating women (Sultana et al. 2023; Das and Nag 2018; Nandi et al. 2022). Further research on the supply and demand of health voucher programs can maximize their impact on service uptake and health outcomes and can benefit rural and urban poor.

FOOD UTILIZATION

Sustainable Food Systems to Promote Healthy Diets

Creating sustainable and locally appropriate food systems is essential for enhancing food security and promoting healthy diets. The relationship between nutrition and agriculture is complex and cannot be reduced to mere calorie supply. Diversified and nutrition-sensitive agriculture forms the cornerstone of these systems by fostering the cultivation of a variety of crops that meet nutritional needs while maintaining ecological balance. This approach strengthens community resilience and ensures long-term food availability and access.

♦ RECOMMENDATIONS FOR PROMOTING SUSTAINABLE FOOD SYSTEMS

- Increase food production: Focus on both the quantity and quality of food production, prioritizing nutrient-rich crops like fruits, vegetables, and legumes to address micronutrient deficiencies and improve public health.
- Promote sustainable food systems: Address the environmental impacts of agriculture by implementing regulations that encourage reduced chemical inputs, soil conservation, and climate resilience.
- Invest in agricultural value chains: Support investments from production to distribution to reduce postharvest losses and enhance market access.
- Support public procurement programs: Develop policy frameworks that source nutritious, locally produced foods for schools and institutions, fostering economic and nutritional benefits.

Enhancing nutrient intakes across the population

IFPRI research reveals that dietary patterns have shown some improvements in rural Bangladesh, but overall intakes remain suboptimal. Between 2011 and 2018, macronutrient intake trends show imbalances: while dietary diversity improved across children, adolescents, and adults, around 70 percent of energy still came from carbohydrates, with insufficient intake of protein and fat–particularly in lower-income households. Although energy and protein intake gaps narrowed for some groups, deficiencies in fat and excess carbohydrate intake remained prevalent (Ahmed et al. 2022).

Micronutrient intakes also showed concerning trends, with many essential vitamins and minerals falling below recommended levels, especially among disadvantaged populations (Nguyen et al. Forthcoming). These findings underscore the need for targeted, evidence-based nutritional interventions to address persistent inadequacies in both macro- and micronutrient intake across Bangladesh.

♦ RECOMMENDATIONS FOR ENHANCING NUTRIENT INTAKES

- Promote agricultural diversification: Increase the production of non-rice crops, livestock, and fish to enhance dietary diversity. Developing strong value chains and market linkages for these foods can help manage price risks.

- Develop food value chains: Encourage micro, small and medium enterprises (MSMEs) in food processing, packaging, storage, and transport to improve access to nutritious foods and create income opportunities for women and low-income communities, which can then enhance food access among low-income households. Provide micro and small enterprises with access to credit to strengthen value chains.

- Provide agricultural and nutrition training to farm households: Provide training for husbands and wives together on agricultural and nutrition practices, focusing on production and consumption of high-value, high nutritive-value crops, following the successful ANGeL model, to boost farm diversity, dietary diversity, and women's empowerment.

- Integrate nutrition BCC into safety nets: Embed nutrition behavior change communication (BCC) within safety net programs to positively shape food consumption habits, dietary diversity, and infant and young child feeding practices.

- Expand fortification and biofortification of staples: Address barriers to expand fortification of staple foods, especially rice, with essential vitamins and minerals to address micronutrient deficiencies. Distribute rice biofortified with zinc through public programs to reach the most vulnerable. Additionally, facilitate biosafety approval from the National Committee on Biosafety (NCB) at the Ministry of Environment for the release of Golden Rice, a genetically engineered rice variety developed by the International Rice Research Institute (IRRI), to reduce vitamin A deficiency in the population. The Bangladesh Rice Research Institute (BRRI) has been pursuing the NCB approval of Golden Rice since 2017.

Promoting women's empowerment

Gender inequality has direct consequences for food and nutrition security, affecting nutrient intake and household food distribution. Women play a pivotal role in food systems, particularly in Bangladesh, where their involvement in agriculture is substantial. Yet, due to barriers including limited access to land, credit, and decision-making power, women's contributions to agriculture and nutrition are often constrained. The lack of empowerment not only exacerbates social inequities but also reduces the economic and nutritional efficiency of agricultural systems. Furthermore, research using data from IFPRI's Bangladesh Integrated Household Survey (BIHS) has demonstrated that women's empowerment is crucial for fostering a diversified production structure in rural households (Sraboni et al. 2014).

Policies aimed at enhancing women's empowerment, such as those based on the Women's Empowerment in Agriculture Index (WEAI), should focus on removing these barriers. Legal reforms to ensure women's equal access to resources, as well as programs that promote financial literacy and agricultural training for women, are necessary to support their economic participation.

The government should implement targeted gender-responsive agricultural policies to enhance women's access to productive resources and decision-making roles. Investments in women's capacity building, combined with policies that support gender-equitable land ownership, can increase agricultural productivity and nutrition outcomes.

Furthermore, social protection schemes, such as cash transfers and nutrition behavior change communication targeted at women, can empower them economically as well as increase nutrition knowledge, enhancing their ability to influence household nutrition decisions (Ahmed, Hoddinott, and Roy 2024).

♦ RECOMMENDATIONS FOR PROMOTING WOMEN'S EMPOWERMENT

Implement targeted gender-responsive agricultural policies:

- Enhance access to resources: The government should implement policies to improve women's access to productive resources and decision-making roles.
- Invest in capacity building: Investments in women's capacity building, combined with policies that support gender-equitable land ownership, can increase agricultural productivity and nutrition outcomes.

Leverage the ANGeL project:

- Integrate training and sensitization: The Agriculture, Nutrition, and Gender Linkages (ANGeL) project, designed and evaluated by IFPRI and implemented by the Ministry of Agriculture, combines agricultural extension, nutrition training, and gender sensitization. Evaluations by IFPRI indicate that the ANGeL project successfully improved agricultural production diversity, diet diversity, and the overall quality of household diets, and empowered women (Ahmed et al. 2024, Quisumbing et al. 2021).

Empower women through social protection schemes:

- Targeted cash transfers and nutrition education: Social protection schemes, such as cash transfers and nutrition behavior change communication aimed at women, can empower them economically and increase nutrition knowledge. These measures enhance women's ability to influence household nutrition decisions (Ahmed, Hoddinott, and Roy 2024).

Preventing adolescent marriage and pregnancy

In Bangladesh, the high rates of adolescent marriage and pregnancy pose significant public health and nutrition challenges. In rural areas, the average age of first marriage is 16.8 years and first pregnancy is 19.2 years (Tauseef and Sufian 2024). Early marriage and pregnancy often result in low birthweight babies, which is a determinant of child stunting and perpetuates the intergenerational cycle of malnutrition. Preventing adolescent marriage and pregnancy is crucial for improving maternal and child health outcomes.

♦ RECOMMENDATIONS FOR ADDRESSING EARLY MARRIAGE AND PREGNANCY

- Enforce laws: Strengthen the enforcement of laws prohibiting child marriage while investing in community-based programs that promote the rights and education of girls.

- Implement social campaigns: Conduct widespread social campaigns aimed at changing societal norms, emphasizing the health risks associated with early pregnancy and the benefits of keeping girls in school.

- Provide family planning support: For those who do marry early, offer effective family planning support to help delay pregnancy following marriage.

- Implement secondary school feeding program for adolescent girls: Introducing a school feeding program in secondary girls' schools by providing hot, nutritious school lunches can improve adolescent nutrition.

- Target conditional monthly take-home rations to secondary school girls from poor households: Provide a monthly take-home ration of fortified rice, protein-rich pulses, and fortified oil specifically for adolescent girls from low-income households, contingent upon their remaining unmarried. This strategy could help prevent early marriage and teenage pregnancy.

Integrating nutrition behavior change communication into the secondary school curriculum

Behavior change communication (BCC) is an effective tool for improving dietary practices and addressing malnutrition. However, traditional BCC interventions can be expensive and difficult to scale. Integrating nutrition BCC into the secondary school curriculum offers a cost-effective, scalable solution for improving adolescent nutrition knowledge and practices.

Secondary school children (ages 11–18) are at a critical stage for adopting and disseminating nutrition knowledge, making schools an ideal platform for promoting healthy dietary behaviors. Integrating a year-long nutrition BCC module into the curriculum can engage students in practical lessons on nutrition, food safety, and dietary diversity. This approach leverages existing educational infrastructure, making it a sustainable and affordable intervention.

♦ RECOMMENDATIONS FOR LEVERAGING NUTRITION BCC TO IMPROVE NUTRITION

- Integrate nutrition BCC into school curriculum: Implement national education policies that incorporate nutrition behavior change communication (BCC) into the secondary school curriculum.

- Collaborate with ministries: Foster collaboration between education and health ministries to develop appropriate nutrition education modules and train teachers in effective content delivery.

- Establish monitoring and evaluation systems: Create monitoring and evaluation systems to assess the long-term impacts of these interventions on adolescent nutrition and dietary behaviors.

- Foster informed citizens: By incorporating nutrition education into national education standards, the government can cultivate a generation of informed citizens who contribute to healthier, more sustainable food systems.

Table 8.2: Summary of challenges and recommended evidence-based actions for improving food security and nutrition in Bangladesh

Category	Key Issue	Recommended Action	Target Group
Food Availability			
Land Access and Tenure	High percentage of landless households and pure tenant farmers, leading to low-profit farming and limited opportunities for agricultural growth.	• Promote nonfarm employment to diversify rural incomes. • Support micro, small, and medium enterprises (MSMEs) in agro-processing by improving access to credit. • Reform land tenure policies to better support tenant farmers.	Landless and tenant farmers, MSMEs, agricultural policymakers, rural communities
Labor Productivity and Agricultural Employment	Low labor productivity in agriculture and limited land expansion opportunities make it difficult to absorb the rural labor force.	• Invest in technological advancements for higher agricultural yields. • Promote nonfarm employment and faster agricultural growth to shift labor from agriculture to more productive sectors.	Rural laborers, agricultural workers, policymakers, nonfarm employment sectors
Agricultural Diversification and Growth	Over-reliance on rice production limits the potential for higher-value crops and income diversification.	• Intensify rice production through yield improvement. • Promote diversification into maize, pulses, vegetables, and fruits. • Ensure timely access to inputs like seeds, fertilizers, and machinery.	Smallholder farmers, rural communities, policymakers, agribusinesses, extension services
Access to Finance for Smallholder Farmers	Smallholder farmers face difficulties accessing formal finance due to collateral requirements, lack of financial literacy, and unclear land ownership.	• Develop innovative financing models (e.g., harvest-aligned repayment schedules). • Encourage partnerships between banks and ag-tech firms to assess farmers' creditworthiness. • Create a loss-buffer fund to lower risks in agricultural lending and increase financing for smallholder farmers. • Implement a centralized credit tracking system to improve banks' assessment of lending risks. • Reduce costs of borrowing from microfinance institutions. • Offer flexible loan repayment options.	Smallholder farmers, banks, microfinance institutions, financial literacy programs

Category	Key Issue	Recommended Action	Target Group
Agricultural Extension Services	Lack of access to modern agricultural extension services, especially for smallholder farmers.	• Expand and modernize extension services through ICT tools like mobile-phone-based services and video training. • Regular refresher courses for extension workers to ensure up-to-date information. • Update the agricultural extension curriculum with new practices. • Expand initiatives to integrate nutrition into extension services.	Smallholder farmers, extension workers, agricultural research institutes, policymakers
Farm Mechanization	Rising labor costs and barriers to mechanization due to high equipment costs, limited finance, and poorly allocated subsidies.	• Strengthen the machinery rental market. • Improve access to finance and optimize subsidy allocation. • Train skilled labor for machinery operation and maintenance.	Smallholder farmers, machine service providers, policymakers, banks, agricultural laborers
Fertilizer Sector	Fertilizer shortages, import dependency, and outdated production facilities hinder agricultural productivity and food security.	• Stabilize gas supply to urea plants. • Modernize production facilities. • Diversify import sources and build strategic reserves. • Strengthen fertilizer regulation and quality control. • Introduce a voucher system for targeted subsidies • Promote sustainable farming through awareness programs. • Implement a product assurance program for fertilizer quality.	Farmers, fertilizer producers, policymakers, agricultural extension services, smallholder farmers
Food Access			
Youth Employment	High rate of youth (one-fifth) not in education, employment, or training.	• Expand vocational training in farm machinery operation, repair, and maintenance.	Unemployed rural youth
	Lack of formal vocational training (only 1.5% received training).	• Introduce vocational training programs targeting rural youth to bridge the skills and employment gap.	Rural youth, working-age population
	Underutilization of subsidies for agricultural machinery,	• Encourage youth groups to utilize subsidies (50–70%) to purchase machinery and offer services (e.g., rice harvesting).	Rural youth groups

Category	Key Issue	Recommended Action	Target Group
	Limited entrepreneurial skills and funding access.	• Provide low-interest loans and entrepreneurial training to support youth-owned farm machinery businesses.	Rural youth, NGOs
	Shortage of skilled operators and mechanics leads to inefficiency.	• Establish import standards for machinery and invest in training for operators and mechanics.	Rural youth, vocational training institute, import regulating agency
Social Safety Nets	Limited coverage and insufficient funding for social safety net (SSN) programs.	• Expand SSN programs and improve targeting accuracy to reach poor households.	Poor households, government agencies
	Targeting errors (exclusion/inclusion errors).	• Adopt evidence-based targeting criteria (e.g., IFPRI indicators) to enhance the accuracy of program inclusion.	Poor, vulnerable populations
	Small transfer amounts in key programs	• Increase transfer sizes in programs like the Old Age Allowance (now 600 taka/month) and MCBP (now 800 taka/month), Allowances for the Financially Insolvent Disabled (now 550 taka/month), and Allowances for Widowed, Deserted, and Destitute Women (now 550 taka/month).	Elderly people, pregnant women, disadvantaged women
	Need for sustainable income growth for ultra-poor.	• Scale up programs like asset transfers (e.g., BRAC's Targeted Ultra Poor program) to provide sustainable benefits. • Introduce programs like urban clean-up initiatives that provide income-generating opportunities and improve urban environment.	Ultra-poor households
	Lack of social safety nets for urban poor or lack of reach of existing programs.	• Expand social safety net programs, like the Open Market Sale (OMS) Program, to enhance coverage for the urban poor, particularly women.	Vulnerable urban poor, especially women
	Inefficient disbursement of cash benefits to program participants hinders timely access to financial support.	• Streamline and expedite the disbursement of cash benefits to program participants through the government-to-person (G2P) payment system.	

Category	Key Issue	Recommended Action	Target Group
Health-Related Social Safety Nets	Vulnerability to health-related shocks (22% of households cite health expenses as major shock).	• Pilot and evaluate social health insurance programs.	Rural and urban poor households
	High medical expenses among poor households.	• Introduce health vouchers linked to social transfers (e.g., Maternal Health Voucher Scheme) to reduce healthcare costs.	Rural and urban poor households
Food Utilization			
Sustainable Food Systems to Promote Healthy Diets	Lack of diversified, nutrition-sensitive agriculture and ecological sustainability in food production systems.	• Promote cultivation of nutrient-rich crops like fruits, vegetables, and legumes to address micronutrient deficiencies. • Regulate to reduce chemical inputs and support soil conservation. • Invest in value chains to reduce postharvest losses and improve market access.	Smallholder farmers, agricultural policymakers, rural communities, non-producers needing affordable food access
Women's Empowerment in Agriculture	Barriers to women's access to land, credit, and decision-making power reduce agricultural productivity and nutrition outcomes.	• Implement legal reforms ensuring women's equal access to productive resources. • Invest in financial literacy and agricultural training for women. • Support gender-responsive agricultural policies to increase women's decision-making roles and access to land.	Rural women farmers, policymakers, women's empowerment programs, women's advocacy groups
Adolescent Marriage and Pregnancy	High rates of adolescent marriage and pregnancy contribute to poor maternal and child nutrition, including low birthweight and child stunting.	• Strengthen enforcement of child marriage laws. • Conduct widespread social campaigns aimed at changing societal norms, emphasizing the health risks associated with early pregnancy and the benefits of keeping girls in school. • For those who do marry early, offer effective family planning support to help delay pregnancy following marriage. • Provide a monthly take-home ration of fortified rice, pulses, and fortified oil specifically for adolescent girls from low-income households, contingent upon their remaining unmarried. This strategy could	Adolescent girls, civil society activists, media, development partners, policymakers

Category	Key Issue	Recommended Action	Target Group
		help prevent early marriage and teenage pregnancy.	
Integrating Nutrition into the Secondary School Curriculum	Nutrition behavior change communication (BCC) is crucial for improving nutrition because it addresses the knowledge gaps and misconceptions that hinder healthy dietary practices.	• Integrate nutrition BCC into the secondary school curriculum. • Foster collaboration between education and health ministries to develop appropriate nutrition education modules and train teachers in effective content delivery. • Create monitoring and evaluation systems to assess the long-term impacts of these interventions on adolescent nutrition and dietary behaviors. • Incorporate nutrition education into national standards to cultivate informed citizens who contribute to healthier, more sustainable food systems.	Students, teachers, education ministries, NGOs and other development partners who deliver nutrition BCC

TABLES

Table 3.1: Population statistics, by district, 2022

District	Population	Households	Household size	Area	Population density
	(number)		(person/HH)	(sq km)	(persons/sq km)
Barguna	1,010,531	255,390	4.0	1,831.3	552
Barishal	2,570,446	629,626	4.1	2,784.5	923
Bhola	1,932,518	449,057	4.3	3,403.5	568
Jhalokati	661,160	162,401	4.1	706.8	935
Patuakhali	1,727,254	424,743	4.1	3,221.3	536
Pirojpur	1,198,195	298,490	4.0	1,277.8	938
Barishal Division	**9,100,104**	**2,219,707**	**4.1**	**13,225.2**	**688**
Barishal Division (adj.)	**9,325,818**	-	-	-	**705**
Bandarban	481,106	106,155	4.5	4,479.0	107
Brahmanbaria	3,306,563	712,578	4.6	1,881.2	1,758
Chandpur	2,635,748	635,431	4.1	1,645.3	1,602
Chattogram	9,169,465	2,143,909	4.3	5,282.9	1,736
Cumilla	6,212,216	1,407,368	4.4	3,146.3	1,974
Cox's Bazar	2,823,268	587,114	4.8	2,491.9	1,133
Feni	1,648,896	377,164	4.4	990.4	1,665
Khagrachhari	714,119	169,526	4.2	2,749.2	260
Lakshmipur	1,937,948	459,344	4.2	1,440.4	1,345
Noakhali	3,625,442	776,070	4.7	3,685.9	984
Rangamati	647,586	153,482	4.2	6,116.1	106
Chattogram Division	**33,202,357**	**7,528,141**	**4.4**	**33,908.6**	**979**
Chattogram Division (adj.)	**34,178,581**	-	-	-	**1,008**
Dhaka	14,734,701	4,035,241	3.7	1,463.6	10,067
Faridpur	2,162,879	525,877	4.1	2,052.9	1,054
Gazipur	5,263,450	1,579,781	3.3	1,806.4	2,914
Gopalganj	1,295,057	308,710	4.2	1,468.7	882
Kishoreganj	3,267,626	760,952	4.3	2,688.6	1,215

District	Population	Households	Household size	Area	Population density
	(number)		(person/HH)	(sq km)	(persons/sq km)
Madaripur	1,293,027	313,273	4.1	1,125.7	1,149
Manikganj	1,558,025	393,524	4.0	1,383.7	1,126
Munshiganj	1,625,416	399,631	4.1	1,004.3	1,618
Narayanganj	3,909,138	1,023,175	3.8	684.4	5,712
Narsingdi	2,584,452	621,511	4.2	1,150.1	2,247
Rajbari	1,189,818	295,216	4.0	1,092.3	1,089
Shariatpur	1,294,562	308,964	4.2	1,174.1	1,103
Tangail	4,037,608	1,061,746	3.8	3,414.3	1,183
Dhaka Division	**44,215,759**	**11,627,601**	**3.8**	**20,509.1**	**2,156**
Dhaka Division (adj.)	**45,643,915**	**-**	**-**	**-**	**2,226**
Bagerhat	1,613,076	408,840	3.9	3,959.1	407
Chuadanga	1,234,054	326,714	3.8	1,174.1	1,051
Jashore	3,076,144	798,032	3.9	2,606.9	1,180
Jhenaidah	2,005,849	519,295	3.9	1,964.8	1,021
Khulna	2,613,385	670,861	3.9	4,394.4	595
Kushtia	2,149,692	565,339	3.8	1,608.8	1,336
Magura	1,033,115	254,154	4.1	1,039.1	994
Meherpur	705,356	195,322	3.6	751.6	938
Narail	788,671	195,660	4.0	968.0	815
Satkhira	2,196,582	566,752	3.9	3,817.3	575
Khulna Division	**17,415,924**	**4,500,969**	**3.9**	**22,284.1**	**782**
Khulna Division (adj.)	**17,813,957**	**-**	**-**	**-**	**799**
Jamalpur	2,499,738	652,047	3.8	2,115.2	1,182
Mymensingh	5,899,005	1,460,904	4.0	4,394.6	1,342
Netrokona	2,324,853	548,443	4.2	2,794.3	832
Sherpur	1,501,853	396,149	3.8	1,364.7	1,101
Mymensingh Division	**12,225,449**	**3,057,543**	**4.0**	**10,668.8**	**1,146**
Mymensingh Division (adj.)	**12,637,524**	**-**	**-**	**-**	**1,185**
Bogura	3,734,297	1,025,200	3.6	2,898.7	1,288
Joypurhat	956,431	269,905	3.5	1,012.4	945

District	Population	Households	Household size	Area	Population density
	(number)		(person/HH)	(sq km)	(persons/sq km)
Naogaon	2,784,599	765,457	3.6	3,435.6	811
Natore	1,859,922	501,957	3.7	1,900.2	979
Chapai Nawabganj	1,835,528	448,028	4.1	1,702.5	1,078
Pabna	2,909,624	743,558	3.9	2,376.1	1,225
Rajshahi	2,915,009	775,245	3.8	2,425.4	1,202
Sirajganj	3,357,706	842,308	4.0	2,402.1	1,398
Rajshahi Division	**20,353,116**	**5,371,658**	**3.8**	**18,153.0**	**1,121**
Rajshahi Division (adj.)	**20,794,023**	**-**	**-**	**-**	**1,145**
Dinajpur	3,315,236	836,977	4.0	3,444.3	963
Gaibandha	2,562,233	700,288	3.7	2,114.8	1,212
Kurigram	2,329,160	605,722	3.8	2,245.0	1,037
Lalmonirhat	1,428,406	342,028	4.2	1,247.4	1,145
Nilphamari	2,092,568	505,605	4.1	1,546.6	1,353
Panchagarh	1,179,843	281,627	4.2	1,404.6	840
Rangpur	3,169,614	834,307	3.8	2,400.6	1,320
Thakurgaon	1,533,895	382,400	4.0	1,781.7	861
Rangpur Division	**17,610,955**	**4,488,954**	**3.9**	**16,185.0**	**1,088**
Rangpur Division (adj.)	**18,020,073**	**-**	**-**	**-**	**1,113**
Habiganj	2,358,886	491,884	4.8	2,636.6	895
Moulvibazar	2,123,447	446,356	4.8	2,799.4	759
Sunamganj	2,695,496	528,550	5.1	3,747.2	719
Sylhet	3,857,123	746,854	5.2	3,452.1	1,117
Sylhet Division	**11,034,952**	**2,213,644**	**5.0**	**12,635.3**	**873**
Sylhet Division (adj.)	**11,415,021**	**-**	**-**	**-**	**903**
Bangladesh	**165,158,616**	**41,008,217**	**4.0**	**147,569.1**	**1,119**
Bangladesh (adj.)	**169,828,912**	**-**	**-**	**-**	**1,151**

Source: Final Report of the Population and Housing Census, 2023, and Post Enumeration Check (PEC) Adjusted Population, 2023, Bangladesh Bureau of Statistics.

Note: District-level population and household numbers are unadjusted enumerated numbers only. The Final Report of the 2022 Population and Housing Census and the corresponding Post Enumeration Check Report from BBS do not report adjusted population or adjusted number of households by district, and as such are not reported herein.

Table 3.2: Structure of Bangladesh's agrifood system and economy, 2019

	GDP		Employment	
	Value (US$ billion)	**Share (%)**	**Workers (million)**	**Share (%)**
Total economy	**348.0**	**100**	**66.9**	**100**
Agrifood system	**82.9**	**23.8**	**33.1**	**49.5**
Primary agriculture (A)	43.5	12.5	25.8	38.6
Off-farm AFS	39.5	11.3	7.3	10.9
Processing (B)	12.2	3.5	2.0	3.1
Trade and transport (C)	18.6	5.3	3.6	5.4
Food services (D)	3.7	1.1	1.1	1.7
Input supply (E)	4.9	1.4	0.5	0.7
Rest of economy	**265.1**	**76.2**	**33.8**	**50.5**
Total manufacturing	75.6	21.7	9.9	14.7
Total services	185.5	53.3	27.0	40.4
Total trade and transport	82.1	23.6	16.6	24.8

Source: (Diao et al. 2023)

Note: *Primary agriculture* (A) comprises the supply and demand of all agricultural products, including crops, livestock, fisheries, and forestry products. *Agroprocessing* (B) is part of the manufacturing sector and includes those subsectors that process agriculture-related food or nonfood products. *Trade and transport services* (C) include those services associated with the transporting, wholesaling, and retailing of agrifood products between farms, firms, and final points of sale. *Food services* (D) include services, such as meals prepared at restaurants, food stalls, or hotels. Finally, *input supply* (E) is the portion of domestically produced intermediate inputs that is used directly in agricultural and agroprocessing production, such as fertilizers and financial services.

Table 3.3: Land utilization statistics and cropping intensity, by district, 2021/22

District	Total area	Gross cropped area	Net cropped area	Cropping intensity	Net cropped area as % of total area
	('000 hectares)			(percent)	
Barguna	183	148	100	140.0	54.7
Barishal	278	277	187	202.0	67.0
Bhola	340	349	166	156.0	48.9
Jhalokati	71	100	50	148.0	70.9
Patuakhali	322	225	161	210.0	49.9
Pirojpur	128	125	80	200.0	62.3
Barishal Division	**1,323**	**1,224**	**744**	**164.0**	**56.2**
Bandarban	448	53	32	109.0	7.2
Brahmanbaria	188	213	126	156.0	66.9
Chandpur	165	145	93	197.0	56.5
Chattogram	528	350	171	163.0	32.4
Cox's Bazar	249	176	95	205.0	38.0
Cumilla	314	406	206	185.0	65.6
Feni	99	117	54	220.0	54.3
Khagrachhari	275	70	34	163.0	12.2
Lakshmipur	144	211	96	211.0	66.6
Noakhali	369	288	136	169.0	37.0
Rangamati	611	53	33	208.0	5.4
Chattogram Division	**3,391**	**2,082**	**1,076**	**217.0**	**31.7**
Dhaka	146	95	62	163.0	42.5
Faridpur	205	313	146	196.0	71.0
Gazipur	180	134	81	152.0	45.1
Gopalganj	147	183	93	186.0	63.6
Kishoreganj	269	299	179	191.0	66.7
Madaripur	113	140	75	213.0	66.5
Manikganj	138	149	70	164.0	50.6
Munshiganj	100	93	51	213.0	50.4
Narayanganj	68	48	28	185.0	41.4

District	Total area	Gross cropped area	Net cropped area	Cropping intensity	Net cropped area as % of total area
	('000 hectares)			(percent)	
Narsingdi	115	111	57	169.0	49.3
Rajbari	109	191	89	215.0	81.9
Shariatpur	117	123	68	195.0	57.9
Tangail	342	368	193	182.0	56.5
Dhaka Division	**2,051**	**2,247**	**1,193**	**167.0**	**58.2**
Bagerhat	396	157	107	146.0	27.1
Chuadanga	117	209	79	263.0	67.6
Jashore	261	380	166	230.0	63.5
Jhenaidah	197	321	142	226.0	72.2
Khulna	439	178	121	148.0	27.4
Kushtia	161	275	113	242.0	70.4
Magura	104	162	68	238.0	65.4
Meherpur	75	140	50	279.0	66.7
Narail	97	148	64	232.0	65.7
Satkhira	382	210	142	147.0	37.3
Khulna Division	**2,229**	**2,182**	**1,052**	**207.0**	**47.2**
Jamalpur	212	327	154	206.0	72.7
Mymensingh	439	604	293	188.0	66.7
Netrokona	279	326	178	209.0	63.8
Sherpur	136	203	97	213.0	71.2
Mymensingh Division	**1,067**	**1,460**	**722**	**183.0**	**67.7**
Bogura	290	515	212	243.0	73.3
Chapai Nawabganj	170	231	116	199.0	68.2
Joypurhat	101	204	85	240.0	84.0
Naogoan	344	513	254	202.0	73.9
Natore	190	293	144	204.0	75.5
Pabna	238	332	151	220.0	63.5
Rajshahi	242	394	191	206.0	78.8
Sirajganj	240	346	152	229.0	63.1

District	Total area	Gross cropped area	Net cropped area	Cropping intensity	Net cropped area as % of total area
	('000 hectares)			(percent)	
Rajshahi Division	**1,815**	**2,828**	**1,305**	**217.0**	**71.9**
Dinajpur	344	620	274	226.0	79.7
Gaibandha	212	318	155	206.0	73.2
Kurigram	225	289	138	210.0	61.3
Lalmonirhat	125	203	87	232.0	70.1
Nilphamari	155	269	117	230.0	75.7
Panchagarh	140	233	107	217.0	76.4
Rangpur	240	429	189	228.0	78.6
Thakurgaon	178	358	157	228.0	88.2
Rangpur Division	**1,618**	**2,719**	**1,224**	**222.0**	**75.6**
Habiganj	263	285	153	149.0	57.9
Moulvibazar	280	258	157	159.0	56.2
Sunamganj	375	329	220	164.0	58.7
Sylhet	345	314	197	193.0	57.1
Sylhet Division	**1,263**	**1,186**	**727**	**187.0**	**57.6**

Source: Yearbook of Agricultural Statistics, 2023, Bangladesh Bureau of Statistics.

Table 3.4: Distribution of owned cultivated land: Rural Bangladesh

Group	Size of average cultivable land owned	Share of total cultivable land in each group
	(decimals/household)	(percent)
1 (lowest)	5.3	0.28
2	10.5	0.56
3	14.9	0.80
4	18.9	1.01
5	22.3	1.19
6	26.4	1.41
7	31.1	1.67
8	36.3	1.94
9	42.2	2.26
10	49.7	2.66
11	57.7	3.09
12	66.7	3.57
13	78.9	4.23
14	91.5	4.90
15	107.1	5.74
16	126.2	6.76
17	149.8	8.02
18	190.0	10.18
19	249.4	13.36
20 (highest)	492.0	26.35
All households	90.4	100.0

Source: IFPRI Bangladesh Integrated Household Survey, 2018/2019, national rural stratum

Table 3.5: Distribution of operated land: Rural Bangladesh

Group	Size of average operated land	Share of total operable land in each group
	(decimal/household)	(percent)
1 (lowest)	7.6	0.42
2	15.8	0.88
3	21.4	1.19
4	26.4	1.47
5	31.5	1.75
6	36.0	2.00
7	40.8	2.27
8	47.2	2.63
9	53.8	2.99
10	60.6	3.37
11	67.0	3.73
12	76.2	4.24
13	84.3	4.69
14	95.5	5.32
15	108.7	6.05
16	122.9	6.84
17	142.1	7.91
18	167.4	9.32
19	214.0	11.91
20 (highest)	377.6	21.02
All households	86.6	100.0

Source: IFPRI Bangladesh Integrated Household Survey, 2018/2019, national rural stratum

Table 3.6: Land tenancy arrangements, 2018/19

Tenancy arrangement	Overall	Bari-shal	Chatto-gram	Dhaka	Khulna	Rajshahi	Rangpur	Sylhet
				(percent)				
Pure tenant	40.3	39.8	50.8	37.3	35.2	38.1	42.6	46.6
Sharecropping	28.0	20.4	27.9	28.2	24.2	23.0	34.4	40.6
Cash lease	9.6	15.3	19.0	6.9	8.7	11.7	5.9	4.5
Both	2.7	4.1	3.9	2.2	2.3	3.4	2.3	1.5
Mixed tenant (own land + land taken in)	23.2	29.1	19.8	21.5	26.0	24.5	25.3	17.3
Sharecropping	15.0	12.2	8.3	15.0	15.2	15.7	19.6	15.5
Cash lease	6.0	14.8	9.1	4.7	8.7	6.0	2.6	1.5
Both	2.3	2.0	2.3	1.8	2.1	2.9	3.1	0.3
Own land only	35.6	30.6	27.1	41.0	38.6	37.1	29.7	34.9

Source: IFPRI's Bangladesh Integrated Household Survey, 2018/19, national rural stratum

Table 3.7: Share of crops as percentage of gross cropped area, by district, 2022/23

District	Gross cropped area	Rice	Wheat	Maize	Potato	Pulses	Oilseeds	All Veg	Chili	Onion	Sugar-cane	Jute
	(hectare)	(percent)										
Barguna	149,329	98.8	0.0	0.0	0.6	5.3	0.7	1.2	0.2	0.0	0.0	0.0
Barishal	276,805	65.4	0.1	0.2	0.2	6.9	1.9	2.6	0.5	0.1	0.2	4.0
Bhola	349,244	81.4	1.0	0.2	1.5	7.8	1.9	1.5	2.9	0.2	0.1	0.0
Jhalokati	100,362	69.4	0.1	0.4	0.4	3.3	0.6	4.1	0.5	0.0	0.1	0.0
Patuakhali	225,005	94.5	0.0	0.0	0.2	3.8	0.4	0.9	0.5	0.0	0.0	0.0
Pirojpur	124,643	80.7	0.0	0.2	0.7	2.2	0.2	3.2	0.3	0.0	0.1	0.2
Barishal Division	**1,225,388**	**81.7**	**0.3**	**0.2**	**0.7**	**5.6**	**1.2**	**2.0**	**1.2**	**0.1**	**0.1**	**0.9**
Bandarban	52,609	54.4	0.0	0.6	1.3	0.2	0.8	8.8	0.7	0.1	0.2	0.0
Brahmanbaria	212,865	86.6	0.4	0.2	0.7	0.6	6.4	2.9	0.6	0.2	0.0	1.3
Chandpur	145,282	79.6	0.1	3.2	5.0	0.5	2.2	3.3	1.6	0.5	0.4	2.8
Chattogram	350,458	79.3	0.0	0.0	1.2	2.1	0.6	5.8	0.9	0.0	0.2	0.0
Cox's Bazar	175,634	72.8	0.0	5.5	6.2	0.3	2.3	6.7	1.6	0.0	0.1	0.2
Cumilla	406,304	87.5	0.1	0.0	0.1	0.1	0.1	0.9	0.2	0.1	0.1	0.0
Feni	116,954	90.7	0.0	0.1	0.3	4.8	1.7	2.5	0.2	0.0	0.1	0.0
Khagrachari	70,011	59.2	0.0	0.9	0.9	0.2	0.4	14.2	0.8	0.0	0.4	0.0
Lakshmipur	210,841	61.7	0.1	0.0	0.0	0.6	21.7	2.2	0.8	0.1	0.1	0.0
Noakhali	287,731	92.9	0.0	0.1	0.1	9.1	5.5	2.0	1.1	0.1	0.0	0.0
Rangamati	53,419	42.3	0.0	0.8	0.6	0.4	1.9	13.2	1.5	0.1	0.4	0.0
Chattogram Division	**2,082,107**	**79.6**	**0.1**	**0.8**	**1.3**	**2.1**	**4.3**	**3.9**	**0.8**	**0.1**	**0.1**	**0.3**

District	Gross cropped area	Rice	Wheat	Maize	Potato	Pulses	Oilseeds	All Veg	Chili	Onion	Sugar-cane	Jute
	(hectare)	(percent)										
Dhaka	94,696	54.5	0.1	5.6	1.0	1.6	11.1	9.3	0.5	0.5	0.1	3.2
Faridpur	313,227	35.1	6.1	0.1	0.0	7.5	4.1	1.9	0.9	13.0	0.8	27.9
Gazipur	133,546	78.2	0.0	0.0	0.2	0.3	1.3	4.6	0.6	0.2	0.9	0.7
Gopalganj	182,513	57.4	3.0	0.0	0.1	4.6	2.7	2.9	0.2	1.1	0.1	12.9
Kishoreganj	299,467	88.7	0.4	2.5	1.9	0.2	0.6	2.0	0.6	0.2	0.0	4.9
Madaripur	139,617	42.1	3.5	0.2	0.2	7.8	7.3	2.2	0.4	2.6	0.3	24.5
Manikganj	148,924	58.9	0.2	14.9	1.2	4.9	3.7	4.9	1.8	4.6	0.9	2.6
Munshiganj	93,482	45.8	0.0	4.7	36.3	0.2	3.0	5.4	0.5	0.2	0.2	2.6
Narayanganj	47,753	58.3	0.1	0.2	3.6	0.4	1.7	9.4	0.5	0.5	0.1	0.5
Narsingdi	111,289	83.5	0.1	0.0	1.4	0.2	1.8	6.0	0.9	0.1	0.1	2.5
Rajbari	190,607	32.5	7.1	0.1	0.1	4.8	1.9	4.1	0.8	14.9	0.5	25.2
Shariatpur	123,429	37.6	3.6	0.0	1.4	4.5	3.7	2.8	3.4	0.7	0.3	21.2
Tangail	368,264	77.3	1.2	1.1	1.1	2.2	9.5	3.7	0.4	0.8	0.3	4.3
Dhaka Division	**2,246,815**	**59.6**	**2.4**	**2.0**	**2.3**	**3.4**	**4.3**	**3.7**	**0.8**	**3.9**	**0.4**	**11.7**
Bagerhat	157,018	79.1	0.1	0.1	0.2	2.6	0.5	4.4	0.3	0.1	0.2	1.2
Chuadanga	209,222	52.0	0.4	22.9	1.0	1.4	1.0	5.2	0.5	0.4	0.9	9.1
Jashore	380,000	82.8	0.2	0.1	0.4	2.4	3.2	4.3	0.3	0.3	0.1	6.3
Jhenaidah	320,511	71.5	1.6	5.6	0.4	4.4	1.5	3.8	0.5	2.3	0.3	7.3
Khulna	178,062	90.4	0.1	0.1	0.3	0.2	1.0	3.2	0.2	0.1	0.0	0.7
Kushtia	275,186	54.4	4.5	3.8	0.6	4.2	2.3	2.7	0.7	4.0	1.2	14.9

District	Gross cropped area	Rice	Wheat	Maize	Potato	Pulses	Oilseeds	All Veg	Chili	Onion	Sugar-cane	Jute
	(hectare)	(percent)										
Magura	161,874	63.4	3.1	0.0	0.0	8.9	4.2	1.6	0.3	4.0	0.1	22.4
Meherpur	140,021	45.8	8.6	8.1	0.8	3.4	3.1	3.6	1.0	1.5	0.1	14.5
Narail	147,710	66.9	1.1	0.1	0.0	10.2	4.2	2.7	0.2	0.4	0.5	15.0
Satkhira	210,032	81.6	0.3	0.0	0.9	0.8	2.3	3.6	0.2	0.2	0.1	5.5
Khulna Division	**2,179,637**	**69.9**	**1.8**	**4.1**	**0.5**	**3.6**	**2.3**	**3.6**	**0.4**	**1.4**	**0.4**	**9.2**
Jamalpur	327,391	74.1	1.2	4.3	1.5	0.8	1.9	4.3	1.8	0.4	1.2	8.9
Mymensingh	603,791	89.5	0.3	0.0	0.7	0.2	0.4	2.8	0.3	0.1	0.3	0.9
Netrokona	325,772	95.8	0.2	0.0	0.9	0.0	0.8	1.4	0.2	0.1	0.0	1.6
Sherpur	203,152	91.4	0.4	0.6	2.5	0.3	1.7	3.1	0.3	0.3	0.0	1.2
Mymensingh Division	**1,460,106**	**87.7**	**0.5**	**1.1**	**1.1**	**0.3**	**1.0**	**2.9**	**0.6**	**0.2**	**0.4**	**2.9**
Bogura	515,165	74.5	0.4	2.4	10.2	0.1	4.3	1.6	1.1	0.4	0.0	2.3
Chapai Nawabganj	230,671	63.4	10.6	0.2	0.5	0.9	3.6	1.9	0.1	1.3	0.6	0.9
Joypurhat	203,557	66.6	1.1	3.7	7.1	0.3	23.5	4.1	0.5	0.4	0.4	2.9
Naogaon	513,141	86.3	3.2	2.6	1.9	1.3	0.7	1.1	0.1	0.6	0.1	6.0
Natore	293,397	53.5	8.5	2.4	0.4	8.4	7.5	2.0	0.1	1.5	7.1	0.7
Pabna	331,842	49.3	7.8	0.2	0.4	5.1	6.8	3.1	1.2	12.8	1.0	13.2
Rajshahi	393,759	48.0	5.7	3.8	9.0	5.2	5.3	4.0	0.4	3.7	1.3	4.7
Sirajganj	346,411	66.6	1.3	4.0	1.4	1.8	16.4	2.0	0.3	0.2	0.2	4.6
Rajshahi Division	**2,827,943**	**65.4**	**4.4**	**2.5**	**5.5**	**2.8**	**7.2**	**2.3**	**0.5**	**2.5**	**1.2**	**4.6**
Dinajpur	619,978	71.4	0.5	11.3	7.5	0.1	2.3	1.7	0.3	0.4	0.2	0.6

District	Gross cropped area	Rice	Wheat	Maize	Potato	Pulses	Oilseeds	All Veg	Chili	Onion	Sugar-cane	Jute
	(hectare)	(percent)										
Gaibandha	318,488	83.5	1.0	4.0	2.9	0.3	0.9	1.5	0.2	0.4	0.7	4.7
Kurigram	288,946	82.6	2.7	3.2	2.6	0.8	2.1	1.9	0.3	0.2	0.1	6.5
Lalmonirhat	202,747	71.4	0.6	17.1	2.8	0.1	0.5	2.3	0.2	0.3	0.1	1.9
Nilphamari	268,711	73.1	1.6	9.9	8.1	0.0	1.3	2.3	0.8	0.4	0.0	2.8
Panchagarh	233,099	58.0	8.6	12.9	4.2	0.1	5.0	3.0	2.5	0.7	0.3	3.8
Rangpur	429,371	74.4	0.4	6.1	11.8	0.2	0.5	1.9	0.4	0.5	0.1	2.0
Thakurgaon	357,742	61.2	12.9	13.6	7.9	0.2	1.8	2.0	0.2	0.1	1.2	1.8
Rangpur Division	**2,719,083**	**72.2**	**3.2**	**9.5**	**6.6**	**0.2**	**1.8**	**2.0**	**0.5**	**0.3**	**0.3**	**2.7**
Habiganj	285,303	89.1	0.1	0.0	0.7	0.0	0.2	1.9	0.1	0.0	0.3	0.1
Moulvibazar	257,785	78.8	0.0	0.0	0.9	0.1	0.6	1.5	0.1	0.0	0.0	0.0
Sunamganj	329,009	96.5	0.1	0.0	0.5	0.0	0.5	1.6	0.1	0.0	0.0	0.2
Sylhet	313,631	79.7	0.1	0.0	0.4	0.0	0.3	2.4	0.1	0.0	0.0	0.0
Sylhet Division	**1,185,729**	**86.4**	**0.1**	**0.0**	**0.6**	**0.0**	**0.4**	**1.9**	**0.1**	**0.0**	**0.1**	**0.1**
Bangladesh	**15,926,807**	**73.1**	**2.0**	**3.1**	**2.9**	**2.2**	**3.3**	**2.8**	**0.6**	**1.3**	**0.4**	**4.6**

Source: Yearbook of Agricultural Statistics, 2023, Bangladesh Bureau of Statistics.

Table 3.8: Production of cereal crops, potatoes, pulses and oilseeds by district, 2022/23

District	Aus	Aman	Boro	Total Rice	Wheat	Maize	Potatoes	Pulses	Oilseeds
	(metric tons)								
Barguna	113,460	216,768	25,317	355,545	0	156	20,165	7,206	1141
Barishal	24,710	240,372	214,468	479,550	937	2,242	13,679	26,870	7,458
Bhola	209,628	459,308	167,367	836,303	13,984	4,917	110,860	31,545	12,603
Jhalokati	29,858	98,816	44,013	172,687	438	2,216	7,390	2,958	790
Patuakhali	39,860	389,671	13,369	442,900	0	367	11,275	6,551	774.25
Pirojpur	31,863	97,603	105,081	234,547	88	1,196	18,649	2,728	278
Barishal Division	**449,379**	**1,502,538**	**569,615**	**2,521,532**	**15,447**	**11,094**	**182,018**	**77,858**	**23,045**
Bandarban	24,434	29,428	23,948	77,810	0	907.15	6,520	126	399.35
Brahmanbaria	30,106	171,344	439,170	640,620	2,242	2,721	23,921	1257	16,444
Chandpur	24,903	73,872	212,331	311,106	368	32,517	204,051	791	7,358
Chattogram	105,278	454,439	260,741	820,458	199	351.36	62,302	6253	3,109
Cox's Bazar	8,257	216,224	215,446	439,927	0	425	27,804	538	5,520
Cumilla	210,647	324,039	626,711	1,161,397	1,735	54813	191,371	609	1,522
Feni	23,277	200,407	102,512	326,196	10	675	4,787	6015	2,714
Khagrachhari	6,788	89,872	41,805	138,465	0	2,784	7,525	83	367.22
Lakshmipur	54,044	205,715	114,598	374,357	584	326	1,874	1047	86,037
Noakhali	92,642	433,645	353,364	879,651	75	1,297	5,347	29587	22,840
Rangamati	9,277	28,356	31,052	68,685	0	1,844	3,753	252	798.75
Chattogram Division	**589,653**	**2,227,341**	**2,421,678**	**5,238,672**	**5,213**	**98,660**	**539,254**	**46,557**	**147,109**
Dhaka	1,923	14,072	197,344	213,339	259	36,892	20,737	1,996	12,602
Faridpur	12,071	228,663	104,006	344,740	67,510	3,156	2,555	35,830	15,471

District	Aus	Aman	Boro	Total Rice	Wheat	Maize	Potatoes	Pulses	Oilseeds
	(metric tons)								
Gazipur	4,578	110,418	254,806	369,802	46	286.93	4,663	308.19	1,137
Gopalganj	5,009	39,488	429,796	474,293	16,893	327.55	6,344	10,378	5,028
Kishoreganj	65,691	228,851	696,449	990,991	3,190	63,560	115,373	731.26	2,760
Madaripur	2,538	52,219	141,089	195,846	15,957	2,622	7,992	12,210	12,176
Manikganj	7,527	52,506	244,577	304,610	972	175,358	34,627	7,688	37,325
Munshiganj	420	20,341	96,681	117,442	57	26,130	1,000,451	172.52	3,616
Narayanganj	3,985	9,700	82,400	96,085	86	924.19	42,951	177.83	842.28
Narsingdi	2,964	102,647	205,033	310,644	181	157.1	19,717	251.16	2,121
Rajbari	5,703	121,113	58,218	185,034	43,481	1,704	2,228	17,945	5,378
Shariatpur	20,980	21,590	110,066	152,636	14,374	195.4	52,224	7,585	5,660
Tangail	4,441	261,291	736,806	1,002,538	12,505	33,715	52,288	6,105	37,518
Dhaka Division	**137,830**	**1,262,899**	**3,357,271**	**4,758,000**	**175,511**	**345,028**	**1,362,150**	**101,378**	**141,635**
Bagerhat	8,944	142,870	275,830	427,644	377	1,240	6,655	4,051	964.98
Chuadanga	107,485	98,857	153,494	359,836	3,185	555,116	44,849	3,541	2,878
Jashore	47,832	406,071	751,125	1,205,028	2,581	4,758	32,989	10,224	14,327
Jhenaidah	118,305	346,088	391,242	855,635	19,957	183,514	34,486	18,972	5,837
Khulna	6,322	254,568	248,551	509,441	357	923.07	11,858	307.07	1035.12
Kushtia	76,160	271,055	151,597	498,812	48,586	64,682	33,687	16,981	8,964
Magura	10,961	168,913	146,431	326,305	15,634	570.6	1,672	12,703	6,480
Meherpur	51,616	78,605	73,431	203,652	50,535	12,987	25,144	6,326	5,778
Narail	16,772	110,718	223,438	350,928	4,587	943	687	15,762	6,925
Satkhira	18,387	267,282	311,434	597,103	1,721	637.49	36,473	1,703	7,011

District	Aus	Aman	Boro	Total Rice	Wheat	Maize	Potatoes	Pulses	Oilseeds
					(metric tons)				
Khulna Division	**462,784**	**2,145,027**	**2,726,573**	**5,334,384**	**147,520**	**825,372**	**228,500**	**90,570**	**60,200**
Jamalpur	8,206	282,125	530,669	821,000	10,179	148,869	101,298	2,218	6,270
Mymensingh	52,563	692,344	1,057,952	1,802,859	4,514	1,397	41,027	1,525	3,301
Netrokona	732	365,289	768,778	1,134,799	2,143	387	38,650	172	3,313
Sherpur	9,365	231,790	429,548	670,703	2,085	8,149	79,542	835	4,638
Mymensingh Division	**70,866**	**1,571,548**	**2,786,947**	**4,429,361**	**18,921**	**158,802**	**260,517**	**4,750**	**17,522**
Bogura	43,924	555,785	773,052	1,372,761	5,760	116,666	1,146,289	783.75	36,008
Chapai Nawabganj	129,767	171,432	237,451	538,650	100,608	51,468	1,067,560	2,254	17,177
Joypurhat	597	194,686	253,455	448,738	5,956	3,228	342,389	917.09	79,276
Naogaon	169,744	545,877	861,924	1,577,545	56,729	77,211	13,842	7,952	5,096
Natore	25,853	241,485	274,617	541,955	100,540	111,167	21,455	26,940	30,871
Pabna	45,611	195,234	235,041	475,886	79,400	7,246	17,322	25,416	30,148
Rajshahi	148,600	255,478	297,738	701,816	76,270	114,641	966,966	27,790	29,820
Sirajganj	14,169	235,034	631,759	880,962	13,067	136,985	65,237	7,260	73,660
Rajshahi Division	**578,265**	**2,395,011**	**3,565,037**	**6,538,313**	**438,330**	**618,613**	**3,641,060**	**99,312**	**302,055**
Dinajpur	28,662	731,951	726,949	1,487,562	9,768	641,407	1,128,833	381.79	19,553
Gaibandha	36,814	324,723	525,297	886,834	7,803	99,424	211,330	1,363	3,909
Kurigram	16,064	349,357	483,310	848,731	23,188	81,129	181,914	2,538	8,108
Lalmonirhat	33,639	266,260	204,819	504,718	4,090	316,765	133,835	212.13	1,754
Nilphamari	4,561	315,608	361,116	681,285	13,366	282,253	396,708	87.09	4,650
Panchagarh	6,815	316,596	142,578	465,989	75,090	325,433	211,012	320.79	19,155
Rangpur	68,030	460,590	595,564	1,124,184	5,049	210,861	1,193,796	802.99	2,677

District	Aus	Aman	Boro	Total Rice	Wheat	Maize	Potatoes	Pulses	Oilseeds
	(metric tons)								
Thakurgaon	58,871	399,653	249,129	707,653	165,264	429,655	656,279	474.57	9,269
Rangpur Division	**253,456**	**3,164,738**	**3,288,762**	**6,706,956**	**303,618**	**2,386,927**	**4,113,707**	**6,180**	**69,075**
Habiganj	117,050	234,316	501,786	853,152	762	105.66	27,926	24.24	817.14
Moulvibazar	124,432	309,088	289,316	722,836	116	18.6	33,043	197.09	2,199
Sunamganj	41,898	227,025	987,656	1,256,579	1,228	911.94	28,189	105	2,640
Sylhet	75,533	386,865	272,987	735,385	570	53	15,371	106.57	1,385
Sylhet Division	**358,913**	**1,157,294**	**2,051,745**	**3,567,952**	**2,676**	**1,089**	**104,529**	**432.9**	**7,041**
Bangladesh	**2,901,146**	**15,426,396**	**20,767,628**	**39,095,170**	**1,107,236**	**4,445,585**	**10,431,735**	**427,038**	**767,682**

Source: Yearbook of Agricultural Statistics, 2023, Bangladesh Bureau of Statistics.

Table 3.9: Production of vegetables, chilis, onions, and sugarcane by district, 2022/23

District	All vegetables	Chilis	Onions	Sugarcane
	(metric tons)			
Barguna	11,176	1,055	62	375
Barishal	46,216	3,524	518	4,265
Bhola	34,543	12,593	3,816	6,880
Jhalokati	29,468	1,323	164	3,240
Patuakhali	10,785	4,076	86	302
Pirojpur	23,626	822	97	2,301
Barishal Division	**155,814**	**23,393**	**4,743**	**17,363**
Bandarban	27,122	1,939	208	913
Brahmanbaria	60,098	10,278	2,695	264
Chandpur	38,474	18,451	5,135	15,395
Chattogram	198,440	24,948	355	16,859
Cox's Bazar	99,022	3,735	86	2,968
Cumilla	55,014	29,764	1,337	5,524
Feni	25,040	1,683	94	3,500
Khagrachhari	79,084	4,001	84	5,899
Lakshmipur	35,905	12,031	622	4,318
Noakhali	45,584	24,893	1,978	2,360
Rangamati	46,313	3,927	260	7,357
Chattogram Division	**710,096**	**135,649**	**12,853**	**65,357**
Dhaka	112,254	2,813	4,006	1,155
Faridpur	48,194	12,950	544,980	89,084
Gazipur	51,617	2,503	1,019	24,771
Gopalganj	57,523	2,160	12,754	9,078
Kishoreganj	70,939	7,614	4,875	509
Madaripur	29,207	3,755	40,391	18,520
Manikganj	90,515	33,386	59,206	69,212
Munshiganj	43,762	2,948	1,643	6,266
Narayanganj	30,823	982	1,378	648

District	All vegetables	Chilis	Onions	Sugarcane
		(metric tons)		
Narsingdi	64,768	8,262	659	2,514
Rajbari	99,689	9,127	366,498	41,763
Shariatpur	47,758	11,793	31,792	14,754
Tangail	134,580	5,646	4,627	48,738
Dhaka Division	**881,631**	**103,939**	**1,073,829**	**327,012**
Bagerhat	50,138	767	758	6,214
Chuadanga	124,572	4,605	10,810	117,973
Jashore	121,054	3,434	12,853	15,270
Jhenaidah	160,408	6,890	98,588	58,806
Khulna	102,843	1,195	890	1,210
Kushtia	71,818	16,473	141,877	159,414
Magura	468,762	1,229	70,970	3,279
Meherpur	101,930	9,620	58,209	8,954
Narail	33,247	1,641	5,155	27,232
Satkhira	107,501	1,462	3,349	5,852
Khulna Division	**1,342,273**	**47,318**	**403,459**	**404,205**
Jamalpur	138,822	50,492	11,138	204,309
Mymensingh	183,157	16,743	4,082	80,888
Netrokona	75,554	4,372	2,015	878
Sherpur	82,579	6,121	4,106	5,059
Mymensingh Division	**480,112**	**77,728**	**21,341**	**291,134**
Bogura	124,904	60,517	13,499	5,650
Chapai Nawabganj	38,151	1,624	34,604	60,219
Joypurhat	119,879	3,659	9,256	44,887
Naogaon	82,811	9,954	34,067	13,795
Natore	121,890	5,049	67,777	928,965
Pabna	168,093	48,039	535,401	150,627
Rajshahi	278,333	12,278	248,649	226,012
Sirajganj	92,547	11,966	5,340	37,357
Rajshahi Division	**1,026,608**	**153,087**	**948,594**	**1,467,513**

District	All vegetables	Chilis	Onions	Sugarcane
	(metric tons)			
Dinajpur	129,732	19,052	18,394	47,474
Gaibandha	40,518	4,178	9,000	115,120
Kurigram	49,112	4,586	2,826	8,518
Lalmonirhat	55,955	3,052	4,153	3,856
Nilphamari	69,771	20,513	11,130	5,760
Panchagarh	80,241	52,315	14,999	17,418
Rangpur	77,960	9,792	16,983	21,089
Thakurgaon	69,426	4,486	2,387	149,673
Rangpur Division	**572,714**	**117,973**	**79,873**	**368,908**
Habiganj	67,405	1,154	273	36,847
Moulvibazar	41,714	438	194	864
Sunamganj	81,536	812	917	3,190
Sylhet	78,053	1,059	919	153
Sylhet Division	**268,708**	**3,461**	**2,303**	**41,055**
Bangladesh	**5,437,956**	**662,547**	**2,546,994**	**2,982,547**

Source: Yearbook of Agricultural Statistics, 2023, Bangladesh Bureau of Statistics.

Table 3.10: Production of fruits by district, 2022/23

District	Banana	Mango	Pineapple	Papaya
	(metric tons)			
Barguna	1,020	8,126	69	858
Barishal	3,656	7,015	33	5,568
Bhola	2,890	2,175	115	954
Jhalokati	10,239	1,273	0	1,554
Patuakhali	2,006	6,589	234	345
Pirojpur	13,717	4,754	84	763
Barishal Division	**33,528**	**29,931**	**535**	**10,042**
Bandarban	18,500	3,798	6,303	2,192
Brahmanbaria	1,070	10,140	75	655
Chandpur	6,571	11,164	9	2,503
Chattogram	15,026	21,163	7,273	2,794
Cox's Bazar	3,631	9,715	1,043	4,393
Cumilla	3,937	24,821	116	2,410
Feni	2,389	3,672	53	614
Khagrachhari	27,102	9,432	8,918	2,482
Lakshmipur	13,734	1,922	71	4,000
Noakhali	3,918	8,796	38	2,325
Rangamati	44,016	6,077	24,949	5,246
Chattogram Division	**139,893**	**110,700**	**48,849**	**29,613**
Dhaka	4,300	5,600	3	1,772
Faridpur	1,099	9,650	0	1,143

District	Banana	Mango	Pineapple	Papaya
	(metric tons)			
Gazipur	9,748	9,350	4,974	1,764
Gopalganj	4,621	4,333	0	1,120
Kishoreganj	11,645	12,057	19	1,506
Madaripur	10,753	11,214	0	1,224
Manikganj	3,076	6,128	0	1,775
Munshiganj	934	3,210	0	585
Narayanganj	969	2,168	17	866
Narsingdi	22,963	5,464	1,280	3,850
Rajbari	6,554	23,035	0	2,034
Shariatpur	1,693	4,837	0	1,993
Tangail	89,583	16,926	123,573	4,992
Dhaka Division	**167,939**	**113,973**	**129,866**	**24,623**
Bagerhat	9,449	2,486	64	1,017
Chuadanga	18,063	7,105	0	1,963
Jashore	11,029	10,296	374	3,280
Jhenaidah	51,349	17,893	3	1,241
Khulna	5,162	5,320	48	1,316
Kushtia	34,780	57,183	0	5,592
Magura	17,069	6,957	10	2,403
Meherpur	37,956	11,717	0	1,477
Narail	4,532	7,715	0	1,377
Satkhira	6,474	10,358	77	1,637

District	Banana	Mango	Pineapple	Papaya
		(metric tons)		
Khulna Division	**195,862**	**137,029**	**575**	**21,301**
Jamalpur	7,448	13,153	624	4,190
Mymensingh	37,744	23,866	5,991	5,846
Netrokona	4,904	30,427	118	1,469
Sherpur	4,081	11,665	260	1,237
Mymensingh Division	**54,177**	**79,111**	**6,993**	**12,742**
Bogura	20,194	25,395	14	3,919
Chapai Nawabganj	5,341	117,354	0	1,297
Joypurhat	3,161	5,426	0	759
Naogaon	16,722	346,539	0	2,056
Natore	18,327	36,861	0	8,046
Pabna	6,143	36,110	0	4,532
Rajshahi	51,081	236,293	0	9,600
Sirajganj	2,945	20,348	0	3,285
Rajshahi Division	**123,914**	**824,325**	**14**	**33,494**
Dinajpur	26,259	39,034	0	1,996
Gaibandha	42,913	13,767	0	1,807
Kurigram	5,157	12,606	130	854
Lalmonirhat	3,149	5,713	20	802
Nilphamari	3,577	9,462	30	1,242
Panchagarh	5,640	15,408	38	1,367
Rangpur	19,484	22,599	67	1,725

District	Banana	Mango	Pineapple	Papaya
	(metric tons)			
Thakurgaon	9,941	30,308	47	608
Rangpur Division	**116,119**	**148,897**	**332**	**10,401**
Habiganj	1,359	19,432	1,852	636
Moulvibazar	1,597	5,386	6,506	1,054
Sunamganj	1,977	6,133	111	526
Sylhet	3,988	8,020	1,102	885
Sylhet Division	**8,921**	**38,971**	**9,571**	**3,100**
Bangladesh	**840,354**	**1,482,937**	**196,735**	**145,317**

Source: Yearbook of Agricultural Statistics, 2023, Bangladesh Bureau of Statistics.

Table 3.11: Yield rates of aus, aman, boro, all rice wheat, maize, and jute, by district, 2022/23

District	Aus	Aman	Boro	All rice	Wheat	Maize	Jute
			(metric ton/ha)				(bales/ha)
Barguna	2.3	2.3	3.2	2.3	0.0	3.5	0.0
Barishal	2.0	2.1	4.2	2.6	2.6	5.0	10.4
Bhola	2.6	2.8	4.2	2.9	4.2	6.5	0.0
Jhalokati	2.7	2.1	3.6	2.5	3.0	5.1	0.0
Patuakhali	2.1	2.1	2.4	2.1	0.0	6.3	0.0
Pirojpur	2.4	1.6	4.1	2.3	4.2	4.6	6.0
Barishal Division	**2.4**	**2.2**	**4.0**	**2.5**	**4.0**	**5.5**	**10.3**
Bandarban	2.0	2.8	3.9	2.7	0.0	2.8	0.0
Brahmanbaria	3.1	2.7	4.0	3.5	2.6	5.2	12.1
Chandpur	2.4	1.8	3.4	2.7	3.3	7.1	11.4
Chattogram	2.9	2.6	4.1	3.0	0.0	6.3	0.0
Cox's Bazar	3.4	2.9	4.2	3.4	0.0	5.2	0.0
Cumilla	2.8	2.5	4.2	3.3	3.6	5.6	12.9
Feni	2.2	3.0	3.5	3.1	1.6	8.9	0.0
Khagrachhari	2.1	3.3	3.9	3.3	0.0	4.4	0.0
Lakshmipur	2.6	2.7	3.4	2.9	4.3	5.6	10.0
Noakhali	2.6	2.7	4.9	3.3	2.5	8.1	0.0
Rangamati	1.7	2.9	4.3	3.0	0.0	4.5	0.0
Chattogram Division	**2.7**	**2.7**	**4.0**	**3.2**	**3.1**	**5.9**	**11.7**
Dhaka	2.7	1.8	4.6	4.1	3.0	7.0	11.0

District	Aus	Aman	Boro	All rice	Wheat	Maize	Jute
			(metric ton/ha)				(bales/ha)
Faridpur	2.0	2.8	4.5	3.1	3.6	8.3	11.4
Gazipur	3.2	2.5	4.3	3.5	1.9	10.6	9.5
Gopalganj	2.4	1.8	5.3	4.5	3.0	7.1	11.9
Kishoreganj	2.8	3.0	4.2	3.7	2.5	8.6	11.5
Madaripur	2.0	2.1	4.3	3.3	3.2	9.3	11.9
Manikganj	2.6	1.5	5.0	3.5	3.1	7.9	10.4
Munshiganj	2.4	1.0	4.2	2.7	3.0	6.0	10.9
Narayanganj	2.1	1.6	4.2	3.4	2.9	8.0	11.1
Narsingdi	2.7	2.7	3.8	3.3	2.3	6.7	12.0
Rajbari	2.1	2.6	4.6	3.0	3.2	7.5	10.7
Shariatpur	2.5	1.6	4.5	3.3	3.2	6.8	10.4
Tangail	2.1	2.3	4.4	3.5	2.9	8.1	10.8
Dhaka Division	**2.5**	**2.4**	**4.5**	**3.6**	**3.3**	**7.8**	**11.2**
Bagerhat	2.5	2.3	4.6	3.4	2.7	5.8	10.9
Chuadanga	2.8	3.0	4.1	3.3	3.7	11.6	10.7
Jashore	3.2	2.9	4.7	3.8	3.1	8.4	11.5
Jhenaidah	3.3	3.4	4.4	3.7	3.9	10.3	11.7
Khulna	1.8	2.6	4.2	3.2	2.9	7.2	11.9
Kushtia	2.9	3.1	4.2	3.3	3.9	6.1	11.9
Magura	2.1	2.7	4.1	3.2	3.1	7.6	12.1
Meherpur	2.6	3.1	4.0	3.2	4.2	1.1	11.9

District	Aus	Aman	Boro	All rice	Wheat	Maize	Jute
	(metric ton/ha)						(bales/ha)
Narail	2.1	2.7	4.5	3.6	2.9	8.7	10.7
Satkhira	2.9	3.1	4.0	3.5	2.9	7.7	10.1
Khulna Division	**2.9**	**2.9**	**4.4**	**3.5**	**3.8**	**10.6**	**11.5**
Jamalpur	2.2	2.6	4.1	3.4	2.7	3.0	9.9
Mymensingh	2.8	2.7	4.1	3.3	2.7	3.0	10.8
Netrokona	2.6	2.8	4.3	3.6	3.0	4.0	9.6
Sherpur	2.6	2.5	4.7	3.6	2.7	3.7	14.0
Mymensingh Division	**2.7**	**2.6**	**4.2**	**3.5**	**2.7**	**3.1**	**10.2**
Bogura	2.8	3.1	4.1	3.6	2.6	9.3	11.9
Chapai Nawabganj	3.1	3.2	4.6	3.7	4.1	7.2	13.6
Joypurhat	2.7	2.9	3.7	3.3	2.6	8.8	11.9
Naogoan	3.1	2.8	4.5	3.6	3.4	10.3	12.0
Natore	2.8	2.8	4.5	3.5	4.0	8.3	11.8
Pabna	2.2	2.2	4.3	2.9	3.1	9.6	13.0
Rajshahi	3.3	3.3	4.5	3.7	3.4	7.6	12.1
Sirajganj	2.3	2.8	4.5	3.8	2.8	9.8	11.5
Rajshahi Division	**3.0**	**2.9**	**4.3**	**3.5**	**3.5**	**8.8**	**12.3**
Dinajpur	2.8	2.8	4.2	3.4	3.0	9.2	11.5
Gaibandha	2.8	2.5	4.2	3.3	2.4	7.8	11.3
Kurigram	2.8	2.9	4.3	3.6	3.0	8.8	12.9
Lalmonirhat	3.0	3.1	4.3	3.5	3.6	9.1	12.6

District	Aus	Aman	Boro	All rice	Wheat	Maize	Jute
			(metric ton/ha)				(bales/ha)
Nilphamari	2.9	2.8	4.4	3.5	3.2	10.6	12.8
Panchagarh	2.8	3.2	4.3	3.4	3.7	10.8	14.6
Rangpur	2.9	2.8	4.5	3.5	3.1	8.0	14.5
Thakurgaon	2.9	2.9	4.0	3.2	3.6	8.8	13.6
Rangpur Division	**2.9**	**2.9**	**4.3**	**3.4**	**3.5**	**9.2**	**13.0**
Habiganj	2.7	2.7	4.1	3.4	3.4	4.6	13.4
Moulvibazar	3.0	3.0	4.8	3.6	2.3	7.4	0.0
Sunamganj	2.9	2.8	4.5	4.0	3.5	7.5	12.2
Sylhet	2.9	2.7	3.3	2.9	2.3	4.0	0.0
Sylhet Division	**2.9**	**2.8**	**4.2**	**3.5**	**3.1**	**7.3**	**12.6**
Bangladesh	**2.7**	**2.7**	**4.2**	**3.3**	**3.4**	**7.3**	**11.6**
Coefficient of variation (CV) (%)	15.3	19.1	11.0	12.8	40.4	32.0	52.7

Source: Yearbook of Agricultural Statistics, 2023, Bangladesh Bureau of Statistics.

Table 3.12: Yield rates of fruits and vegetables, by district, 2022/23

District	Mango	Pineap-ple	Papaya	Banana	Brinjal	Tomato	Water gourd	Okra	Pump-kin	Puishak	Palong-shak	Lentils	Mustard
	(metric ton/ha)												
Barguna	2.5	4.3	0.8	9.1	9.5	5.7	7.8	4.7	7.9	5.5	3.5	2.0	1.4
Barishal	7.2	3.3	20.9	5.3	6.9	7.6	9.8	3.7	9.7	6.7	4.7	1.0	1.1
Bhola	11.5	11.4	30.2	12.4	6.9	7.1	10.9	5.3	10.5	6.9	5.0	1.3	1.3
Jhalokati	1.5	0.0	23.4	8.6	4.5	5.3	16.7	4.3	13.7	6.3	2.9	1.2	0.9
Patuakhali	3.3	4.2	1.1	8.2	6.9	3.1	6.2	2.0	6.4	3.6	2.8	0.9	0.6
Pirojpur	3.0	6.1	44.9	12.0	3.8	4.7	8.6	3.1	7.1	4.6	4.3	1.3	0.9
Barishal Division	**4.8**	**5.8**	**20.2**	**9.3**	**6.4**	**5.6**	**10.0**	**3.9**	**9.2**	**5.6**	**3.9**	**1.1**	**1.1**
Bandarban	3.3	10.0	19.5	11.9	5.5	6.5	4.8	5.8	6.1	4.2	3.5	0.9	0.7
Brahmanbaria	9.9	4.9	34.2	9.8	8.0	11.0	13.6	7.3	8.5	8.1	5.0	0.8	1.2
Chandpur	24.2	3.2	24.6	16.2	8.3	8.2	13.7	2.8	10.1	6.0	4.4	1.2	2.5
Chattogram	20.3	8.9	27.0	12.4	11.6	10.0	13.2	4.4	10.8	8.9	4.9	0.7	0.9
Cox's Bazar	8.8	8.4	6.3	11.4	7.8	18.3	15.5	4.6	12.4	6.8	5.1	0.0	0.0
Cumilla	16.6	10.7	52.7	10.4	7.0	16.4	12.1	5.3	9.3	4.9	5.2	0.9	1.4
Feni	5.7	6.2	11.5	12.0	11.3	14.0	15.1	2.6	9.8	4.7	5.2	1.3	1.1
Khagrachhari	4.7	11.1	17.8	9.1	8.4	8.1	9.0	4.7	9.4	4.9	4.4	0.6	1.2
Lakshmipur	3.6	8.2	53.7	10.4	8.2	20.5	10.3	6.8	7.6	4.8	4.0	0.8	0.9
Noakhali	27.4	5.4	22.2	8.4	11.3	11.3	10.4	5.7	8.7	5.7	5.6	1.0	0.8
Rangamati	4.0	19.0	27.2	11.7	11.2	5.8	9.4	3.8	7.0	4.4	2.5	0.9	1.1

District	Mango	Pineap-ple	Papaya	Banana	Brinjal	Tomato	Water gourd	Okra	Pump-kin	Puishak	Palong-shak	Lentils	Mustard
							(metric ton/ha)						
Chattogram Division	**11.7**	**8.7**	**27.0**	**11.2**	**9.0**	**11.8**	**11.6**	**4.9**	**9.1**	**5.8**	**4.5**	**1.0**	**1.3**
Dhaka	26.0	7.1	33.5	17.4	14.5	12.6	19.5	5.9	20.2	5.6	12.9	1.2	1.2
Faridpur	18.0	0.0	25.2	12.3	9.0	14.2	10.8	6.4	8.8	5.7	4.9	1.7	0.9
Gazipur	9.1	8.7	14.5	15.1	5.4	15.7	11.3	3.9	8.3	5.3	5.7	1.0	0.6
Gopalganj	9.8	0.0	23.1	14.3	10.5	18.2	16.3	5.3	15.6	14.2	5.5	1.0	0.9
Kishoreganj	31.8	10.5	33.7	18.5	9.9	20.4	17.8	7.8	14.4	8.1	5.3	0.9	1.1
Madaripur	26.4	0.0	21.8	16.8	12.2	20.3	12.4	5.3	11.8	8.8	5.6	1.2	1.2
Manikganj	6.1	0.0	27.1	12.5	15.3	15.2	12.6	9.4	18.0	8.9	5.5	1.2	1.3
Munshiganj	29.4	0.0	15.3	12.6	6.0	7.0	16.9	9.8	15.5	4.7	6.8	0.9	1.3
Narayanganj	47.7	10.6	31.8	12.7	7.3	8.4	10.1	5.5	10.8	6.4	5.0	1.0	0.9
Narsingdi	16.2	11.5	32.3	15.9	12.8	7.9	19.1	5.9	10.4	6.6	3.2	0.7	1.1
Rajbari	32.1	0.0	47.6	15.2	16.8	10.3	14.8	11.2	18.3	12.3	10.0	2.2	1.4
Shariatpur	7.8	0.0	26.5	9.8	12.9	24.4	20.9	9.4	21.8	17.0	6.2	1.3	1.1
Tangail	14.2	17.0	30.4	19.8	11.1	16.0	12.2	5.4	12.0	7.2	5.9	0.8	1.1
Dhaka Division	**21.1**	**10.9**	**27.9**	**14.8**	**11.0**	**14.7**	**15.0**	**7.0**	**14.3**	**8.5**	**6.3**	**1.6**	**1.1**
Bagerhat	11.2	3.4	30.4	10.3	7.4	12.7	9.5	3.9	8.3	7.5	7.6	0.9	1.0
Chuadanga	19.6	0.0	67.4	24.6	8.7	12.2	15.4	7.5	15.7	7.5	8.3	1.2	1.5
Jashore	7.1	8.8	47.3	13.3	7.3	12.3	14.1	8.3	13.0	13.5	7.6	1.1	1.2
Jhenaidah	23.3	4.4	26.5	15.2	19.0	8.4	12.3	7.0	14.4	15.0	6.2	1.4	1.3
Khulna	4.2	7.9	14.7	9.8	5.3	7.7	7.4	3.7	11.8	8.8	5.1	0.8	0.8

District	Mango	Pineap-ple	Papaya	Banana	Brinjal	Tomato	Water gourd	Okra	Pump-kin	Puishak	Palong-shak	Lentils	Mustard
	(metric ton/ha)												
Kushtia	36.0	0.0	107.1	21.8	18.0	18.2	18.1	11.2	17.8	18.5	6.9	1.5	1.5
Magura	28.4	11.9	29.0	26.2	10.4	16.0	15.4	10.5	15.1	12.1	8.3	0.9	1.0
Meherpur	5.3	0.0	59.2	37.9	19.1	28.4	22.5	13.2	18.4	27.1	10.8	1.3	1.3
Narail	11.5	0.0	16.7	17.1	9.7	9.4	13.8	8.6	12.0	15.5	7.6	1.2	1.0
Satkhira	6.2	6.6	11.0	15.5	10.2	9.0	15.2	6.9	12.4	10.2	6.2	1.0	1.5
Khulna Division	**15.3**	**7.2**	**40.9**	**19.2**	**11.5**	**13.4**	**14.4**	**8.1**	**13.9**	**13.6**	**7.5**	**1.2**	**1.2**
Jamalpur	12.2	15.9	28.5	13.7	9.6	8.8	9.9	13.1	9.7	7.2	5.0	0.8	1.0
Mymensingh	8.4	18.6	15.7	17.5	16.7	29.2	17.5	7.8	15.4	7.4	10.0	1.3	1.2
Netrokona	16.6	12.1	30.0	14.3	13.6	18.3	13.3	11.6	18.3	13.8	6.0	1.0	1.1
Sherpur	12.2	13.7	27.9	15.6	11.0	17.5	14.6	9.9	10.5	10.1	9.7	1.0	1.3
Mymensingh Divi-sion	**12.4**	**15.1**	**25.5**	**15.3**	**12.7**	**18.5**	**13.8**	**10.6**	**13.5**	**9.6**	**7.7**	**1.1**	**1.1**
Bogura	18.3	6.4	37.5	19.7	15.0	9.3	12.1	7.3	11.7	9.9	8.1	1.0	1.6
Chapai Na-wabganj	15.9	0.0	18.2	18.1	18.4	14.2	15.0	22.8	15.0	12.0	6.2	1.2	1.4
Joypurhat	20.2	0.0	36.8	28.0	15.9	15.3	15.2	8.5	13.4	13.9	7.0	1.2	2.1
Naogoan	11.8	0.0	38.6	45.4	19.9	11.5	10.9	16.5	15.0	21.2	6.3	1.4	1.7
Natore	4.4	0.0	49.3	26.9	17.3	16.9	10.0	4.0	12.3	9.5	6.4	1.3	1.5
Pabna	37.9	0.0	43.6	19.7	17.0	15.7	10.0	19.1	19.4	15.8	9.5	1.5	1.4
Rajshahi	16.2	0.0	17.2	25.8	20.5	20.5	20.3	9.5	23.6	13.5	5.3	1.4	1.5
Sirajganj	67.5	0.0	23.1	17.2	18.4	18.9	16.8	9.9	14.9	14.2	7.2	1.2	1.3

District	Mango	Pineap-ple	Papaya	Banana	Brinjal	Tomato	Water gourd	Okra	Pump-kin	Puishak	Palong-shak	Lentils	Mustard
							(metric ton/ha)						
Rajshahi Division	**24.0**	**6.4**	**33.0**	**25.1**	**17.8**	**15.3**	**13.8**	**12.2**	**15.6**	**13.7**	**7.0**	**1.4**	**1.5**
Dinajpur	13.2	0.0	19.9	23.2	9.8	16.3	13.6	13.8	10.7	6.1	5.3	1.1	1.3
Gaibandha	20.1	0.0	27.2	32.1	9.1	7.8	9.9	4.9	10.1	5.5	4.0	1.7	1.1
Kurigram	40.4	10.7	20.3	26.7	10.1	8.6	11.9	4.5	10.5	10.0	4.7	1.0	1.3
Lalmonirhat	15.5	5.0	21.0	27.5	8.7	12.9	20.3	5.6	8.0	5.7	6.0	1.0	1.6
Nilphamari	34.2	13.8	39.5	19.2	11.5	13.9	16.7	5.9	12.5	9.0	6.0	1.2	1.4
Panchagarh	19.7	5.9	49.0	33.3	12.4	19.5	17.0	7.3	12.4	6.4	5.0	0.9	1.3
Rangpur	50.8	5.2	37.0	20.6	6.7	17.9	10.5	4.4	11.3	5.7	4.0	1.3	1.2
Thakurgaon	18.0	5.5	11.9	20.9	14.5	28.0	8.4	3.9	8.5	7.5	7.9	0.9	1.5
Rangpur Division	**26.5**	**7.7**	**28.2**	**25.4**	**10.4**	**15.6**	**13.5**	**6.3**	**10.5**	**7.0**	**5.4**	**1.2**	**1.3**
Habiganj	3.8	8.9	34.9	11.4	10.3	14.7	22.9	4.7	14.2	12.2	7.2	1.0	1.4
Moulvibazar	17.4	14.2	15.8	13.3	10.8	15.6	18.9	4.7	14.1	10.6	2.9	1.1	1.4
Sunamganj	10.8	7.2	7.7	14.7	19.9	25.6	29.2	7.2	10.8	15.4	5.2	0.0	1.0
Sylhet	13.2	7.6	5.6	11.9	11.3	17.1	15.4	5.0	13.0	8.1	4.2	1.3	1.6
Sylhet Division	**11.3**	**9.5**	**16.0**	**12.8**	**13.1**	**18.3**	**21.6**	**5.4**	**13.0**	**11.5**	**4.9**	**1.1**	**1.4**
Bangladesh	**12.0**	**15.0**	**20.0**	**16.9**	**12.3**	**15.1**	**14.1**	**7.6**	**12.9**	**9.4**	**6.4**	**1.4**	**1.3**
Coefficient of variation (%)	77.2	89.9	59.0	45.2	38.3	43.7	32.1	54.2	31.0	49.5	34.4	31.9	28.7

Source: Yearbook of Agricultural Statistics, 2023, Bangladesh Bureau of Statistics.

Table 3.13: Top ten boro rice varieties cultivated, 2018/19

Variety	Year of release	% of total boro land	% of all boro farmers	Rice yield (mt/ha)	Variety type
BRRI Dhan 28	1994	34.8	38.7	5.4	HYV
BRRI Dhan 29	1994	28.3	31.4	5.8	HYV
Hira	2008	7.2	8.4	6.0	Hybrid
Jira	N/A	6.1	6.3	6.3	HYV
Minikit	N/A	4.0	4.4	6.1	N/A
Tej gold	2008	2.1	2.6	6.4	Hybrid
Katari bhog	N/A	1.5	1.6	6.6	HYV
Subollota	N/A	1.5	1.6	6.3	HYV
BRRI Dhan 58	2012	1.3	1.4	5.9	HYV
BR 14 (Gazi)	1983	1.1	1.2	5.4	HYV
All other	-	12.1	2.4	-	-
Total	**-**	**100.0**	**100.0**	**-**	**-**

N/A = Not available; mt/ha = metric ton/hectare; HYV = high yielding variety; - = not applicable

Source: IFPRI's Bangladesh Integrated Household Survey (BIHS), 2018/2019, national rural

Table 3.14: Top ten t. aman rice varieties cultivated, 2018/19

Variety	Year of release	% of total t. aman land	% of all t. aman farmers	Rice yield (mt/ha)	Variety type
Guti/Lal shorna	N/A	28.7	30.6	4.6	N/A
BRRI Dhan 49	2008	11.6	13.1	3.9	HYV
BR 25 (Naya Pajam)	N/A	5.0	5.8	3.5	N/A
BR 11 (Mukta)	1980	4.0	5.3	4.1	HYV
BR 22 (Kiran)	1988	3.1	3.6	3.3	HYV
Ronjit	N/A	2.8	3.3	4.8	N/A
Shorna 5	N/A	2.6	3.0	4.6	N/A
Hari dhan	N/A	2.4	2.7	3.5	N/A
Bhojon	N/A	2.3	2.5	3.2	N/A
BINA 7	2007	1.7	2.4	4.3	HYV
All other	-	35.8	27.7	-	-
Total	-	100	100	-	-

N/A = Not available; mt/ha = metric ton/hectare; HYV = high yielding variety; - = not applicable

Source: IFPRI's Bangladesh Integrated Household Survey (BIHS), 2018/2019, national rural

Table 3.15: Share of irrigated area as a percentage of gross cropped area, by district, 2022/23

District	Gross cropped area	Total irrigated area	Share of irrigated area in gross cropped area
	('000 hectares)		(percent)
Barguna	148	9	6.0
Barishal	277	67	24.1
Bhola	349	59	16.8
Jhalokati	100	14	13.7
Patuakhali	225	17	7.6
Pirojpur	125	27	21.4
Barishal Division	**1,224**	**192**	**15.7**
Bandarban	53	8	16.2
Brahmanbaria	213	126	59.1
Chandpur	145	78	53.5
Chattogram	350	109	31.2
Cox's Bazar	176	64	36.2
Cumilla	406	175	43.1
Feni	117	35	29.8
Khagrachhari	70	25	35.8
Lakshmipur	211	40	19.0
Noakhali	288	73	25.5
Rangamati	53	14	25.8
Chattogram Division	**2,082**	**747**	**35.9**
Dhaka	95	61	64.1
Faridpur	313	120	38.4
Gazipur	134	73	54.8
Gopalganj	183	92	50.6
Kishoreganj	299	187	62.3
Madaripur	140	61	43.8
Manikganj	149	74	49.7
Munshiganj	93	61	64.9

District	Gross cropped area	Total irrigated area	Share of irrigated area in gross cropped area
	('000 hectares)		(percent)
Narayanganj	48	32	67.8
Narsingdi	111	74	66.9
Rajbari	191	87	45.6
Shariatpur	123	40	32.8
Tangail	368	223	60.5
Dhaka Division	**2,247**	**1,186**	**52.8**
Bagerhat	157	67	42.8
Chuadanga	209	202	96.3
Jashore	380	267	70.2
Jhenaidah	321	239	74.6
Khulna	178	77	43.4
Kushtia	275	258	93.7
Magura	162	132	81.2
Meherpur	140	115	82.4
Narail	148	98	66.3
Satkhira	210	105	50.1
Khulna Division	**2,182**	**1,560**	**71.5**
Jamalpur	327	178	54.5
Mymensingh	604	292	48.3
Netrokona	326	195	60.0
Sherpur	203	106	52.0
Mymensingh Division	**1,460**	**771**	**52.8**
Bogura	515	369	71.7
Chapai Nawabganj	231	154	66.7
Joypurhat	204	115	56.5
Naogoan	513	405	78.9
Natore	293	194	66.2
Pabna	332	169	50.9
Rajshahi	394	279	70.9

District	Gross cropped area	Total irrigated area	Share of irrigated area in gross cropped area
	('000 hectares)		(percent)
Sirajganj	346	237	68.5
Rajshahi Division	**2,828**	**1,923**	**68.0**
Dinajpur	620	386	62.3
Gaibandha	318	178	55.8
Kurigram	289	141	48.9
Lalmonirhat	203	118	58.1
Nilphamari	269	175	65.2
Panchagarh	233	81	34.9
Rangpur	429	219	51.1
Thakurgaon	358	197	55.2
Rangpur Division	**2,719**	**1,496**	**55.0**
Habiganj	285	144	50.6
Moulvibazar	258	51	19.8
Sunamganj	329	198	60.1
Sylhet	314	101	32.3
Sylhet Division	**1,186**	**495**	**41.7**
Bangladesh	**15,928**	**8,369**	**52.5**

Source: Yearbook of Agricultural Statistics, 2023, Bangladesh Bureau of Statistics.

Table 3.16: Annual fish production of ponds, by district, 2022/23

District	Total area	Pond area	Pond area as % of total area	Production	Yield
	(hectare)		(percent)	(metric ton)	(metric ton/ha)
Barguna	183,323	2,441	1.3	7,581	3.1
Barishal	278,424	9,822	3.5	38,389	3.9
Bhola	340,341	7,977	2.3	38,218	4.8
Jhalokati	70,820	1,178	1.7	4,559	3.9
Patuakhali	322,130	8,273	2.6	25,195	3.1
Pirojpur	127,881	3,012	2.4	8,902	3.0
Barishal Division	**1,322,919**	**32,703**	**2.5**	**122,844**	**3.8**
Bandarban	447,988	518	0.1	1,366	2.6
Brahmanbaria	188,179	6,858	3.6	36,469	5.3
Chandpur	164,707	9,421	5.7	37,916	4.0
Chattogram	528,116	21,220	4.0	66,515	3.1
Cox’s Bazar	249,287	22,633	9.1	138,708	6.1
Cumilla	314,441	1,343	0.4	4,811	3.6
Feni	99,148	5,436	5.5	24,941	4.6
Khagrachhari	274,782	1,040	0.4	2,919	2.8
Lakshmipur	144,068	8,135	5.6	31,543	3.9
Noakhali	368,669	13,125	3.6	49,413	3.8
Rangamati	611,481	484	0.1	1,160	2.4
Chattogram Division	**3,390,866**	**90,213**	**2.7**	**395,761**	**4.4**
Dhaka	146,496	1,922	1.3	8,845	4.6
Faridpur	205,176	3,976	1.9	20,907	5.3
Gazipur	180,490	4,102	2.3	26,490	6.5
Gopalganj	146,901	3,817	2.6	16,796	4.4
Kishoreganj	268,712	4,978	1.9	26,619	5.4
Madaripur	112,503	2,946	2.6	13,166	4.5
Manikganj	138,403	2,596	1.9	13,020	5.0
Munshiganj	100,362	2,224	2.2	9,763	4.4
Narayanganj	68,392	2,104	3.1	10,235	4.9

District	Total area	Pond area	Pond area as % of total area	Production	Yield
Narsingdi	114,931	2,853	2.5	23,400	8.2
Rajbari	109,265	3,701	3.4	15,226	4.1
Shariatpur	117,359	2,629	2.2	14,107	5.4
Tangail	341,555	7,776	2.3	39,724	5.1
Dhaka Division	**2,050,545**	**45,624**	**2.2**	**238,298**	**5.2**
Bagerhat	395,783	5,345	1.4	17,731	3.3
Chuadanga	117,359	2,231	1.9	11,497	5.2
Jashore	260,618	17,712	6.8	132,471	7.5
Jhenaidah	196,678	5,182	2.6	27,289	5.3
Khulna	439,489	4,909	1.1	17,396	3.5
Kushtia	161,065	4,528	2.8	23,514	5.2
Magura	104,004	2,322	2.2	10,818	4.7
Meherpur	75,272	1,572	2.1	7,059	4.5
Narail	96,720	1,099	1.1	4,986	4.5
Satkhira	381,619	13,124	3.4	39,887	3.0
Khulna Division	**2,228,607**	**58,024**	**2.6**	**292,648**	**5.0**
Jamalpur	211,651	3,522	1.7	18,213	5.2
Mymensingh	439,489	29,180	6.6	319,894	11.0
Netrokona	279,234	8,121	2.9	39,936	4.9
Sherpur	136,379	4,541	3.3	22,891	5.0
Mymensingh Division	**1,066,753**	**45,364**	**4.3**	**400,934**	**8.8**
Bogura	289,755	14,368	5.0	88,240	6.1
Chapai Nawabganj	170,373	3,132	1.8	13,020	4.2
Joypurhat	101,172	4,634	4.6	23,385	5.1
Naogoan	343,579	12,850	3.7	58,615	4.6
Natore	190,203	8,297	4.4	48,039	5.8
Pabna	237,551	10,546	4.4	46,262	4.4
Rajshahi	242,407	12,568	5.2	63,399	5.0
Sirajganj	240,384	5,354	2.2	26,093	4.9
Rajshahi Division	**1,815,423**	**71,749**	**4.0**	**367,053**	**5.1**

District	Total area	Pond area	Pond area as % of total area	Production	Yield
Dinajpur	344,388	9,720	2.8	49,573	5.1
Gaibandha	211,651	5,831	2.8	25,884	4.4
Kurigram	224,601	4,540	2.0	20,955	4.6
Lalmonirhat	124,643	3,279	2.6	14,176	4.3
Nilphamari	154,590	4,309	2.8	20,224	4.7
Panchagarh	140,426	3,218	2.3	13,913	4.3
Rangpur	239,979	6,428	2.7	31,003	4.8
Thakurgaon	178,062	5,394	3.0	25,512	4.7
Rangpur Division	**1,618,340**	**42,719**	**2.6**	**201,240**	**4.7**
Habiganj	263,451	4,909	1.9	18,642	3.8
Moulvibazar	280,043	7,187	2.6	22,548	3.1
Sunamganj	374,739	3,109	0.8	10,650	3.4
Sylhet	345,197	6,024	1.7	20,169	3.4
Sylhet Division	**1,263,431**	**21,229**	**1.7**	**72,009**	**3.4**
Bangladesh	**14,756,885**	**386,396**	**2.6**	**2,090,787**	**5.4**

Source: Yearbook of Agricultural Statistics, 2023, Bangladesh Bureau of Statistics.

Table 4.1: Overview of major social safety net programs in Bangladesh, 2023/24

Program name	Program description	Start date	Transfer size	Coverage in 2023/24 (lac persons)	2023/24 budget (crore taka)	Percentage of total NSS budget excluding pension	Implementing agencies
Honorarium for Heroic Freedom Fighters	Provide regular stipends to freedom fighters and families, so an acceptable standard of living can be maintained. All gazetted heroic freedom fighters are eligible for the program.	2000	BDT 20,000 per month and festival allowance	2.0	4,680.0	4.7	Liberation War Affairs
Old Age Allowance	Main objective of this unconditional cash transfer program is to support the livelihood of elderly people and enhance their status in the family and society. It helps to increase their medical and nutritional supplies. Eligibility criteria: minimum age for men is 65 years, minimum age for women is 62 years, vulnerable economic condition	1997-98	BDT 600 per month	58.0	4,206.0	4.3	MoSW
Allowances for the Financially Insolvent Disabled	Unconditional cash transfer. Provides basic income support to people with disabilities (PWDs) living in poverty. Eligibility criteria: registered PWDs who are permanent residents of the area; minimum age in years at least 6; and annual income: less than 36,000 taka (US$ 439)	2006	BDT 850 per month	29.0	2,978.7	3.0	MoSW
Food Friendly Program (FFP)	Provides 30 kg of rice for 5 months to ultra poor households in the months of March-April and September-November for smoothening their food consumption in the situation of seasonal income loss. Concentrated on distribution of rice to the ultra-poor households	2016	30 kg of rice for 5 months at subsidized rate of BT 15 per kg	62.5	2,898.8	2.9	Food
Primary Education Stipend Program (PESP)	Promote primary school enrolment and attendance, and reduce dropouts, Participating students receive monthly cash stipend for attending school.	1999-00	Stipend of BDT 75-200 per month/child	140.0	2,569.2	2.6	MoPME
Open Market Sales (OMS)	Maintain food security and price stability for essential commodities. Customers can buy up to 5 kg rice once a week by showing NID. Rice is sold at 30 taka per kg, while wheat flour is priced at 27.5 taka per kg. Low income and vulnerable households and fixed income earners are the usual beneficiaries; general public can also opt for it during crisis periods	1992	Up to 5 kg of rice and up to 5 kg of wheat flour/week	37.4	2,110.0	2.1	Food
Vulnerable Group Development (VGD)	VGD was one of the largest social safety net initiatives in Bangladesh, aimed at improving the livelihoods of ultra-poor women. It has been renamed	VGD was launched in 1975,	30 kg of fortified rice or wheat per	10.4	2,029.1	2.1	MOWCA

Program name	Program description	Start date	Transfer size	Coverage in 2023/24 (lac persons)	2023/24 budget (crore taka)	Percentage of total NSS budget excluding pension	Implementing agencies
	as 'Vulnerable Women Benefit' (VWB) program in 2022-23. Target group is poor and vulnerable women.	renamed as VWB in	month, for a period of 24 months.				
Employment Generation Program for the Poorest (EGPP)	Objectives of the EGPP are to provide short-term employment to the hardcore poor in lean period and to develop rural infrastructure to enhance disaster resilience of vulnerable households. First cycle spans from October to December and second one from March to April. Beneficiaries are landless, low-income households with no significant livestock resources	2008-09	Daily wage of BDT 200 (2 cycles, 40 days each).	5.2	1,780.0	1.8	MoDMR
Allowances for the Widowed, Deserted and Destitute Women	An unconditional cash transfer, which aims to improve the livelihood of the poor women. A program initiated with only rural coverage has now become one of the largest social safety net programs that covers the entire country. Eligibility Criteria: i Women of at least 18 years; and annual income is less than 15,000 taka (US$145)	1998-99	Monthly allowance of BDT 550	25.8	1,711.4	1.7	MoSW
Ashroyan-2 Project	The objective of the project is to alleviate poverty of the poor people through providing shelters and human resource development activities. Project provides various income-generating need-based training like handicrafts, poultry, pisciculture, gardening, agriculture, cattle rearing, etc. Beneficiaries are poor helpless, landless and homeless	2010	Housing support along with training on IGAs	1.5	1,530.0	1.5	PMO
Work For Money (WFM)	Address shortage of work opportunities for agricultural workers; generate seasonal employment for the rural poor- help build, repair or strengthen rural infrastructure; maintain equilibrium in food supply. Eligibility Criteria: (i) landless due to natural disaster; and (ii) ownership of less than 0.5 acre of land	2014	8 kg of rice for 7 hours of work or cash equivalent	18.2	1,500.0	1.5	MoDMR
Test Relief (TR) (Cash)	Generate seasonal employment for the rural poor, help build, repair or strengthen rural infrastructure to improve the performance of agriculture; and reduce physical damage and loss of human life due to natural disasters, maintain equilibrium in food supply, alleviate rural poverty. Eligibility Criteria: (i) Poorest households; (ii) Participants are landless due to natural disaster. (iii) Participants of ownership of less than 0.5 acres of land	2014	8 kg of rice for 7 hours of work or cash equivalent	3.7	1,450.0	1.5	MoDMR

Program name	Program description	Start date	Transfer size	Coverage in 2023/24 (lac persons)	2023/24 budget (crore taka)	Percentage of total NSS budget excluding pension	Implementing agencies
Secondary Education Stipend Program (SESP)	30% of unmarried girls and 10% of the boys belonging to poor families would receive stipends. Monthly stipend: BDT 100 for grades 6 and 7; BDT 120 for grade 8; BDT 150 for grades 9 and 10. (ii) Monthly tuition fee: BDT 15 for grades 6, 7 and 8; BDT 20 for grades 9 and 10. (iii) Exam fees: BDT 750 for grade 10. Underprivileged and meritorious students in the secondary or higher secondary level are the target groups.	1994	Monthly stipend, tuition fee and exam fee support	60.0	1,398.0	1.4	SHED and TMED
Mother and Child Benefit Program (MCBP)	Introduced by combining the rural-based Maternity Allowance (MA) Program and urban-based Lactating Mother Allowance (LMA) program. It aims to reduce maternal and infant mortality rate, increase breastfeeding rate, and enhance utilization of delivery and prenatal care services by providing improved linkages between services and BCC. Eligibility Criteria: First or second pregnancy, age between 20-35 years, poor pregnant woman	2019	Monthly BDT 800 is provided to beneficiaries.	13.0	1,294.4	1.3	MOWCA
Vulnerable Group Feeding (VGF)	Disaster relief. Foodgrain distribution to needy families in periods of disasters (floods, cyclones, droughts, etc.). Target Group: Poor families, in periods of disasters	Mid 1980s	10-30 kg of rice per month per household with different provisions for specific vulnerabilities.	180.0	1,089.8	1.1	MoDMR
Food For Work (FFW)	Employment generation for the poor, mainly in the dry season development and maintenance of rural infrastructure. People who are willing to work at onerous, low-paying manual labor (self-selected). Beneficiaries are ultra poor men and women in rural areas	1974	8 kg of rice or cash equivalent	9.8	992.0	1.0	MoDMR
Gratuitous Relief (Food)	Disaster relief. Foodgrain is distributed according to perceived need. Beneficiaries are Poor families, in periods of disasters	Early 1980s	10-20 kg foodgrain	33.0	648.7	0.7	MoDMR

Source: Author's compilation using data curated from Ministry of Finance, Finance Division, Government of the People's Republic of Bangladesh, various years.

MoSW= Ministry of Social Welfare, MoPME= Ministry of Primary and Mass Education, MOWCA= Ministry of Women and Children Affairs, MoDMR= Ministry of Disaster Management and Relief, PMO= Prime Minister's Office, SHED-Secondary and Higher Education Division, TMED-Technical and Madrasah Education Division

Table 5.1: Percentage of exclusive breastfeeding (children under 6 months), by district, 2019

Districts	Exclusive breastfeeding (%)
Barguna	62.1
Barishal	63.8
Bhola	65.0
Jhalokati	42.7
Patuakhali	72.0
Pirojpur	42.3
Barishal Division	**61.3**
Bandarban	72.9
Brahmanbaria	61.4
Chandpur	76.1
Chattogram	71.6
Cox's Bazar	64.1
Cumilla	63.2
Feni	69.4
Khagrachhari	73.2
Lakshmipur	66.1
Noakhali	82.4
Rangamati	81.8
Chattogram Division	**69.9**
Dhaka	46.4
Faridpur	56.0
Gazipur	66.0
Gopalganj	68.1
Kishoreganj	48.4
Madaripur	46.4
Manikganj	58.8
Munshiganj	53.9
Narayanganj	60.4

Districts	Exclusive breastfeeding (%)
Narsingdi	36.2
Rajbari	40.8
Shariatpur	58.3
Tangail	41.0
Dhaka Division	**50.3**
Bagerhat	66.8
Chuadanga	56.7
Jashore	69.2
Jhenaidah	74.9
Khulna	41.0
Kushtia	42.9
Magura	70.5
Meherpur	45.0
Narail	50.0
Satkhira	54.1
Khulna Division	**58.5**
Jamalpur	73.9
Mymensingh	48.4
Netrokona	41.7
Sherpur	73.4
Mymensingh Division	**53.8**
Bogura	73.7
Chapai Nawabganj	72.6
Joypurhat	54.8
Naogaon	84.5
Natore	77.1
Pabna	51.1
Rajshahi	75.8
Sirajganj	35.2
Rajshahi Division	**62.9**
Dinajpur	87.8

Districts	Exclusive breastfeeding (%)
Gaibandha	70.6
Kurigram	75.7
Lalmonirhat	60.5
Nilphamari	74.1
Panchagarh	83.9
Rangpur	79.1
Thakurgaon	81.7
Rangpur Division	**76.1**
Habiganj	67.8
Moulvibazar	71.1
Sunamganj	61.9
Sylhet	56.5
Sylhet Division	**63.2**
Bangladesh	**61.5**

Source: Multiple Indicator Cluster Survey (MICS) 2019, Bangladesh

Table 5.2: Prevalence of stunting and wasting (below 2SD) in children under 5 years of age, by district, 2019

Districts	Stunting (%)	Wasting (%)
Barguna	25.7	13.1
Barishal	35.8	11.0
Bhola	38.0	11.3
Jhalokati	19.9	6.5
Patuakhali	27.9	7.8
Pirojpur	21.1	13.3
Barishal Division	**30.6**	**10.6**
Bandarban	29.5	14.4
Brahmanbaria	26.9	7.9
Chandpur	23.1	7.4
Chattogram	23.2	12.4
Cox's Bazar	34.6	9.7
Cumilla	24.4	9.3
Feni	23.7	9.0
Khagrachhari	27.1	4.0
Lakshmipur	26.2	15.5
Noakhali	36.6	11.7
Rangamati	36.0	9.4
Chattogram Division	**27.0**	**10.4**
Dhaka	33.4	9.1
Faridpur	24.6	7.5
Gazipur	26.1	8.9
Gopalganj	24.8	7.2
Kishoreganj	36.5	8.6
Madaripur	27.4	10.7
Manikganj	19.5	4.8
Munshiganj	25.7	8.1
Narayanganj	24.3	6.6
Narsingdi	28.6	6.8

Districts	Stunting (%)	Wasting (%)
Rajbari	21.8	8.0
Shariatpur	24.4	8.3
Tangail	19.3	14.1
Dhaka Division	**28.0**	**8.7**
Bagerhat	26.8	7.4
Chuadanga	21.3	11.5
Jashore	21.1	9.3
Jhenaidah	22.0	8.4
Khulna	17.2	8.7
Kushtia	15.3	10.6
Magura	24.3	6.7
Meherpur	15.6	7.7
Narail	27.4	8.6
Satkhira	19.9	12.0
Khulna Division	**20.6**	**9.3**
Jamalpur	33.2	11.0
Mymensingh	33.2	6.7
Netrokona	36.7	11.1
Sherpur	27.5	15.2
Mymensingh Division	**33.3**	**9.4**
Bogura	31.5	11.4
Chapai Nawabganj	25.2	4.8
Joypurhat	29.4	12.3
Naogaon	25.1	11.5
Natore	18.2	8.5
Pabna	26.0	9.1
Rajshahi	24.4	7.3
Sirajganj	27.2	10.8
Rajshahi Division	**26.3**	**9.5**
Dinajpur	24.7	11.2
Gaibandha	30.3	7.8

Districts	Stunting (%)	Wasting (%)
Kurigram	29.3	12.7
Lalmonirhat	30.3	12.1
Nilphamari	29.0	11.8
Panchagarh	40.2	11.4
Rangpur	15.9	10.8
Thakurgaon	25.9	11.0
Rangpur Division	**26.6**	**10.9**
Habiganj	34.9	12.7
Moulvibazar	30.3	15.0
Sunamganj	44.2	7.6
Sylhet	37.3	11.0
Sylhet Division	**37.6**	**11.0**
Bangladesh	**28.0**	**9.8**

Source: Multiple Indicator Cluster Survey (MICS) 2019, Bangladesh

Table 5.3: Percent of children (6-23 months) that had minimum acceptable diet, by district, 2019

Districts	Minimum acceptable diet (%)
Barguna	55.8
Barishal	25.0
Bhola	20.9
Jhalokati	31.7
Patuakhali	43.3
Pirojpur	34.6
Barishal Division	22.9
Bandarban	16.4
Brahmanbaria	16.3
Chandpur	36.7
Chattogram	23.5
Cox's Bazar	24.9
Cumilla	23.9
Feni	31.7
Khagrachhari	28.9
Lakshmipur	13.1
Noakhali	20.5
Rangamati	36.5
Chattogram Division	19.6
Dhaka	43.1
Faridpur	36.1
Gazipur	32.1
Gopalganj	25.3
Kishoreganj	36.2
Madaripur	23.2
Manikganj	14.3
Munshiganj	23.5
Narayanganj	30.5
Narsingdi	42.5
Rajbari	36.7

Districts	Minimum acceptable diet (%)
Shariatpur	26.1
Tangail	18.9
Dhaka Division	33.9
Bagerhat	30.7
Chuadanga	32.2
Jashore	36.6
Jhenaidah	35.6
Khulna	31.0
Kushtia	45.8
Magura	29.2
Meherpur	48.3
Narail	35.1
Satkhira	43.1
Khulna Division	44.6
Jamalpur	31.1
Mymensingh	16.8
Netrokona	12.6
Sherpur	9.0
Mymensingh Division	33.1
Bogura	27.4
Chapai Nawabganj	16.4
Joypurhat	35.3
Naogaon	22.2
Natore	25.8
Pabna	22.0
Rajshahi	31.0
Sirajganj	25.9
Rajshahi Division	27.8
Dinajpur	32.8
Gaibandha	13.6
Kurigram	30.7
Lalmonirhat	9.6
Nilphamari	26.8

Districts	Minimum acceptable diet (%)
Panchagarh	21.5
Rangpur	26.0
Thakurgaon	17.6
Rangpur Division	26.7
Habiganj	24.6
Moulvibazar	30.6
Sunamganj	8.5
Sylhet	15.1
Sylhet Division	19.3
Bangladesh	28.7

Source: Multiple Indicator Cluster Survey (MICS) 2019, Bangladesh

Table 5.4: Percentage of weighed live births recorded below 2,500 grams (low birth weight), by district, 2019

Districts	Low birth weight (%)
Barguna	17.2
Barishal	15.9
Bhola	18.7
Jhalokati	8.1
Patuakhali	12.0
Pirojpur	14.8
Barishal Division	**14.5**
Bandarban	14.3
Brahmanbaria	16.6
Chandpur	10.1
Chattogram	26.4
Cox's Bazar	17.4
Cumilla	17.4
Feni	13.2
Khagrachhari	18.1
Lakshmipur	21.6
Noakhali	17.4
Rangamati	5.7
Chattogram Division	**19.7**
Dhaka	15.7
Faridpur	23.5
Gazipur	23.0
Gopalganj	12.5
Kishoreganj	14.5
Madaripur	16.0
Manikganj	12.2
Munshiganj	12.6
Narayanganj	17.6
Narsingdi	15.3

Districts	Low birth weight (%)
Rajbari	10.9
Shariatpur	7.2
Tangail	16.3
Dhaka Division	**16.1**
Bagerhat	9.1
Chuadanga	12.8
Jashore	10.2
Jhenaidah	6.9
Khulna	18.3
Kushtia	10.0
Magura	10.1
Meherpur	13.0
Narail	4.7
Satkhira	9.3
Khulna Division	**10.7**
Jamalpur	7.7
Mymensingh	7.6
Netrokona	23.0
Sherpur	22.7
Mymensingh Division	**11.9**
Bogura	6.8
Chapai Nawabganj	10.9
Joypurhat	1.8
Naogaon	15.8
Natore	9.4
Pabna	11.2
Rajshahi	10.5
Sirajganj	23.2
Rajshahi Division	**11.5**
Dinajpur	4.9
Gaibandha	16.1

Districts	Low birth weight (%)
Kurigram	16.3
Lalmonirhat	23.5
Nilphamari	14.5
Panchagarh	7.2
Rangpur	12.8
Thakurgaon	16.8
Rangpur Division	**13.3**
Habiganj	11.2
Moulvibazar	6.8
Sunamganj	21.8
Sylhet	13.7
Sylhet Division	**14.0**
Bangladesh	**14.8**

Source: Multiple Indicator Cluster Survey (MICS) 2019, Bangladesh

Table 5.5: Percentage of women with a live birth before age 15 years and 18 years among women aged 15-49 years, by district, 2019

Districts	Live birth before age 15 (%)	Live birth before age 18 (%)
Barguna	1.9	25.2
Barishal	5.8	30.8
Bhola	4.0	30.5
Jhalokati	4.3	26.3
Patuakhali	4.6	27.9
Pirojpur	5.6	28.5
Barishal Division	**4.7**	**28.9**
Bandarban	3.8	19.7
Brahmanbaria	4.9	38.5
Chandpur	3.5	29.9
Chattogram	2.8	24.7
Cox's Bazar	6.5	29.4
Cumilla	4.5	33.8
Feni	2.8	21.7
Khagrachhari	4.7	19.4
Lakshmipur	3.2	33.5
Noakhali	3.0	25.5
Rangamati	2.9	15.7
Chattogram Division	**3.8**	**28.5**
Dhaka	3.9	25.1
Faridpur	4.7	28.8
Gazipur	3.9	31.9
Gopalganj	1.6	17.5
Kishoreganj	1.7	21.3
Madaripur	0.8	14.7
Manikganj	4.5	31.1
Munshiganj	2.0	23.6
Narayanganj	3.3	26.9
Narsingdi	1.5	21.4

Districts	Live birth before age 15 (%)	Live birth before age 18 (%)
Rajbari	2.3	22.1
Shariatpur	2.1	26.9
Tangail	4.0	27.6
Dhaka Division	**3.3**	**25.5**
Bagerhat	3.5	36.9
Chuadanga	2.0	32.3
Jashore	1.7	28.9
Jhenaidah	1.7	36.4
Khulna	3.8	36.0
Kushtia	1.1	34.0
Magura	5.5	35.2
Meherpur	1.5	34.2
Narail	4.2	36.1
Satkhira	3.7	38.4
Khulna Division	**2.7**	**34.4**
Jamalpur	4.2	33.0
Mymensingh	4.2	25.2
Netrokona	1.7	17.6
Sherpur	3.0	34.6
Mymensingh Division	**3.5**	**26.4**
Bogura	2.6	37.4
Chapai Nawabganj	11.4	53.5
Joypurhat	2.3	26.4
Naogaon	5.8	43.2
Natore	3.5	39.0
Pabna	5.7	41.1
Rajshahi	7.5	45.1
Sirajganj	3.9	38.3
Rajshahi Division	**5.3**	**41.1**
Dinajpur	4.6	33.2
Gaibandha	4.4	36.3

Districts	Live birth before age 15 (%)	Live birth before age 18 (%)
Kurigram	6.5	32.8
Lalmonirhat	4.1	31.1
Nilphamari	1.6	31.6
Panchagarh	5.9	37.3
Rangpur	2.5	32.3
Thakurgaon	2.7	33.2
Rangpur Division	**4.0**	**33.3**
Habiganj	0.7	15.2
Moulvibazar	1.7	17.5
Sunamganj	3.5	24.5
Sylhet	1.7	14.8
Sylhet Division	**2.0**	**17.9**
Bangladesh	**3.6**	**29.9**

Source: Multiple Indicator Cluster Survey (MICS) 2019, Bangladesh

Table 5.6: Percentage of households using improved sources of drinking water, hand washing facilities with water and soap, and improved sanitation facilities (WASH), by district, 2019

Districts	Improved source of drinking water (%)	Handwashing facilities with soap and water (%)	Improved sanitation facilities (%)
Barguna	95.5	42.0	90.8
Barishal	99.9	49.1	82.5
Bhola	100.0	49.4	55.0
Jhalokati	99.6	44.6	55.8
Patuakhali	100.0	54.2	92.9
Pirojpur	91.1	31.8	65.1
Barishal Division	**98.2**	**46.6**	**75.5**
Bandarban	56.8	43.8	43.1
Brahmanbaria	100.0	87.9	71.2
Chandpur	99.2	66.0	94.9
Chattogram	99.7	66.5	88.1
Cox's Bazar	99.8	62.9	52.4
Cumilla	100.0	90.0	86.5
Feni	99.8	69.4	87.7
Khagrachhari	78.4	59.8	64.1
Lakshmipur	100.0	51.0	95.3
Noakhali	100.0	47.1	71.0
Rangamati	59.2	48.1	54.8
Chattogram Division	**97.2**	**69.0**	**79.9**
Dhaka	100.0	94.1	97.0
Faridpur	100.0	73.6	72.8
Gazipur	100.0	94.6	91.8
Gopalganj	99.9	55.1	98.4
Kishoreganj	100.0	74.1	62.3
Madaripur	99.8	85.5	97.7
Manikganj	100.0	84.6	93.4
Munshiganj	100.0	86.9	87.5

Districts	Improved source of drinking water (%)	Handwashing facilities with soap and water (%)	Improved sanitation facilities (%)
Narayanganj	100.0	93.2	73.8
Narsingdi	100.0	97.3	66.1
Rajbari	100.0	82.6	77.1
Shariatpur	99.9	75.8	96.0
Tangail	100.0	95.7	98.2
Dhaka Division	**100.0**	**88.2**	**87.2**
Bagerhat	76.7	41.0	97.6
Chuadanga	99.8	86.9	94.1
Jashore	100.0	87.5	94.6
Jhenaidah	100.0	79.6	94.8
Khulna	95.2	75.2	96.2
Kushtia	99.9	78.8	97.3
Magura	100.0	62.4	91.3
Meherpur	99.9	88.9	96.2
Narail	99.8	67.3	99.4
Satkhira	86.6	66.9	86.7
Khulna Division	**95.5**	**74.6**	**94.6**
Jamalpur	99.2	65.3	80.8
Mymensingh	100.0	71.0	83.7
Netrokona	99.3	50.4	70.1
Sherpur	99.4	48.3	79.4
Mymensingh Division	**99.6**	**62.7**	**79.8**
Bogura	100.0	65.1	89.1
Chapai Nawabganj	100.0	58.3	66.3
Joypurhat	100.0	69.6	84.8
Naogaon	97.6	73.9	84.1
Natore	100.0	69.5	88.8
Pabna	100.0	68.4	91.6
Rajshahi	100.0	71.9	85.3
Sirajganj	100.0	69.6	86.3

Districts	Improved source of drink-ing water (%)	Handwashing facilities with soap and water (%)	Improved sanitation facilities (%)
Rajshahi Division	**99.7**	**68.5**	**85.4**
Dinajpur	100.0	87.0	85.8
Gaibandha	100.0	90.3	88.1
Kurigram	100.0	64.9	80.3
Lalmonirhat	99.9	79.1	91.2
Nilphamari	100.0	91.8	85.7
Panchagarh	100.0	81.4	91.7
Rangpur	100.0	95.6	90.1
Thakurgaon	100.0	82.6	85.7
Rangpur Division	**100.0**	**85.2**	**86.9**
Habiganj	99.8	76.3	76.1
Moulvibazar	95.1	93.2	83.4
Sunamganj	98.9	64.2	64.3
Sylhet	92.5	74.2	91.6
Sylhet Division	**96.2**	**75.2**	**79.5**
Bangladesh	**98.5**	**74.8**	**84.6**

Source: Multiple Indicator Cluster Survey (MICS) 2019, Bangladesh

Table 5.7: Use of sanitary materials during menstruation period (age 15-49), 2018/19

Information on Menstrual hygiene from BIHS	Over-all	Barishal	Chatto-gram	Dhaka	Khulna	Rajshahi	Rangpur	Sylhet
				(percent)				
Type of Material used during menstruation								
Disposable commercially sold sanitary napkins, pads, tampons etc.	22.0	16.6	22.3	23.2	26.0	22.6	16.5	22.5
Disposable sanitary napkin, pad, tampons etc.	2.7	3.5	3.9	1.4	4.9	1.8	3.4	1.3
Reusable cloth after boiling or washing	68.2	68.3	67.0	66.4	60.5	69.2	77.0	73.7
Old cloth thrown away after single use	2.7	8.8	3.4	3.2	4.0	0.2	0.8	1.2
Nothing	4.3	2.8	3.4	5.8	4.6	6.2	2.3	1.4
Change pads/cloth in one day on average								
Less than 2 times	14.7	18.4	13.7	12.1	12.7	21.0	13.8	16.8
Two to three times	74.7	70.0	77.4	78.2	70.9	70.2	77.9	66.2
More than three times	10.6	11.6	8.9	9.7	16.4	8.7	8.3	16.9
Reason for not using disposable sanitary napkins/pads/tampons								
Never heard of it	3.4	3.1	2.7	4.8	0.9	1.6	6.9	0.9
Expensive	53.1	58.2	48.8	50.1	56.6	43.4	60.5	73.6
No one is there to buy it for her	4.7	5.7	5.2	5.3	4.3	4.0	3.8	3.9
Difficult to discard	1.2	1.6	1.7	1.6	0.6	1.1	1.0	0.0
Don’t feel comfortable	30.7	21.4	31.4	31.4	31.9	41.4	24.6	20.4
Others (Less bleeding, don't want to, don't know how to use etc.)	6.9	10.1	10.1	6.7	5.8	8.6	3.3	1.2
Wash reusable sanitary napkin/cloth with (Only applicable for reusable napkin/cloth user)								

Information on Menstrual hygiene from BIHS	Over-all	Barishal	Chatto-gram	Dhaka	Khulna	Rajshahi	Rangpur	Sylhet
Only water	1.0	0.8	0.5	0.8	2.0	0.5	1.9	1.0
Soap and water	68.2	71.6	65.4	67.5	61.7	68.9	75.6	72.2
Not applicable	30.8	27.6	34.1	31.7	36.3	30.6	22.5	26.7
Place to dry the cloth (Only applicable for reusable napkin/cloth user)								
Indoors	48.1	55.6	44.9	46.8	55.1	49.6	38.1	60.9
Sunlight	51.7	44.4	54.5	53.1	44.6	50.4	61.6	39.3
Not applicable	0.2	0.0	0.6	0.1	0.3	0.0	0.2	0.0
Disposal of the sanitary napkin/pad/cotton/cloth etc.								
Throw away	27.4	24.4	26.7	31.1	22.0	28.3	25.8	26.6
Burning	1.9	0.5	2.3	1.7	2.2	1.2	2.8	1.6
Disposed by burning	27.8	21.9	12.4	19.6	37.7	37.5	40.8	49.4
Not applicable	39.3	50.0	54.2	44.4	32.7	30.9	27.1	18.8
Others (Toilet, nearby waterbody, dustbin etc.)	3.6	3.3	4.5	3.2	5.4	2.2	3.6	3.6

Source: IFPRI's Bangladesh Integrated Household Survey, 2018/19, national rural stratum

APPENDIX

Appendix 3: Tables on cropping patterns

Table A3.1: Distribution of the most dominant boro-fallow- t. aman cropping pattern and area coverage in Bangladesh, 2014/15

District	Area (ha)	% of district NCA	% coverage of the pattern in BD
Barguna	350	0.4	0.0
Barishal	31,050	19.6	1.4
Bhola	35,650	19.1	1.6
Jhalokati	5,450	10.5	0.2
Patuakhali	1,670	0.8	0.1
Pirojpur	6,540	8.0	0.3
Barishal Division	**80,710**	-	**3.5**
Bandarban	5,170	12.7	0.2
Brahmanbaria	34,010	24.4	1.5
Chandpur	14,690	16.0	0.6
Chattogram	46,420	23.2	2.0
Cox's Bazar	42,400	49.7	1.8
Cumilla	38,710	18.7	1.7
Feni	28,800	40.0	1.3
Khagrachhari	9,570	21.6	0.4
Lakshmipur	20,200	20.2	0.9
Noakhali	12,460	6.3	0.5
Rangamati	4,660	10.7	0.2
Chattogram Division	**257,090**	-	**11.0**
Dhaka	2,040	3.0	0.1
Faridpur	6,080	4.3	0.3
Gazipur	27,100	31.7	1.2
Gopalganj	2,900	2.6	0.1
Kishoreganj	40,300	20.2	1.8

District	Area (ha)	% of district NCA	% coverage of the pattern in BD
Madaripur	1,800	2.2	0.1
Manikganj	980	1.1	0.0
Narayanganj	2,200	5.5	0.1
Narsingdi	31,500	43.6	1.4
Rajbari	5,450	7.2	0.2
Shariatpur	1,455	1.9	0.1
Tangail	84,000	36.0	3.6
Dhaka Division	**205,805**	**-**	**9.0**
Bagerhat	19,600	17.3	0.9
Chuadanga	28,800	32.6	1.3
Jashore	80,700	42.5	3.5
Jhenaidah	54,900	39.3	2.4
Khulna	19,870	15.6	0.9
Kushtia	17,900	15.6	0.8
Magura	20,800	27.4	0.9
Meherpur	9,800	18.1	0.4
Narail	24,950	33.7	1.1
Satkhira	40,950	33.7	1.8
Khulna Division	**318,270**	**-**	**14.0**
Jamalpur	75,300	46.8	3.3
Mymensingh	188,650	65.1	8.2
Netrokona	98,300	49.2	4.3
Sherpur	69,000	68.6	3.0
Mymensingh Division	**431,250**	**-**	**19.0**
Bogura	80,200	36.1	3.5
Chapai Nawabganj	14,100	11.7	0.6
Joypurhat	19,200	24.5	0.8
Naogaon	96,400	35.6	4.2
Natore	25,490	18.9	1.1
Pabna	8,650	4.7	0.4

District	Area (ha)	% of district NCA	% coverage of the pattern in BD
Rajshahi	22,400	13.4	1.0
Sirajganj	38,200	20.8	1.7
Rajshahi Division	**304,640**	**-**	**13.0**
Dinajpur	138,400	50.0	6.0
Gaibandha	96,670	63.9	4.2
Kurigram	83,500	55.9	3.6
Lalmonirhat	44,600	45.1	1.9
Nilphamari	65,300	53.7	2.8
Panchagarh	32,400	31.7	1.4
Rangpur	81,300	46.4	3.5
Thakurgaon	45,050	30.4	2.0
Rangpur Division	**587,220**	**-**	**25.0**
Habiganj	19,070	11.3	0.8
Moulvibazar	24,650	19.3	1.1
Sunamganj	43,100	16.1	1.9
Sylhet	34,200	16.3	1.5
Sylhet Division	**121,020**	**-**	**5.0**
Bangladesh	**2,306,005**	**26.9**	**100.0**

Source: Nasim, M., Shahidullah, S. M., Saha, A., Muttaleb, M. A., Aditya, T. L., Ali, M. A., & Kabir, M. S. (2017). Distribution of crops and cropping patterns in Bangladesh. *Bangladesh rice journal*, *21*(2), 1-55.

Note: Percentage of divisional net cropped area (NCA) was not available.

Table A3.2: Distribution of the second dominant boro-fallow-fallow cropping pattern and area coverage in Bangladesh, 2014/15

District	Area (ha)	% of district NCA	% coverage of the pattern in BD
Barishal	21,450	13.5	1.9
Jhalokati	2,200	4.2	0.2
Patuakhali	350	0.2	0.0
Pirojpur	11,100	13.5	1.0
Barishal Division	**35,100**	**-**	**3.0**
Bandarban	700	1.7	0.1
Brahmanbaria	58,050	41.6	5.1
Chandpur	22,100	24.0	1.9
Chattogram	400	0.2	0.0
Cox's Bazar	860	1.0	0.1
Cumilla	34,630	16.7	3.0
Feni	250	0.4	0.0
Lakshmipur	4,200	4.2	0.4
Noakhali	43,000	21.7	3.8
Rangamati	4,250	9.7	0.4
Chattogram Division	**168,440**	**-**	**14.8**
Dhaka	17,750	26.1	1.6
Faridpur	6,700	4.8	0.6
Gazipur	25,150	29.5	2.2
Gopalganj	66,300	58.6	5.8
Kishoreganj	102,000	51.0	9.0
Madaripur	18,700	22.4	1.6
Manikganj	5,180	5.6	0.5
Munshiganj	16,400	26.5	1.4
Narayanganj	16,400	41.3	1.4
Narsingdi	16,100	22.3	1.4
Rajbari	6,550	8.6	0.6
Shariatpur	21,500	27.6	1.9
Tangail	12,550	5.4	1.1

District	Area (ha)	% of district NCA	% coverage of the pattern in BD
Dhaka Division	**331,280**	-	**29.0**
Bagerhat	13,700	12.1	1.2
Chuadanga	2,200	2.5	0.2
Jashore	19,030	10.0	1.7
Jhenaidah	6,560	4.7	0.6
Khulna	7,150	5.6	0.6
Kushtia	2,450	2.1	0.2
Magura	1,970	2.6	0.2
Meherpur	600	1.1	0.1
Narail	6,200	8.4	0.5
Satkhira	7,000	5.8	0.6
Khulna Division	**66,860**	-	**6.0**
Jamalpur	5,180	3.2	0.5
Mymensingh	30,320	10.5	2.7
Netrokona	78,200	39.2	6.9
Sherpur	2,950	2.9	0.3
Mymensingh Division	**116,650**	-	**10.0**
Bogura	6,000	2.7	0.5
Chapai Nawabganj	4,050	3.4	0.4
Naogaon	24,100	8.9	2.1
Natore	12,830	9.5	1.1
Pabna	9,600	5.2	0.8
Rajshahi	9,150	5.5	0.8
Sirajganj	21,700	11.8	1.9
Rajshahi Division	**87,430**	-	**8.0**
Dinajpur	150	0.1	0.0
Gaibandha	6,700	4.4	0.6
Kurigram	10,600	7.1	0.9
Lalmonirhat	2,100	2.1	0.2
Nilphamari	1,450	1.2	0.1

District	Area (ha)	% of district NCA	% coverage of the pattern in BD
Rangpur	7,470	4.3	0.7
Thakurgaon	500	0.3	0.0
Rangpur Division	**28,970**	**-**	**2.5**
Habiganj	55,900	33.2	4.9
Moulvibazar	22,850	17.9	2.0
Sunamganj	181,600	67.9	15.9
Sylhet	44,450	21.2	3.9
Sylhet Division	**304,800**	**-**	**27.0**
Bangladesh	1,139,530	13.3	100.0

Source: Nasim, M., Shahidullah, S. M., Saha, A., Muttaleb, M. A., Aditya, T. L., Ali, M. A., & Kabir, M. S. (2017). Distribution of crops and cropping patterns in Bangladesh. *Bangladesh rice journal*, *21*(2), 1-55.

Note: Percentage of divisional net cropped area (NCA) was not available.

Table A3.3: Distribution of the third dominant fallow-fallow-t. aman cropping pattern and area coverage in Bangladesh, 2014/15

District	Area (ha)	% of district NCA	% coverage of the pattern in BD
Barguna	19,200	19.3	3.8
Barishal	11,130	7.0	2.2
Bhola	7,200	3.9	1.4
Jhalokati	8,200	15.8	1.6
Patuakhali	35,600	16.8	7.0
Pirojpur	24,620	29.9	4.8
Barishal Division	**105,950**	**-**	**21.0**
Bandarban	5,030	12.4	1.0
Chattogram	66,500	33.2	13.1
Cox's Bazar	10,400	12.2	2.0
Cumilla	3,430	1.7	0.7
Feni	15,600	21.7	3.1
Khagrachhari	9,050	20.4	1.8
Lakshmipur	200	0.2	0.0
Noakhali	32,900	16.6	6.5
Rangamati	3,530	8.1	0.7
Chattogram Division	**146,640**	**-**	**56.0**
Gazipur	7,850	9.2	1.5
Kishoreganj	2,260	1.1	0.4
Narsingdi	100	0.1	0.0
Tangail	1,700	0.7	0.3
Dhaka Division	**11,910**	**-**	**2.3**
Bagerhat	33,700	29.7	6.6
Jashore	300	0.2	0.1
Khulna	42,000	33.1	8.2
Satkhira	21,200	17.5	4.2
Khulna Division	**97,200**	**-**	**19.1**
Mymensingh	2,600	0.9	0.5

District	Area (ha)	% of district NCA	% coverage of the pattern in BD
Netrokona	5,000	2.5	1.0
Sherpur	1,320	1.3	0.3
Mymensingh Division	**8,920**	**-**	**1.8**
Bogura	1,550	0.7	0.3
Chapai Nawabganj	11,800	9.8	2.3
Naogaon	7,300	2.7	1.4
Rajshahi Division	20,650		4.1
Dinajpur	200	0.1	0.0
Panchagarh	100	0.1	0.0
Rangpur	350	0.2	0.1
Rangpur Division	**650**	**-**	**0.1**
Habiganj	12,340	7.3	2.4
Moulvibazar	25,070	19.7	4.9
Sunamganj	21,900	8.2	4.3
Sylhet	58,250	27.7	11.4
Sylhet Division	**117,560**	**-**	**23.1**
Bangladesh	**509,480**	**6.0**	**100.0**

Source: Nasim, M., Shahidullah, S. M., Saha, A., Muttaleb, M. A., Aditya, T. L., Ali, M. A., & Kabir, M. S. (2017). Distribution of crops and cropping patterns in Bangladesh. *Bangladesh rice journal*, *21*(2), 1-55.

Note: Percentage of divisional net cropped area (NCA) was not available.

Table A3.4: Distribution of the fourth dominant boro-aus-t. aman cropping pattern and area coverage in Bangladesh, 2014/15

District	Area (ha)	% of district NCA	% coverage of the pattern in BD
Bhola	10,000	5.4	4.8
Jhalokati	100	0.2	0.1
Patuakhali	30	0.0	0.0
Pirojpur	100	0.1	0.1
Barishal Division	**10,230**	**-**	**4.9**
Bandarban	80	0.2	0.0
Brahmanbaria	4,870	3.5	2.3
Chandpur	9,280	10.1	4.4
Chattogram	9,250	4.6	4.4
Comilla	50,680	24.5	24.3
Cox's Bazar	3,500	4.1	1.7
Feni	50	0.1	0.0
Khagrachhari	200	0.5	0.1
Lakshmipur	2,200	2.2	1.1
Noakhali	1,070	0.5	0.5
Rangamati	200	0.5	0.1
Chattogram Division	**81,380**	**-**	**38.9**
Gazipur	1,120	1.3	0.5
Kishoreganj	12,350	6.2	5.9
Narsingdi	90	0.1	0.0
Rajbari	50	0.1	0.0
Shariatpur	100	0.1	0.1
Tangail	5	0.0	0.0
Dhaka Division	**13,715**	**-**	**6.6**
Bagerhat	950	0.8	0.5
Jashore	11,500	6.1	5.5
Jhenaidah	1,700	1.2	0.8
Khulna	165	0.1	0.1

District	Area (ha)	% of district NCA	% coverage of the pattern in BD
Kushtia	6,650	5.8	3.2
Magura	500	0.7	0.2
Satkhira	2,780	2.3	1.3
Khulna Division	**24,245**	**-**	**11.6**
Jamalpur	50	0.0	0.0
Mymensingh	8,000	2.8	3.8
Sherpur	1,350	1.3	0.7
Mymensingh Division	**9,400**	**-**	**4.5**
Bogura	14,290	6.4	6.8
Chapai Nawabganj	6,640	5.5	3.2
Joypurhat	10	0.0	0.0
Naogaon	13,600	5.0	6.5
Natore	3,400	2.5	1.6
Pabna	2,950	1.6	1.4
Rajshahi	1,650	1.0	0.8
Sirajganj	2,450	1.3	1.2
Rajshahi Division	**44,990**	**-**	**21.5**
Dinajpur	1,575	0.6	0.8
Gaibandha	170	0.1	0.1
Kurigram	880	0.6	0.4
Nilphamari	20	0.0	0.0
Rangpur	4,570	2.6	2.2
Rangpur Division	**7,215**	**-**	**3.5**
Habiganj	14,200	8.4	6.8
Moulvibazar	3,040	2.4	1.5
Sylhet	600	0.3	0.3
Sylhet Division	**17,840**	**-**	**8.5**
Bangladesh	**209,015**	**2.4**	**100.0**

Source: Nasim, M., Shahidullah, S. M., Saha, A., Muttaleb, M. A., Aditya, T. L., Ali, M. A., & Kabir, M. S. (2017). Distribution of crops and cropping patterns in Bangladesh. *Bangladesh rice journal*, *21*(2), 1-55.

Note: Percentage of divisional net cropped area (NCA) was not available.

Table A3.5: Distribution of the fifth dominant fallow-aus-t. aman cropping pattern, 2014/15

District	Area (ha)	% of district NCA	% coverage of the pattern in BD
Barguna	8,540	8.57	4.42
Barishal	8,400	5.3	4.35
Bhola	2,900	1.56	1.5
Jhalokati	12,300	23.7	6.36
Patuakhali	2,060	0.97	1.07
Pirojpur	8,800	10.7	4.55
Barishal Division	**43,000**	-	**22.25**
Brahmanbaria	810	0.58	0.42
Chattogram	9,290	4.64	4.81
Cox's Bazar	250	0.29	0.13
Cumilla	3,350	1.62	1.73
Feni	4,200	5.84	2.17
Khagrachhari	1,110	2.5	0.57
Lakshmipur	1,200	1.2	0.62
Noakhali	12,200	6.15	6.31
Rangamati	210	0.48	0.11
Chattogram Division	**32,620**	-	**16.87**
Gazipur	50	0.06	0.03
Kishoreganj	2,200	1.1	1.14
Tangail	100	0.04	0.05
Dhaka Division	**2,350**	-	**1.22**
Bagerhat	1,740	1.53	0.9
Khulna	100	0.08	0.05
Satkhira	380	0.31	0.2
Khulna Division	**2,220**	-	**1.15**
Mymensingh	8,400	2.9	4.35
Netrokona	410	0.21	0.21
Sherpur	1,100	1.09	0.57

District	Area (ha)	% of district NCA	% coverage of the pattern in BD
Mymensingh Division	**9,910**	**-**	**5.13**
Naogaon	1,620	0.6	0.84
Rajshahi	4,500	2.69	2.33
Rajshahi Division	**6,120**	**-**	**3.17**
Habiganj	23,825	14.14	12.33
Moulvibazar	33,900	26.59	17.54
Sunamganj	3,730	1.39	1.93
Sylhet	35,600	16.94	18.42
Sylhet Division	**97,055**	**-**	**50.22**
Bangladesh	**193,275**	**2.26**	**100**

Source: Nasim, M., Shahidullah, S. M., Saha, A., Muttaleb, M. A., Aditya, T. L., Ali, M. A., & Kabir, M. S. (2017). Distribution of crops and cropping patterns in Bangladesh. *Bangladesh rice journal*, *21*(2), 1-55.

Note: Percentage of divisional net cropped area (NCA) was not available.

Table A3.6: Distribution of the sixth dominant mustard-boro-t. aman cropping pattern and area coverage in Bangladesh, 2014/15

District	Area (ha)	% of district NCA	% coverage of the pattern in BD
Barishal	70	0.04	0.04
Bhola	2,570	1.38	1.39
Barishal Division	**2,640**	**-**	**1.43**
Brahmanbaria	900	0.65	0.49
Chandpur	1,000	1.09	0.54
Chattogram	210	0.1	0.11
Cox's Bazar	420	0.49	0.23
Cumilla	200	0.1	0.11
Khagrachhari	10	0.02	0.01
Lakshmipur	30	0.03	0.02
Chattogram Division	**2,770**	**-**	**1.51**
Dhaka	1,710	2.51	0.93
Faridpur	30	0.02	0.02
Gazipur	110	0.13	0.06
Kishoreganj	1,450	0.73	0.79
Madaripur	1,510	1.81	0.82
Manikganj	4,720	5.05	2.56
Narayanganj	100	0.25	0.05
Narsingdi	1,610	2.23	0.87
Rajbari	50	0.07	0.03
Tangail	14,150	6.07	7.66
Dhaka Division	**25,440**	**-**	**13.79**
Chuadanga	400	0.45	0.22
Jashore	6,000	3.16	3.25
Jhenaidah	7,050	5.04	3.82
Khulna	80	0.06	0.04
Kushtia	700	0.61	0.38
Magura	5,100	6.73	2.76

District	Area (ha)	% of district NCA	% coverage of the pattern in BD
Meherpur	2,400	4.44	1.3
Narail	950	1.28	0.51
Satkhira	2,390	1.97	1.29
Khulna Division	**25,070**	-	**13.57**
Jamalpur	11,500	7.15	6.23
Mymensingh	2,930	1.01	1.59
Netrokona	940	0.47	0.51
Sherpur	5,450	5.42	2.95
Mymensingh Division	**20,820**	-	**11.28**
Bogura	19,800	8.91	10.72
Chapai Nawabganj	1,300	1.08	0.7
Joypurhat	9,900	12.61	5.36
Naogaon	22,600	8.34	12.24
Natore	500	0.37	0.27
Pabna	600	0.33	0.32
Rajshahi	1,250	0.75	0.68
Sirajganj	9,810	5.35	5.31
Rajshahi Division	**65,760**	-	**35.6**
Dinajpur	10,250	3.7	5.55
Gaibandha	6,650	4.39	3.6
Kurigram	8,000	5.36	4.33
Lalmonirhat	1,390	1.41	0.75
Nilphamari	2,850	2.34	1.54
Panchagarh	820	0.8	0.44
Rangpur	3,950	2.25	2.14
Thakurgaon	7,650	5.16	4.14
Rangpur Division	**41,560**	-	**22.49**
Habiganj	50	0.03	0.03
Moulovibazar	10	0.01	0.01
Sunamganj	500	0.19	0.27
Sylhet Division	**560**	-	**0.31**

District	Area (ha)	% of district NCA	% coverage of the pattern in BD
Bangladesh	**184,620**	**2.16**	**100**

Source: Nasim, M., Shahidullah, S. M., Saha, A., Muttaleb, M. A., Aditya, T. L., Ali, M. A., & Kabir, M. S. (2017). Distribution of crops and cropping patterns in Bangladesh. *Bangladesh rice journal*, *21*(2), 1-55.

Note: Percentage of divisional net cropped area (NCA) was not available.

APPENDIX 5: FOOD UTILIZATION METHODOLOGY

Appendix 5.1: Methodology on 24-hour recall estimates

Food consumption data were collected using 24-hour recall and food-weighing methods. IFPRI contracted the Data Analysis and Technical Assistance (DATA), a Bangladeshi consulting firm with expertise in conducting complex surveys and data analysis, to conduct the Bangladesh Integrated Household Survey (BIHS). DATA worked under the supervision and guidance of IFPRI researchers.

Survey enumerators interviewed the household member responsible for meal preparation and distribution, usually the primary adult female. Specifically, enumerators asked about the food items cooked the previous day, the associated recipes, ingredients, the source, and the amounts consumed by different family members and guests. The enumerator asked the respondents to show the raw ingredient details and quantities, then weighed them with an electronic dietary scale precise to 1 gram. Enumerators then inquired about the total cooked food using measuring cups and bowls and collected food distribution data for each household member and guest. Portion sizes were estimated using visual aids, such as standard pots, plates, bowls, cups, and spoons.

Additionally, individual-level data included leftovers, recipes consumed, meals taken away from home, and food given to animals were collected. Given the gender-sensitive nature of interactions with outsiders in Bangladesh, female enumerators were primarily responsible for collecting the dietary information from the selected household, while male enumerators assisted in collecting information regarding food consumption at both the household- and individual-levels from the male respondent. Enumerators received extensive hands-on, practical training and a survey pretest and pilot test were conducted to ensure data quality. During data collection, all data were checked daily by supervisors for consistency and plausibility.

Appendix 5.2: Methodology for calculating adequacies of macronutrients and micronutrients

Calculating adequacies for macronutrients

Estimated energy requirements (EERs) for adults were calculated for each individual following the methodology given in FAO/WHO's Human Energy Requirements Report (FAO (Food and Agriculture Organization) and WHO (World Health Organization) 2004). The EER of an individual was calculated by taking the product of the individual's basal metabolic rate (BMR) and his/her physical activity level (PAL). BMR was estimated from an individual's body weight using a set of standard predictive equations based on sex and age. PAL—the total energy required over 24 h divided by the BMR over 24 h—was categorized into 3 levels, as defined in FAO/WHO (2004) (FAO (Food and Agriculture Organization) and WHO (World Health Organization) 2004): 1.4 for light, 1.7 for moderate, and 2.0 for high (27). BIHS collected data on the main occupation for each household member. From these data, individuals were assigned a PAL value based on their main occupation reported in each survey round. Energy intake was categorized as insufficient if it was <85% of EER.

The percentage of energy from protein, carbohydrate, and fat intakes was compared with the Acceptable Macronutrient Distribution Ranges (AMDRs) recommended by the US Institute of Medicine for assessing insufficient or excessive intake (28). The AMDR is the percentage of energy intake that is associated with reduced risk of chronic disease yet provides adequate amounts of essential nutrients. A diet is considered balanced if the contributions of protein, fat, and carbohydrate to energy for an individual meet the AMDR for a specific age group and sex. Consuming below or above these ranges implies increased risk of insufficient intakes of essential nutrients or chronic disease. For adults, the AMDRs for fat, carbohydrate, and protein are 20–35%, 45–65%, and 10–35%, respectively. AMDRs for children aged 1–3 y are 30–40%, 45–65%, and 5–20%, respectively; and AMDRs for children aged 4–18 years are 25–35%, 45–65%, and 10–30%, respectively.

Calculating adequacies for micronutrients

We used Harmonized Average Requirements (H-ARs) to calculate the probability of adequacy for each micronutrient (Allen, Carriquiry, and Murphy 2020). Coefficients of variations (CVs) and standard deviations (SD) for each micronutrient were calculated following the Institute of Medicine (IOM) guidelines (IOM (Institute of Medicine) 2000). The H-AR applied to zinc considers semi-refined diets, assuming that all the food ingredients consumed by rural people in Bangladesh are a mix of both unrefined and semi-refined food ingredients. Additionally, a moderate absorption efficiency (10% bioavailability) was used for iron (Allen, Carriquiry, and Murphy 2020), using the full probability method to assess iron adequacy.

APPENDIX 6: WEAI METHODOLOGY

The Women's Empowerment in Agriculture Index (WEAI) measures the empowerment, agency, and inclusion of women in the agriculture sector in an effort to identify and address the constraints that hinder women's full engagement in the agriculture sector.

The WEAI is composed of two sub-indexes; the Five Domains of Empowerment sub-index (5DE) measures the empowerment of women in five areas; and the Gender Parity sub-Index (GPI) measures the average level of equality in empowerment of men and women within the household. The WEAI is an aggregate index reported at the ZOI level and is based on individual-level data on men and women within the same households and data on women living in households with no adult male.

The 5DE sub-index assesses whether women are empowered across the five domains examined in the WEAI. Each domain is weighted equally, as are each of the indicators within a domain. The five domains, their definitions under the WEAI, the corresponding indicators, and their weights for the 5DE are:

Domain	Definition of domain	Indicators	Weight of Indicator in 5DE subindex
Production	Sole or joint decision-making over food and cash crop farming, livestock, and fisheries, and autonomy in agricultural production	Input in productive decisions	1/10
		Autonomy in production	1/10
Resources	Ownership, access to, and decision-making power over productive resources such as land, livestock, agricultural equipment, consumer durables, and credit	Ownership of assets	1/15
		Purchase, sale or transfer of assets	1/15
		Access to and decisions on credit	1/15
Income	Sole or joint control over income and expenditures	Control over use of income	1/5
Leadership	Membership in economic or social groups and comfort in speaking in public	Group member	1/10
		Speaking in public	1/10
Time	Allocation of time to productive and domestic tasks and satisfaction with the available time for leisure activities	Workload	1/10
		Leisure	1/10

Source: Feed the Future Indicator Handbook. U.S. Government Working Document, October 2014.

The 5DE is a measure of empowerment rather than disempowerment. A woman is defined as empowered in the 5DE if she reaches the threshold of empowerment in 80 percent or more of the weighted indicators. For disempowered women, the 5DE also shows the percentage of indicators in which those women meet the threshold of empowerment. The 5DE contributes 90 percent of the weight to the WEAI.

The GPI reflects the percentage of women who are as empowered as the men in their households. It is a relative equality measure that demonstrates the equality in 5DE profiles between the primary adult male and female in each household. In most cases, these are husband and wife, but they can be the primary male and female decision-maker regardless of their relationship to each other. For households that have not achieved gender parity, the GPI shows the gap that needs to be closed for women to reach the same level of empowerment as men. By definition, households without a primary adult male are excluded from this measure, and thus the aggregate WEAI uses the mean GPI value of dual-adult households. The GPI contributes 10 percent of the weight to the WEAI.

The 5DE score ranges from zero to one, where higher values indicate greater empowerment. It is constructed using a robust multidimensional methodology known as the Alkire Foster Method (see http://www.ophi.org.uk/research/multidimensional-poverty/alkirefoster-

method/ for information on the method). The score has two components. First, it reflects the percentage of women who are empowered (He). Second, it reflects the percentage of domains in which those women who are not yet empowered (Hn) still have adequate achievements (Aa). The 5DE formula is:
5DE = {He + (Hn x Aa)), where He + Hn= 100% and 0 <Aa< 80%.

The GPI also ranges from zero to one, with higher values indicating greater gender parity, and is constructed with two factors. First, it shows the percentage of women whose empowerment scores are lower than the men's in the household (HGPI). Second, the GPI shows the percentage shortfall in empowerment scores (IGPI) for those women who do not have gender parity. The overall formula is the product of these two numbers, following the Foster Greer Thorbecke "poverty gap" measure: GPI = {1 – (HGPI x IGPI)}.

The WEAI score is computed as a weighted sum of the ZOI-level 5DE and the GPI. Thus, improvements in either the 5DE or GPI will increase the WEAI.
The total WEAI score = 0.9{ He+ (Hn x Aa)} + 0.1{1 – (HGPI x IGPI)}.

APPENDIX 7: TABLES FOR ESTIMATING VULNERABILITY INDEXES

Table A7.1: Food Insecurity: Domain, Variable Description, and Sources

Domain	Variables	Definition	Sources
Food Availability	**Cropping intensity**	Gross Cropped Area is divided by Net Cropped Area and then multiplied by 100 to estimate cropping intensity.	Yearbook of Agricultural Statistics, 2023, BBS
	Irrigation coverage	Total irrigated area is divided by gross cropped area and then multiplied by 100 to compute irrigation coverage.	Yearbook of Agricultural Statistics, 2023, BBS
	Rice yield rate	Total rice production is divided by total area under rice production to compute yield of rice.	Yearbook of Agricultural Statistics, 2023, BBS
	Per capita fish production	Total fish production (inland capture and culture) divided by total district population (kg per capita).	Yearbook of Agricultural Statistics, 2023, BBS
	Road density	Total length of rural roads (including earthen and paved) divided by total area of the district (km road per sq km area).	Road and Market Database, 2024, Local Government Engineering Department (LGED)
Food Access	**Population below the lower poverty line**	Lower Poverty Line: The threshold is determined by identifying the extremely poor households whose total expenditure is close to the food poverty line.	Report on Household Income and Expenditure Survey 2016 and 2022
	Lack of electricity	Percentage of households without access to electricity (i.e., interconnected grid, generator, solar panel etc.).	Multiple Indicator Cluster Survey (MICS), 2019
	Depth of poverty	The average consumption shortfall multiplied by the number of people below the poverty line.	Report on Household Income and Expenditure Survey 2016 and 2022

Domain	Variables	Definition	Sources
	Per capita nominal consumption expenditure	The consumption aggregate for the HIES 2022 was constructed by adding all food and non-food consumption expenditures reported by households. The food consumption module includes all food items acquired from various sources such as purchase, home production, government provision, and gifts. Non-purchased items were valued at the average unit market prices of commodities. The non-food expenditure module includes all expenditures on purchased and non-purchased consumption items. Tax payments, savings, and investment expenditures were excluded from consumption expenditure.	Report on Household Income and Expenditure Survey 2016 and 2022
Food Utilization	**Stunting rates**	Children whose height-for-age Z-score is below minus two standard deviations (-2 SD) from the median of the reference population are considered stunted.	MICS, 2019
	Wasting rates	Children whose weight-for-height Z-score is below minus two standard deviations (-2 SD) from the median of the reference population are considered wasted.	MICS, 2019
	Basic sanitation services	Percentage of household members using improved sanitation facilities which are not shared. An improved sanitation facilities include flush or pour flush to piped sewer systems, septic tanks or pit latrines, ventilated improved pit latrines, pit latrines with slabs and composting toilets.	MICS, 2019
	Handwashing facilities with soap and water	Handwashing place or facilities may be fixed or mobile and include a sink with tap water, buckets with taps, tippy-taps, and jugs or basins designated for handwashing. Soap includes bar soap, liquid soap, powder detergent, and soapy water but does not include ash, soil, sand or other handwashing agents.	MICS, 2019
	Consumption of a minimum acceptable diet	Percentage of children aged 6–23 months who had at least the minimum dietary diversity and the minimum meal frequency during the previous day for both breastfed and non-breastfed children.	MICS, 2019

Source: Authors.

Table A7.2: District ranking by overall food insecurity score (from most to least vulnerable)

District	Overall Insecurity Score
Bandarban	11.65112
Sherpur	4.91
Cox's Bazar	4.5532
Sunamganj	4.35215
Khagrachhari	3.65447
Kishoreganj	3.46741
Jamalpur	3.38087
Noakhali	3.30454
Kurigram	3.27651
Habiganj	3.22498
Sylhet	3.07887
Netrakona	3.04788
Gaibandha	2.83212
Lalmonirhat	2.64319
Panchagarh	2.61379
Lakshmipur	2.59596
Moulvibazar	2.2706
Rangamati	2.1666
Chapai Nawabganj	1.99815
Bhola	1.82495
Tangail	1.5934
Brahmanbaria	1.49505
Pirojpur	0.8764
Chattogram	0.74609
Naogaon	0.67884
Barishal	0.52512
Nilphamari	0.48283

District	Overall Insecurity Score
Bogura	0.38633
Gazipur	0.27047
Dinajpur	0.23324
Dhaka	0.21183
Sirajganj	0.0139
Thakurgaon	-0.16773
Rangpur	-0.21151
Manikganj	-0.47629
Munshiganj	-0.53099
Mymensingh	-0.57433
Joypurhat	-0.65424
Pabna	-0.71513
Narayanganj	-0.73938
Patuakhali	-1.09623
Faridpur	-1.34074
Shariatpur	-1.56908
Barguna	-1.64833
Madaripur	-1.66814
Magura	-1.68781
Narsingdi	-1.74809
Jhalokati	-1.94638
Rajbari	-1.95472
Gopalganj	-2.10767
Chuadanga	-2.1607
Rajshahi	-2.30111
Narail	-2.96662
Jhenaidah	-2.99909
Cumilla	-3.1331
Feni	-3.13728

District	Overall Insecurity Score
Natore	-3.18829
Chandpur	-3.96723
Khulna	-3.981
Satkhira	-4.9895
Kushtia	-5.14756
Meherpur	-5.75842
Bagerhat	-6.33994
Jashore	-7.45423

Source: Authors' calculations.

Table A7.3: Indicators for the Food Availability domain of the Vulnerability Index

District	Cropping intensity	Share of irrigated area in gross cropped area (%)	Yield rate of Rice (MT/ha)	Road density (km road per sq km area)	Fish production per capita (kg)	Cropping intensity Standardized	Share of irrigated area Standardized	Yield rate of Rice Standardized	Road density Standardized	Fish production per capita Standardized
	Original values					Standardized values				
Barguna	140.0	6.0	2.3	3.5	20.8	81.8	100.0	90.3	50.9	76.3
Barishal	202.0	24.1	2.6	4.3	43.7	45.3	80.0	76.9	37.0	47.9
Bhola	156.0	16.8	2.9	1.6	79.2	72.4	88.1	64.9	83.1	4.1
Jhalokati	148.0	13.7	2.5	6.3	20.7	77.1	91.5	83.8	0.0	76.4
Patuakhali	210.0	7.6	2.1	3.8	44.8	40.6	98.3	100.0	44.4	46.6
Pirojpur	200.0	21.4	2.3	4.6	18.7	46.5	82.9	89.8	31.6	78.8
Bandarban	109.0	16.2	2.7	0.7	6.3	100.0	88.8	74.0	100.0	94.2
Brahmanbaria	156.0	59.1	3.5	2.4	20.8	72.4	41.2	43.1	70.5	76.3
Chandpur	197.0	53.5	2.7	3.5	42.2	48.2	47.4	75.2	50.5	49.8
Chattogram	163.0	31.2	3.0	2.7	9.3	68.2	72.1	64.5	64.8	90.5
Cox's Bazar	205.0	36.2	3.4	1.8	13.2	43.5	66.6	44.5	80.8	85.7
Cumilla	185.0	43.1	3.3	3.9	49.9	55.3	58.9	51.6	42.7	40.3
Feni	220.0	29.8	3.1	4.4	22.9	34.7	73.7	59.4	34.4	73.6
Khagrachhari	163.0	35.8	3.3	1.2	9.6	68.2	67.0	48.6	92.0	90.1
Lakshmipur	211.0	19.0	2.9	4.0	37.7	40.0	85.6	67.6	41.1	55.4
Noakhali	169.0	25.5	3.3	2.8	27.6	64.7	78.5	50.7	63.0	67.9
Rangamati	208.0	25.8	3.0	0.8	30.9	41.8	78.1	60.8	98.0	63.8
Dhaka	163.0	64.1	4.1	4.7	1.6	68.2	35.7	16.2	29.5	100.0

District	Cropping intensity	Share of irrigated area in gross cropped area (%)	Yield rate of Rice (MT/ha)	Road density (km road per sq km area)	Fish production per capita (kg)	Cropping intensity Standardized	Share of irrigated area Standardized	Yield rate of Rice Standardized	Road density Standardized	Fish production per capita Standardized
Faridpur	196.0	38.4	3.1	2.8	20.5	48.8	64.2	57.0	62.2	76.7
Gazipur	152.0	54.8	3.5	3.7	11.0	74.7	45.9	40.3	46.7	88.4
Gopalganj	186.0	50.6	4.5	3.4	32.0	54.7	50.7	0.0	52.0	62.5
Kishoreganj	191.0	62.3	3.7	2.2	27.0	51.8	37.7	32.6	73.1	68.6
Madaripur	213.0	43.8	3.3	3.7	22.0	38.8	58.2	49.0	46.5	74.8
Manikganj	164.0	49.7	3.5	2.5	21.3	67.6	51.6	43.2	67.4	75.7
Munshiganj	213.0	64.9	2.7	2.5	19.2	38.8	34.8	73.1	67.9	78.3
Narayanganj	185.0	67.8	3.4	4.6	4.9	55.3	31.6	44.1	30.7	95.9
Narsingdi	169.0	66.9	3.3	4.8	17.7	64.7	32.6	48.5	27.6	80.1
Rajbari	215.0	45.6	3.0	3.3	25.2	37.6	56.1	63.1	54.2	70.8
Shariatpur	195.0	32.8	3.3	3.0	21.6	49.4	70.4	50.9	58.6	75.3
Tangail	182.0	60.5	3.5	3.1	15.2	57.1	39.6	41.2	58.2	83.2
Bagerhat	146.0	42.8	3.4	1.7	82.5	78.2	59.3	44.4	82.2	0.0
Chuadanga	263.0	96.3	3.3	2.4	14.9	9.4	0.0	49.9	69.2	83.6
Jashore	230.0	70.2	3.8	3.8	78.4	28.8	29.0	28.5	45.4	5.0
Jhenaidah	226.0	74.6	3.7	2.9	21.5	31.2	24.0	32.5	61.4	75.3
Khulna	148.0	43.4	3.2	1.4	46.8	77.1	58.6	55.7	86.9	44.1
Kushtia	242.0	93.7	3.3	3.3	16.7	21.8	2.9	48.8	54.3	81.4
Magura	238.0	81.2	3.2	3.0	16.3	24.1	16.7	55.1	59.1	81.9
Meherpur	279.0	82.4	3.2	2.1	14.2	0.0	15.5	55.4	74.4	84.4

District	Cropping intensity	Share of irri-gated area in gross cropped area (%)	Yield rate of Rice (MT/ha)	Road density (km road per sq km area)	Fish pro-duction per capita (kg)	Cropping intensity Standard-ized	Share of irri-gated area Standard-ized	Yield rate of Rice Stand-ardized	Road den-sity Stand-ardized	Fish pro-duction per capita Standard-ized
Narail	232.0	66.3	3.6	3.0	19.9	27.6	33.2	39.9	58.8	77.4
Satkhira	147.0	50.1	3.5	2.2	68.0	77.6	51.2	42.7	72.8	17.9
Jamalpur	206.0	54.5	3.4	2.7	15.8	42.9	46.3	46.8	64.3	82.4
Mymensingh	188.0	48.3	3.3	3.0	57.5	53.5	53.2	48.7	58.6	30.9
Netrokona	209.0	60.0	3.6	2.2	40.9	41.2	40.2	36.4	72.8	51.4
Sherpur	213.0	52.0	3.6	2.1	21.8	38.8	49.1	37.5	75.6	75.0
Bogura	243.0	71.7	3.6	2.4	28.0	21.2	27.2	38.8	70.5	67.4
Chapai Na-wabganj	199.0	66.7	3.7	2.0	12.1	47.1	32.8	34.5	76.7	87.1
Joypurhat	240.0	56.5	3.3	1.9	27.6	22.9	44.1	49.9	79.4	67.9
Naogoan	202.0	78.9	3.6	1.9	31.5	45.3	19.2	39.5	78.4	63.0
Natore	204.0	66.2	3.5	2.6	40.3	44.1	33.4	43.9	66.3	52.2
Pabna	220.0	50.9	2.9	2.4	25.6	34.7	50.4	66.3	69.0	70.3
Rajshahi	206.0	70.9	3.7	2.5	30.4	42.9	28.1	33.4	67.3	64.4
Sirajganj	229.0	68.5	3.8	2.8	21.7	29.4	30.9	29.1	63.6	75.1
Dinajpur	226.0	62.3	3.4	2.2	20.3	31.2	37.7	47.7	72.5	76.9
Gaibandha	206.0	55.8	3.3	2.4	15.2	42.9	44.9	48.8	69.8	83.2
Kurigram	210.0	48.9	3.6	2.1	19.9	40.6	52.5	39.7	75.9	77.3
Lalmonirhat	232.0	58.1	3.5	2.8	16.4	27.6	42.4	42.7	62.2	81.7
Nilphamari	230.0	65.2	3.5	2.4	13.5	28.8	34.5	43.3	69.8	85.3
Panchagarh	217.0	34.9	3.4	2.9	16.7	36.5	68.0	44.2	60.1	81.3

District	Cropping intensity	Share of irrigated area in gross cropped area (%)	Yield rate of Rice (MT/ha)	Road density (km road per sq km area)	Fish production per capita (kg)	Cropping intensity Standardized	Share of irrigated area Standardized	Yield rate of Rice Standardized	Road density Standardized	Fish production per capita Standardized
Rangpur	228.0	51.1	3.5	3.2	15.7	30.0	50.1	41.3	55.2	82.6
Thakurgaon	228.0	55.2	3.2	2.8	21.6	30.0	45.5	53.0	62.5	75.3
Habiganj	149.0	50.6	3.4	1.9	23.7	76.5	50.6	47.9	78.3	72.6
Moulvibazar	159.0	19.8	3.6	1.8	26.2	70.6	84.8	39.6	79.8	69.6
Sunamganj	164.0	60.1	4.0	1.3	41.6	67.6	40.1	23.2	88.9	50.6
Sylhet	193.0	32.3	2.9	2.2	19.5	50.6	71.0	64.9	73.8	77.8

Source: Yearbook of Agricultural Statistics, 2023, BBS, Road and Market Database, 2024, Local Government Engineering Department (LGED)

Table A7.4: Indicators for the Food Access domain of the Vulnerability Index

District	Below Lower Poverty Line 2022 (Estimated) (%)	Lack of Electricity (%)	Poverty Depth 2022 (Est.) (%)	Per capita Nominal Consumption Expenditure 2022 (Est.) (BDT)	Below Lower Poverty Line 2022 Standardized (%)	Lack of Electricity Standardized (%)	Poverty Depth 2022 standardized (%)	Per capita Nominal Consumption Expenditure 2022 Standardized
	Original values				Standardized values			
Barguna	9.8	32.7	18.6	5145.8	33.4	62.7	51.8	87.6
Barishal	11.1	7.9	20.6	6458.9	37.5	15.0	60.0	72.8
Bhola	6.9	22.7	20.1	5866.5	23.5	43.4	57.9	79.5
Jhalokati	8.0	7.7	18.3	5710.9	27.0	14.5	50.2	81.2
Patuakhali	19.9	44.3	29.9	4614.1	67.3	85.2	100.0	93.6
Pirojpur	14.3	7.9	23.3	5554.6	48.6	15.0	71.5	83.0
Bandarban	29.5	52.0	29.4	4706.3	100.0	100.0	97.7	92.5
Brahmanbaria	2.7	2.4	17.1	9593.5	9.1	4.3	45.0	37.5
Chandpur	9.0	10.6	17.5	6932.6	30.4	20.2	46.7	67.5
Chattogram	2.1	1.9	14.3	7753.9	7.0	3.5	33.3	58.2
Cox's Bazar	4.5	27.0	18.9	6745.0	15.3	51.8	52.8	69.6
Cumilla	3.2	0.7	14.2	8064.5	10.7	1.1	33.1	54.7
Feni	2.0	0.4	15.8	10288.8	6.8	0.6	39.5	29.6
Khagrachhari	19.2	46.5	22.0	5671.0	65.2	89.4	66.1	81.7
Lakshmipur	12.0	25.5	23.2	6147.5	40.8	49.0	71.1	76.3
Noakhali	7.9	21.1	19.6	7921.5	26.6	40.4	56.0	56.3
Rangamati	6.3	49.5	13.3	6149.9	21.3	95.1	28.9	76.3
Dhaka	0.7	0.1	18.6	12917.7	2.2	0.0	51.8	0.0

District	Below Lower Poverty Line 2022 (Estimated) (%)	Lack of Electricity (%)	Poverty Depth 2022 (Est.) (%)	Per capita Nominal Consumption Expenditure 2022 (Est.) (BDT)	Below Lower Poverty Line 2022 Standardized (%)	Lack of Electricity Standardized (%)	Poverty Depth 2022 standardized (%)	Per capita Nominal Consumption Expenditure 2022 Standardized
Faridpur	1.2	10.1	20.1	8423.1	4.2	19.2	58.2	50.7
Gazipur	0.7	1.0	16.1	10096.0	2.5	1.8	40.8	31.8
Gopalganj	6.0	1.1	20.2	6584.6	20.4	1.9	58.3	71.4
Kishoreganj	13.3	6.7	27.7	4930.6	45.0	12.6	90.3	90.0
Madaripur	0.4	2.9	13.5	8467.1	1.2	5.4	30.0	50.2
Manikganj	6.3	2.8	24.0	7009.3	21.5	5.2	74.9	66.6
Munshiganj	0.5	1.9	18.2	8834.7	1.6	3.5	49.7	46.0
Narayanganj	0.0	0.2	14.3	11699.1	0.0	0.2	33.1	13.7
Narsingdi	1.8	1.2	19.4	9983.1	6.2	2.1	55.2	33.1
Rajbari	6.2	6.7	19.8	6832.6	21.1	12.7	56.8	68.6
Shariatpur	1.9	6.8	16.7	6928.5	6.6	12.9	43.4	67.5
Tangail	3.3	1.2	22.8	8574.7	11.3	2.0	69.4	48.9
Bagerhat	3.4	14.1	8.2	6794.2	11.4	26.9	7.2	69.0
Chuadanga	2.8	2.1	7.0	6662.9	9.6	3.9	2.1	70.5
Jashore	2.1	2.1	6.6	6418.8	7.1	3.9	0.2	73.2
Jhenaidah	3.0	3.6	8.7	6917.9	10.1	6.8	9.3	67.6
Khulna	3.2	11.7	8.3	6860.2	10.9	22.2	7.7	68.3
Kushtia	1.7	2.0	7.9	8173.0	5.6	3.6	6.0	53.5
Magura	8.8	3.9	11.7	5077.4	29.9	7.3	22.3	88.4
Meherpur	2.9	2.5	7.0	6733.5	9.8	4.7	2.1	69.7
Narail	1.4	8.8	6.5	6427.7	4.6	16.8	0.0	73.1

District	Below Lower Poverty Line 2022 (Estimated) (%)	Lack of Electricity (%)	Poverty Depth 2022 (Est.) (%)	Per capita Nominal Consumption Expenditure 2022 (Est.) (BDT)	Below Lower Poverty Line 2022 Standardized (%)	Lack of Electricity Standardized (%)	Poverty Depth 2022 standardized (%)	Per capita Nominal Consumption Expenditure 2022 Standardized
Satkhira	2.2	9.0	9.7	8000.4	7.4	17.0	13.6	55.4
Jamalpur	20.0	15.3	18.1	5529.7	67.8	29.2	49.4	83.3
Mymensingh	5.5	12.9	13.2	6789.4	18.5	24.6	28.6	69.1
Netrokona	8.9	13.0	12.5	6356.1	30.1	24.8	25.6	74.0
Sherpur	13.8	4.9	16.8	5610.3	46.8	9.1	43.9	82.4
Bogura	6.4	7.1	10.3	7905.8	21.6	13.4	16.4	56.5
Chapai Nawabganj	11.2	8.1	12.1	6012.4	37.9	15.4	24.1	77.8
Joypurhat	4.5	1.9	8.9	6614.3	15.4	3.5	10.4	71.0
Naogoan	8.6	7.3	11.1	6238.6	29.1	13.9	19.7	75.3
Natore	5.9	4.4	10.1	6875.1	20.2	8.2	15.2	68.1
Pabna	7.9	2.5	9.6	6224.1	26.9	4.5	13.0	75.4
Rajshahi	3.4	3.9	9.3	6995.7	11.7	7.4	11.8	66.7
Sirajganj	5.9	8.2	8.8	6494.4	19.8	15.6	9.7	72.4
Dinajpur	14.8	7.0	11.4	4949.7	50.0	13.2	20.9	89.8
Gaibandha	9.5	14.8	10.4	5994.0	32.1	28.3	16.4	78.0
Kurigram	17.7	26.2	13.9	4045.3	59.9	50.3	31.7	100.0
Lalmonirhat	7.5	18.4	9.1	5382.6	25.6	35.2	10.9	84.9
Nilphamari	4.7	9.9	7.8	5778.1	15.8	18.9	5.6	80.5
Panchagarh	4.7	21.0	8.0	6473.3	15.8	40.2	6.6	72.6
Rangpur	8.9	7.4	10.4	6001.4	30.0	14.1	16.5	78.0

District	Below Lower Poverty Line 2022 (Estimated) (%)	Lack of Electricity (%)	Poverty Depth 2022 (Est.) (%)	Per capita Nominal Consumption Expenditure 2022 (Est.) (BDT)	Below Lower Poverty Line 2022 Standardized (%)	Lack of Electricity Standardized (%)	Poverty Depth 2022 standardized (%)	Per capita Nominal Consumption Expenditure 2022 Standardized
Thakurgaon	5.1	9.1	9.4	7050.5	17.2	17.2	12.2	66.1
Habiganj	4.0	6.6	17.4	5764.7	13.4	12.5	46.4	80.6
Moulvibazar	2.8	9.6	17.7	6174.7	9.5	18.3	47.8	76.0
Sunamganj	7.7	9.3	15.8	5107.4	26.2	17.7	39.5	88.0
Sylhet	3.5	3.4	22.4	7113.9	11.9	6.3	67.9	65.4

Source: Report on Household Income and Expenditure Survey 2016 and 2022, and Multiple Indicator Cluster Survey (MICS), 2019.

Note: District-level data on average monthly household consumption expenditure are available in the HIES 2016 report but not in the HIES 2022 report. However, both surveys provide this data at the division level. To estimate the district-level average monthly household consumption expenditures for 2022, the following approach is used: First, the percentage change in monthly average consumption expenditure from 2016 to 2022 is calculated for each of Bangladesh's 8 divisions. Then, these division-level percentage changes are applied to each of the 64 districts based on their respective divisions to estimate the 2022 monthly average consumption expenditure at the district level. This same method is also used to estimate district-level prevalence of poverty and depth of poverty.

Table A7.5: Indicators for the Food Utilization domain of the Vulnerability Index

District	Stunting (%)	Wasting (%)	Basic Sanitation Services (%)	Handwashing facilities with soap & water (%)	Minimum acceptable diet (%)	Stunting Standardized	Wasting Standardized	Basic Sanitation Services Standardized	Handwashing facilities with soap & water Standardized	Minimum acceptable diet Standardized
	Original values					**Standardized values**				
Barguna	25.7	13.1	81.8	42.0	55.8	36.1	79.0	11.5	84.4	0.0
Barishal	35.8	11.0	69.7	49.1	25.0	71.2	60.6	36.6	73.6	65.1
Bhola	38.0	11.3	46.0	49.4	20.9	78.8	63.5	85.4	73.1	73.8
Jhalokati	19.9	6.5	50.5	44.6	31.7	16.0	22.0	76.2	80.4	51.0
Patuakhali	27.9	7.8	81.5	54.2	43.3	43.6	33.0	12.2	65.7	26.5
Pirojpur	21.1	13.3	59.9	31.8	34.6	20.3	80.9	56.7	100.0	44.9
Bandarban	29.5	14.4	38.9	43.8	16.4	49.4	90.4	100.0	81.6	83.2
Brahmanbaria	26.9	7.9	54.0	87.9	16.3	40.4	34.4	68.9	14.4	83.5
Chandpur	23.1	7.4	77.4	66.0	36.7	27.3	30.1	20.6	47.7	40.4
Chattogram	23.2	12.4	69.7	66.5	23.5	27.5	73.4	36.5	47.0	68.3
Cox's Bazar	34.6	9.7	42.6	62.9	24.9	66.9	50.1	92.4	52.5	65.3
Cumilla	24.4	9.3	74.2	90.0	23.9	31.6	46.5	27.2	11.1	67.4
Feni	23.7	9.0	77.2	69.4	31.7	29.2	43.6	21.0	42.6	51.0
Khagrachhari	27.1	4.0	55.2	59.8	28.9	40.9	0.0	66.5	57.3	56.8
Lakshmipur	26.2	15.5	78.3	51.0	13.1	37.9	100.0	18.8	70.7	90.3
Noakhali	36.6	11.7	65.3	47.1	20.5	73.7	67.0	45.6	76.6	74.7
Rangamati	36.0	9.4	51.2	48.1	36.5	71.7	47.4	74.8	75.1	40.7

District	Stunting (%)	Wasting (%)	Basic Sanitation Services (%)	Handwashing facilities with soap & water (%)	Minimum acceptable diet (%)	Stunting Standardized	Wasting Standardized	Basic Sanitation Services Standardized	Handwashing facilities with soap & water Standardized	Minimum acceptable diet Standardized
Dhaka	33.4	9.1	57.7	94.1	43.1	62.8	44.1	61.2	5.0	27.0
Faridpur	24.6	7.5	62.0	73.6	36.1	32.3	30.9	52.4	36.1	41.7
Gazipur	26.1	8.9	50.2	94.6	32.1	37.4	42.3	76.8	4.2	50.1
Gopalganj	24.8	7.2	87.4	55.1	25.3	33.2	27.8	0.0	64.4	64.4
Kishoreganj	36.5	8.6	49.4	74.1	36.2	73.6	40.4	78.3	35.4	41.4
Madaripur	27.4	10.7	86.2	85.5	23.2	41.9	58.4	2.4	18.0	68.9
Manikganj	19.5	4.8	76.9	84.6	14.3	14.6	7.4	21.6	19.5	87.8
Munshiganj	25.7	8.1	62.6	86.9	23.5	36.1	35.5	51.2	15.9	68.3
Narayanganj	24.3	6.6	44.8	93.2	30.5	31.3	22.9	87.9	6.3	53.5
Narsingdi	28.6	6.8	53.1	97.3	42.5	46.1	24.8	70.7	0.0	28.2
Rajbari	21.8	8.0	65.5	82.6	36.7	22.5	34.6	45.2	22.5	40.3
Shariatpur	24.4	8.3	79.0	75.8	26.1	31.6	37.3	17.4	32.8	62.8
Tangail	19.3	14.1	73.0	95.7	18.9	13.9	87.8	29.7	2.4	78.1
Bagerhat	26.8	7.4	85.1	41.0	30.7	39.9	30.0	4.8	85.9	53.1
Chuadanga	21.3	11.5	71.6	86.9	32.2	20.9	65.0	32.5	15.9	49.9
Jashore	21.1	9.3	74.0	87.5	36.6	20.1	46.0	27.5	14.9	40.5
Jhenaidah	22.0	8.4	68.0	79.6	35.6	23.3	38.0	40.1	27.1	42.7
Khulna	17.2	8.7	72.1	75.2	31.0	6.8	41.1	31.7	33.7	52.5
Kushtia	15.3	10.6	73.5	78.8	45.8	0.0	57.1	28.6	28.2	21.2
Magura	24.3	6.7	67.5	62.4	29.2	31.2	24.0	41.1	53.3	56.2

District	Stunting (%)	Wasting (%)	Basic Sanitation Services (%)	Handwashing facilities with soap & water (%)	Minimum acceptable diet (%)	Stunting Standardized	Wasting Standardized	Basic Sanitation Services Standardized	Handwashing facilities with soap & water Standardized	Minimum acceptable diet Standardized
Meherpur	15.6	7.7	77.0	88.9	48.3	1.1	32.0	21.5	12.9	15.8
Narail	27.4	8.6	75.2	67.3	35.1	42.1	40.1	25.2	45.8	43.8
Satkhira	19.9	12.0	63.7	66.9	43.1	16.0	69.6	48.8	46.5	26.9
Jamalpur	33.2	11.0	65.4	65.3	31.1	62.2	61.3	45.4	48.9	52.2
Mymensingh	33.2	6.7	53.7	71.0	16.8	62.1	23.4	69.5	40.2	82.4
Netrokona	36.7	11.1	53.9	50.4	12.6	74.2	62.1	69.2	71.5	91.3
Sherpur	27.5	15.2	62.6	48.3	9.0	42.3	97.5	51.1	74.7	98.9
Bogura	31.5	11.4	62.5	65.1	27.4	56.2	64.5	51.4	49.2	60.1
Chapai Nawabganj	25.2	4.8	44.7	58.3	16.4	34.3	7.4	88.1	59.5	83.4
Joypurhat	29.4	12.3	64.5	69.6	35.3	48.8	72.5	47.2	42.3	43.3
Naogoan	25.1	11.5	61.4	73.9	22.2	34.1	65.5	53.6	35.7	71.0
Natore	18.2	8.5	68.2	69.5	25.8	10.3	39.3	39.7	42.4	63.4
Pabna	26.0	9.1	68.0	68.4	22.0	37.3	44.1	39.9	44.0	71.4
Rajshahi	24.4	7.3	59.7	71.9	31.0	31.8	29.0	57.1	38.7	52.4
Sirajganj	27.2	10.8	64.9	69.6	25.9	41.3	59.5	46.5	42.3	63.2
Dinajpur	24.7	11.2	71.8	87.0	32.8	32.8	62.4	32.1	15.8	48.7
Gaibandha	30.3	7.8	54.1	90.3	13.6	52.1	33.4	68.8	10.8	89.3
Kurigram	29.3	12.7	63.5	64.9	30.7	48.8	75.4	49.3	49.4	53.0
Lalmonirhat	30.3	12.1	73.5	79.1	9.6	52.0	70.8	28.8	27.8	97.7

District	Stunting (%)	Wasting (%)	Basic Sanitation Services (%)	Handwashing facilities with soap & water (%)	Minimum acceptable diet (%)	Stunting Standardized	Wasting Standardized	Basic Sanitation Services Standardized	Handwashing facilities with soap & water Standardized	Minimum acceptable diet Standardized
Nilphamari	29.0	11.8	73.0	91.8	26.8	47.5	67.7	29.8	8.5	61.4
Panchagarh	40.2	11.4	69.4	81.4	21.5	86.3	64.6	37.2	24.3	72.5
Rangpur	15.9	10.8	59.5	95.6	26.0	2.3	59.3	57.5	2.7	63.1
Thakurgaon	25.9	11.0	76.3	82.6	17.6	36.8	60.5	23.0	22.5	80.8
Habiganj	34.9	12.7	59.1	76.3	24.6	67.8	75.3	58.4	32.1	66.0
Moulvibazar	30.3	15.0	70.6	93.2	30.6	52.0	96.0	34.6	6.3	53.2
Sunamganj	44.2	7.6	53.2	64.2	8.5	100.0	31.2	70.7	50.6	100.0
Sylhet	37.3	11.0	76.5	74.2	15.1	76.3	60.7	22.5	35.3	86.1

Source: Multiple Indicator Cluster Survey (MICS), 2019

Table A7.6: Indicators for Climate and Environmental risk index

District	Proportion of drought affected household	Proportion of flood affected household	Proportion of Salinity affected household	Proportion of cyclone affected household	Proportion of Storm/tidal surge affected household	Proportion of River/Coastal Erosion surge affected household	Number of Trans-boundary Rivers
				Original values			
Barguna	0.00000	0.00000	0.00644	0.97632	0.09894	0.00233	0
Barishal	0.00072	0.14892	0.33321	0.78837	0.00373	0.08387	0
Bhola	0.00041	0.34341	0.00992	0.84346	0.02543	0.04828	0
Jhalokati	0.00010	0.00631	0.00370	0.90354	0.44694	0.03329	0
Patuakhali	0.00469	0.42094	0.00588	0.70108	0.13328	0.04234	0
Pirojpur	0.00000	0.08675	0.00662	0.88907	0.47338	0.02987	0
Bandarban	0.01970	0.31849	0.00000	0.50385	0.00000	0.14045	0
Brahmanbaria	0.30439	0.33246	0.00000	0.00858	0.00000	0.25779	3
Chandpur	0.01828	0.25323	0.02965	0.42940	0.00488	0.05260	0
Chattogram	0.00424	0.73106	0.06527	0.15659	0.01289	0.02593	0
Cox's Bazar	0.03814	0.36579	0.00000	0.17039	0.00000	0.16986	3
Cumilla	0.00134	0.57286	0.12998	0.86304	0.00524	0.01101	0
Feni	0.00509	0.70836	0.01179	0.62626	0.00165	0.05681	2
Khagrachhari	0.03334	0.29424	0.00000	0.32477	0.00000	0.05900	1
Lakshmipur	0.03611	0.39442	0.02845	0.84818	0.04699	0.10364	0
Noakhali	0.02798	0.11451	0.02679	0.70631	0.00520	0.05854	0
Rangamati	0.13477	0.28504	0.00000	0.12689	0.00000	0.09912	0
Dhaka	0.00908	0.85544	0.00000	0.00773	0.00000	0.04259	0
Faridpur	0.20336	0.58847	0.00000	0.23435	0.00000	0.23644	0
Gazipur	0.00969	0.42488	0.00000	0.02060	0.00000	0.02350	0
Gopalganj	0.02246	0.67759	0.00237	0.79300	0.00000	0.00823	0

District	Proportion of drought affected household	Proportion of flood affected household	Proportion of Salinity affected household	Proportion of cyclone affected household	Proportion of Storm/tidal surge affected household	Proportion of River/Coastal Erosion surge affected household	Number of Trans-boundary Rivers
Kishoreganj	0.02905	0.78170	0.00000	0.05006	0.00000	0.11261	0
Madaripur	0.02202	0.83334	0.00000	0.67193	0.00000	0.04337	0
Manikganj	0.12550	0.94521	0.00000	0.08175	0.00000	0.20763	0
Munshiganj	0.00263	0.80148	0.00000	0.24519	0.00000	0.16256	0
Narayanganj	0.03570	0.11894	0.00000	0.05696	0.00000	0.16254	0
Narsingdi	0.00982	0.07280	0.00000	0.07936	0.00000	0.13897	0
Rajbari	0.15772	0.29586	0.00000	0.46558	0.00000	0.20472	0
Shariatpur	0.01249	0.75268	0.00000	0.31124	0.00000	0.12442	0
Tangail	0.13191	0.90708	0.00000	0.09168	0.00000	0.18697	0
Bagerhat	0.00450	0.07699	0.14229	0.97116	0.07751	0.02077	0
Chuadanga	0.12254	0.00411	0.00000	0.98203	0.00000	0.14924	1
Jashore	0.00063	0.00050	0.00098	0.99358	0.00000	0.00559	2
Jhenaidah	0.09432	0.00075	0.00000	0.91012	0.00000	0.36206	1
Khulna	0.02296	0.05503	0.28851	0.98181	0.02150	0.04503	1
Kushtia	0.00395	0.29127	0.00000	0.64016	0.00000	0.12332	1
Magura	0.07184	0.00057	0.00000	0.93706	0.00000	0.20020	0
Meherpur	0.00138	0.08270	0.00000	0.43543	0.00000	0.12824	2
Narail	0.01724	0.02111	0.00104	0.60684	0.00000	0.11690	0
Satkhira	0.00112	0.02634	0.19116	0.98852	0.01017	0.05236	3
Jamalpur	0.03839	0.90215	0.00000	0.02850	0.00000	0.11926	1
Mymensingh	0.01029	0.71048	0.00000	0.07172	0.00000	0.09376	1
Netrokona	0.06077	0.78625	0.00000	0.06129	0.00000	0.04489	2
Sherpur	0.09484	0.74602	0.00000	0.00187	0.00000	0.05671	2

District	Proportion of drought affected household	Proportion of flood affected household	Proportion of Salinity affected household	Proportion of cyclone affected household	Proportion of Storm/tidal surge affected household	Proportion of River/Coastal Erosion surge affected household	Number of Trans-boundary Rivers
Bogura	0.01186	0.30015	0.00000	0.05966	0.00000	0.13380	1
Chapai Nawabganj	0.09961	0.34281	0.00000	0.00837	0.00000	0.30757	0
Joypurhat	0.03703	0.56787	0.00000	0.09697	0.00000	0.09479	1
Naogoan	0.05187	0.71133	0.00000	0.20701	0.00000	0.11805	0
Natore	0.07907	0.26873	0.00000	0.00949	0.00000	0.24739	4
Pabna	0.16839	0.67630	0.00000	0.30324	0.00000	0.05762	0
Rajshahi	0.01658	0.68009	0.00000	0.32087	0.00000	0.09165	0
Sirajganj	0.05032	0.69739	0.00000	0.02083	0.00000	0.18172	1
Dinajpur	0.03282	0.89976	0.00000	0.00102	0.00000	0.34286	5
Gaibandha	0.00323	0.90985	0.00000	0.00106	0.00000	0.08721	0
Kurigram	0.03613	0.97364	0.00000	0.00641	0.00000	0.10470	5
Lalmonirhat	0.04674	0.76375	0.00000	0.08409	0.00000	0.13761	2
Nilphamari	0.01110	0.63246	0.00000	0.00047	0.00000	0.18963	3
Panchagarh	0.00000	0.53097	0.00000	0.02746	0.00000	0.10410	7
Rangpur	0.06786	0.86869	0.00000	0.05379	0.00000	0.03890	1
Thakurgaon	0.00638	0.80049	0.00000	0.00554	0.00000	0.18240	3
Habiganj	0.00075	0.80517	0.00000	0.00134	0.00000	0.03684	5
Moulvibazar	0.09097	0.84488	0.00000	0.00297	0.00000	0.05255	5
Sunamganj	0.17174	0.96360	0.00000	0.00352	0.00000	0.02877	5
Sylhet	0.08528	0.77144	0.00000	0.02469	0.00000	0.02274	8

Source: Bangladesh Disaster Related Statistics (BDRS) 2021, BBS; Available on: Bangladesh Bureau of Statistics (bbs.gov.bd)

Table A7.7: Standardized values for Climate and Environmental risk index

District	Proportion of drought affected household Standard-ized	Propor-tion of flood af-fected house-hold Standard-ized	Proportion of Salinity affected household Standard-ized	Proportion of cyclone affected household Standard-ized	Proportion of Storm/tidal surge af-fected household Standard-ized	Proportion of River/Coastal Erosion surge affected household Standardized	Number of Trans-boundary River Standard-ized
				Standardized values			
Barguna	0.00	0.00	1.90	98.30	20.90	0.00	0.00
Barishal	0.20	15.30	100.00	79.30	0.80	22.70	0.00
Bhola	0.10	35.30	3.00	84.90	5.40	12.80	0.00
Jhalokati	0.00	0.60	1.10	90.90	94.40	8.60	0.00
Patuakhali	1.50	43.20	1.80	70.50	28.20	11.10	0.00
Pirojpur	0.00	8.90	2.00	89.50	100.00	7.70	0.00
Bandarban	6.50	32.70	0.00	50.70	0.00	38.40	0.00
Brah-manbaria	100.00	34.10	0.00	0.80	0.00	71.00	37.50
Chandpur	6.00	26.00	8.90	43.20	1.00	14.00	0.00
Chattogram	1.40	75.10	19.60	15.70	2.70	6.60	0.00
Cox's Bazar	12.50	37.60	0.00	17.10	0.00	46.60	37.50
Cumilla	0.40	58.80	39.00	86.90	1.10	2.40	0.00
Feni	1.70	72.80	3.50	63.00	0.30	15.10	25.00
Kha-grachhari	11.00	30.20	0.00	32.70	0.00	15.80	12.50
Lakshmipur	11.90	40.50	8.50	85.40	9.90	28.20	0.00
Noakhali	9.20	11.80	8.00	71.10	1.10	15.60	0.00
Rangamati	44.30	29.30	0.00	12.70	0.00	26.90	0.00
Dhaka	3.00	87.90	0.00	0.70	0.00	11.20	0.00
Faridpur	66.80	60.40	0.00	23.60	0.00	65.10	0.00
Gazipur	3.20	43.60	0.00	2.00	0.00	5.90	0.00
Gopalganj	7.40	69.60	0.70	79.80	0.00	1.60	0.00
Kishoreganj	9.50	80.30	0.00	5.00	0.00	30.70	0.00
Madaripur	7.20	85.60	0.00	67.60	0.00	11.40	0.00
Manikganj	41.20	97.10	0.00	8.20	0.00	57.10	0.00

District	Proportion of drought affected household Standardized	Proportion of flood affected household Standardized	Proportion of Salinity affected household Standardized	Proportion of cyclone affected household Standardized	Proportion of Storm/tidal surge affected household Standardized	Proportion of River/Coastal Erosion surge affected household Standardized	Number of Transboundary River Standardized
Munshiganj	0.90	82.30	0.00	24.60	0.00	44.50	0.00
Narayanganj	11.70	12.20	0.00	5.70	0.00	44.50	0.00
Narsingdi	3.20	7.50	0.00	7.90	0.00	38.00	0.00
Rajbari	51.80	30.40	0.00	46.80	0.00	56.30	0.00
Shariatpur	4.10	77.30	0.00	31.30	0.00	33.90	0.00
Tangail	43.30	93.20	0.00	9.20	0.00	51.30	0.00
Bagerhat	1.50	7.90	42.70	97.70	16.40	5.10	0.00
Chuadanga	40.30	0.40	0.00	98.80	0.00	40.80	12.50
Jashore	0.20	0.10	0.30	100.00	0.00	0.90	25.00
Jhenaidah	31.00	0.10	0.00	91.60	0.00	100.00	12.50
Khulna	7.50	5.70	86.60	98.80	4.50	11.90	12.50
Kushtia	1.30	29.90	0.00	64.40	0.00	33.60	12.50
Magura	23.60	0.10	0.00	94.30	0.00	55.00	0.00
Meherpur	0.50	8.50	0.00	43.80	0.00	35.00	25.00
Narail	5.70	2.20	0.30	61.10	0.00	31.80	0.00
Satkhira	0.40	2.70	57.40	99.50	2.10	13.90	37.50
Jamalpur	12.60	92.70	0.00	2.80	0.00	32.50	12.50
Mymensingh	3.40	73.00	0.00	7.20	0.00	25.40	12.50
Netrokona	20.00	80.80	0.00	6.10	0.00	11.80	25.00
Sherpur	31.20	76.60	0.00	0.10	0.00	15.10	25.00
Bogura	3.90	30.80	0.00	6.00	0.00	36.50	12.50
Chapai Nawabganj	32.70	35.20	0.00	0.80	0.00	84.90	0.00
Joypurhat	12.20	58.30	0.00	9.70	0.00	25.70	12.50
Naogoan	17.00	73.10	0.00	20.80	0.00	32.20	0.00
Natore	26.00	27.60	0.00	0.90	0.00	68.10	50.00
Pabna	55.30	69.50	0.00	30.50	0.00	15.40	0.00
Rajshahi	5.40	69.90	0.00	32.30	0.00	24.80	0.00

District	Proportion of drought affected household Standardized	Proportion of flood affected household Standardized	Proportion of Salinity affected household Standardized	Proportion of cyclone affected household Standardized	Proportion of Storm/tidal surge affected household Standardized	Proportion of River/Coastal Erosion surge affected household Standardized	Number of Trans-boundary River Standardized
Sirajganj	16.50	71.60	0.00	2.10	0.00	49.90	12.50
Dinajpur	10.80	92.40	0.00	0.10	0.00	94.70	62.50
Gaibandha	1.10	93.40	0.00	0.10	0.00	23.60	0.00
Kurigram	11.90	100.00	0.00	0.60	0.00	28.50	62.50
Lalmonirhat	15.40	78.40	0.00	8.40	0.00	37.60	25.00
Nilphamari	3.60	65.00	0.00	0.00	0.00	52.10	37.50
Panchagarh	0.00	54.50	0.00	2.70	0.00	28.30	87.50
Rangpur	22.30	89.20	0.00	5.40	0.00	10.20	12.50
Thakurgaon	2.10	82.20	0.00	0.50	0.00	50.10	37.50
Habiganj	0.20	82.70	0.00	0.10	0.00	9.60	62.50
Moulvibazar	29.90	86.80	0.00	0.30	0.00	14.00	62.50
Sunamganj	56.40	99.00	0.00	0.30	0.00	7.40	62.50
Sylhet	28.00	79.20	0.00	2.40	0.00	5.70	100.00

Source: Bangladesh Disaster Related Statistics (BDRS) 2021, BBS; Available on: Bangladesh Bureau of Statistics (bbs.gov.bd)

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ABOUT IFPRI

The International Food Policy Research Institute (IFPRI), a CGIAR Research Center established in 1975, provides research-based policy solutions to sustainably reduce poverty and end hunger and malnutrition. IFPRI's strategic research aims to foster a climate-resilient and sustainable food supply; promote healthy diets and nutrition for all; build inclusive and efficient markets, trade systems, and food industries; transform agricultural and rural economies; and strengthen institutions and governance. Gender is integrated in all the Institute's work. Partnerships, communications, capacity strengthening, and data and knowledge management are essential components to translate IFPRI's research from action to impact. The Institute's regional and country programs play a critical role in responding to demand for food policy research and in delivering holistic support for country-led development. IFPRI collaborates with partners around the world.

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